

# IT'S TIME! to Eradicate TB – School Nurses on the Front Line

LORI EITELBACH, BSN, RN

AUGUST 7&9, 2019



# Polling Instructions

---

**Respond to: [PolEv.com/lorieitelbac884](https://PolEv.com/lorieitelbac884)**

**Or**

**Text: LORIEITELBAC884 to 22333**

# Do we really need to be concerned about TB in the US?

Yes

No

# Man in Texas found dead in alleyway died of tuberculosis, state officials say

---

Published at Tue, 09 Oct 2018 20:32:58 +000052, 09 OCTOBER

A man in Denton, Texas, who was found dead in an alleyway last week died of pulmonary tuberculosis, Fox News has confirmed. Carol Ann Walker, a public information officer for the Tarrant County medical examiner's office, which handles cases in Denton County, told Fox News on Tuesday that **Ngoc Le, 23, died of "necrotizing caseating fibrocavitary pulmonary lesions with bronchiectasis," or pulmonary tuberculosis. An autopsy helped confirm the cause of death.**

Le, of Vietnam, died on Oct. 2 after collapsing in an alleyway near his home. **Shortly before his death, the man was reportedly seen "stumbling around" in the alley "with blood coming from his mouth,"** the Denton Record-Chronicle reported. The condition is a "contagious, airborne infection that destroys body tissue," according to Healthline, which noted it primarily affects the lungs. It is not currently clear how or when Le may have contracted the illness, which is spread from person to person "through microscopic droplets released into the air," according to Mayo Clinic. **This occurs when a person with an "untreated, active" form of the infection coughs, sneezes, or spits, among other methods. While Le had recently traveled to Vietnam, state health officials do not believe the traveling contributed to his death,** according to the newspaper.

His roommates will be tested for tuberculosis, the Denton Record-Chronicle reported. State health officials told the outlet that his death is not indicative of a public health threat. "Based on the autopsy findings, Denton County Public Health (DCPH) is treating this as an active case of TB [tuberculosis]. DCPH routinely tests, diagnoses, treats and investigates TB Cases," Jennifer Rainey, a public information officer for Denton County Public Health, told Fox News in a statement.

In 2017, 1,127 of tuberculosis were reported in the state, according to the Texas Department of State Health Services. While the infection is treatable, tuberculosis remains a "major killer" because some strains are drug-resistant, according to the Mayo Clinic.



Active Case Of Tuberculosis Is Detected In A Fort Bend County High School, May 8, 2018



OCHS student diagnosed with TB, October 19, 2018 (Orange County, CA)



2 Tuberculosis Cases Reported at Georgia Elementary Schools, February 28, 2019



1 Case of Tuberculosis Confirmed in Mississippi High School, February 11, 2019

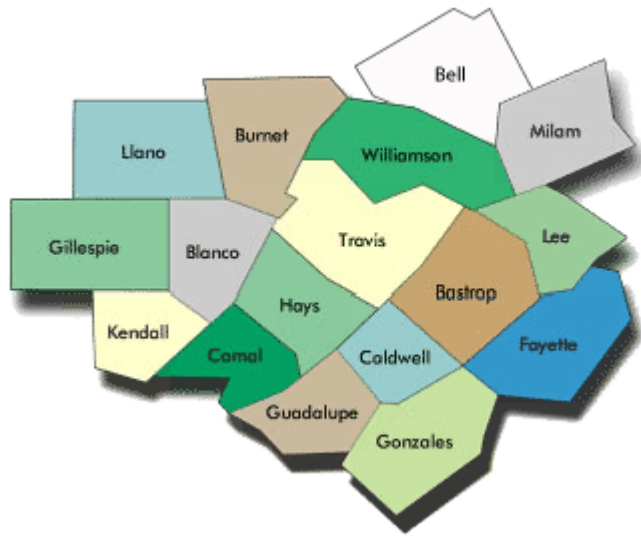


UPDATE: Case of tuberculosis confirmed at Gwinnett high school, March 4, 2019



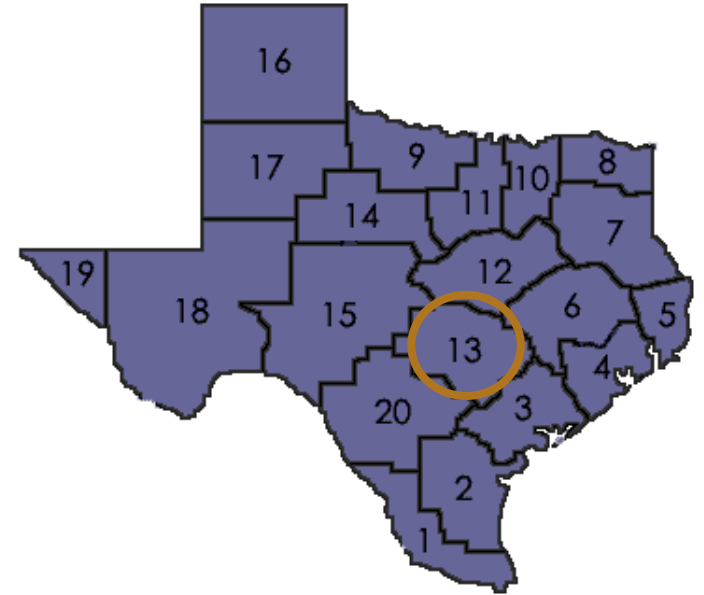
10 new cases of TB found at Texas high school after second round of testing, August 24, 2017

# Region 13 Education Service Centers



## Counties:

- Bell County - Bartlett ISD
- Llano County - Llano ISD
- Burnet County - Burnet CISD, Marble Falls ISD
- Williamson County - Coupland ISD, Florence ISD, Georgetown ISD, Granger ISD, Hutto ISD, Jarrell ISD, Leander ISD, Liberty Hill ISD, Round Rock ISD, Taylor ISD, Thrall SID, SWU
- Milam County - Thorndale ISD
- Gillespie County - Doss CISD, Fredericksburg ISD, Harper ISD
- Blanco County - Blanco ISD, Johnson City ISD
- Travis County - Austin ISD, Del Valle ISD, Eanes ISD, Lake Travis ISD, Lago Vista ISD, Manor ISD, Pflugerville ISD, Region 13, TSB, TSD, HTC, CUA, SEU, UTA
- Bastrop County - Bastrop ISD, Elgin ISD, McDade ISD, Smithville ISD
- Lee County - Dime Box ISD, Giddings ISD, Giddings State School, Lexington ISD
- Kendall County - Comfort ISD
- Comal County - Comal ISD, New Braunfels ISD
- Hays County - Dripping Springs ISD, Hays CISD, San Marcos CISD, Wimberley ISD, Texas State
- Caldwell County - Lockhart ISD, Luling ISD, Prairie Lea ISD
- Fayette County - Fayetteville ISD, Flatonia ISD, La Grange ISD, Round Top- Carmine ISD, Schulenburg ISD
- Guadalupe County - Marion ISD, Navarro ISD, Schertz-Cibolo-Universal City ISD, Seguin ISD, Texas Lutheran University (TLU)
- Gonzales County - Gonzales ISD, Nixon-Smilely CISD, Waelder ISD



# Learning Objectives

History of tuberculosis	School Nurse responsibilities for TB control
Updated World, National, State and Local TB Stats	TST vs IGRA – new guidelines for use of IGRA in >2 years old
Updated guidelines on treating MDR TB	Treatment options for LTBI including newest regimen of 3HP and new Rifampin dosing
New focus on treating LTBI	Possible adverse reactions
Understanding Extrapulmonary TB	Directly observed therapy (DOT)
Who is at risk for becoming infected with TB – including new class of Biologics and new awareness of >5 years immigrants	TB Prevention
TB testing in TX schools	School nurse responsibilities with contact investigations
TB in children	

# History of Tuberculosis

- Tuberculosis (TB) is hypothesized to have evolved from *M bovis*; acquired by humans from domesticated animals ~300,000 years ago. M.TB DNA was found in bones of Great Plains Bison in WY ~20,000 years ago.
- Hippocrates thought the disease was hereditary.
- Aristotle argued that it was contagious in nature.
- 19th-century predecessors often referred to tuberculosis as consumption, which is precisely what the unchecked infection does; it slowly but surely consumes lungs and other organs.
- Because of the color of these tubercles, the disease was commonly referred to as the “White Plague.”
- In 1882, Dr. Robert Koch discovered the *Mycobacterium tuberculosis*, the bacteria that causes TB. He revealed that TB is not genetic, but rather highly contagious.
- In 1943, antibiotic streptomycin was discovered – a huge breakthrough in TB treatment. However, many patients soon relapsed, and resistance occurred.
- It wasn't until multi-drug regimens were used in the early 1950's that the decline of tuberculosis really started to occur.

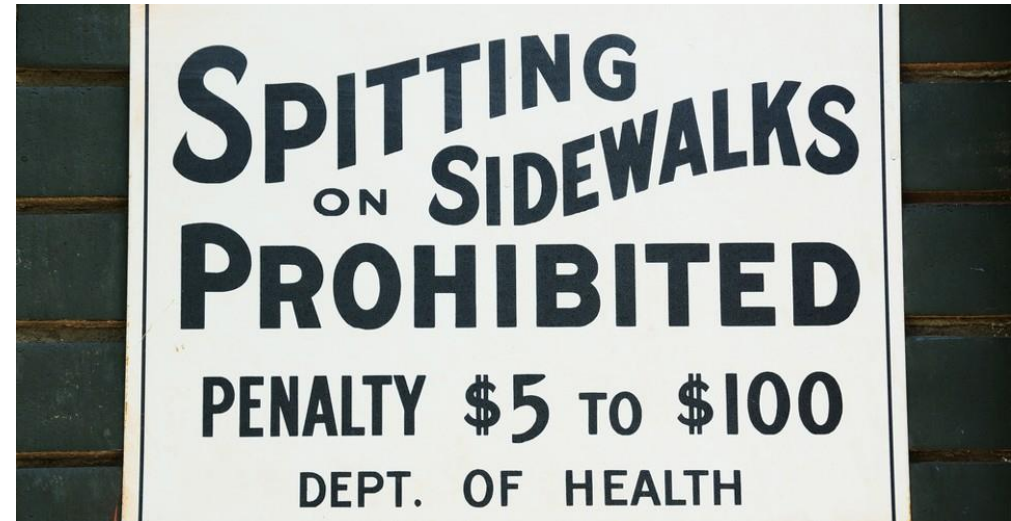


European immigrants to New World brought TB with them.

- Large cities like Boston and New York's death rates reached 7/1,000 in 1800's

1900-1940 TB rates decreased to 4/1,000 in US and Western Europe before TB drugs available - presumably, public health measures played a role in declining rates:

- Better nutrition
- Less crowded housing
- Public health efforts
  - Anti-spitting laws
  - Earlier diagnosis
  - Limit transmission to close contacts
- Surgery
- TB sanatoriums – fresh air and ample food
  - First American sanatorium established in 1875



TB in the US – 1800-1940



In 1900, there were 34 sanatoriums scattered across the country with some 4,485 beds, but by 1925, the United States was home to 536 sanatoriums with some 673,338 beds.



Patients were required to stay in bed for long stretches and remain perfectly still. They couldn't listen to the radio, watch TV, or read a book because it was thought it would disturb the TB germs.



Extreme poverty and lack of sanitary conditions are great breeders of tuberculosis.



The “lungers” camp.

# TB in the US – 1940-1980's

1940s-1960s TB specific antimicrobial agents

- Single drugs
- Multiple drugs

1960s-1980s TB considered a non-problem

- Many old screening programs and requirements shut down.
- In 1980, American Thoracic Society proclaimed that TB was so rare that routine skin testing was no longer necessary, and many schools, for example, dropped TB detection programs.
- Doctors and nurses trained in 1980's didn't get TB training.
- Sanitoriums closed.
- TB treatment moved to private sector.
- Loss of TB-specific public health infrastructure.

# What happened in the late 1980's and early 1990's with respect to TB?

The US finally eradicated TB entirely.

Multi-drug resistant TB was becoming a significant concern.

TB spread more because international travel was becoming common.

HIV emerged causing a spike in HIV/TB co-infections.

All of the above.

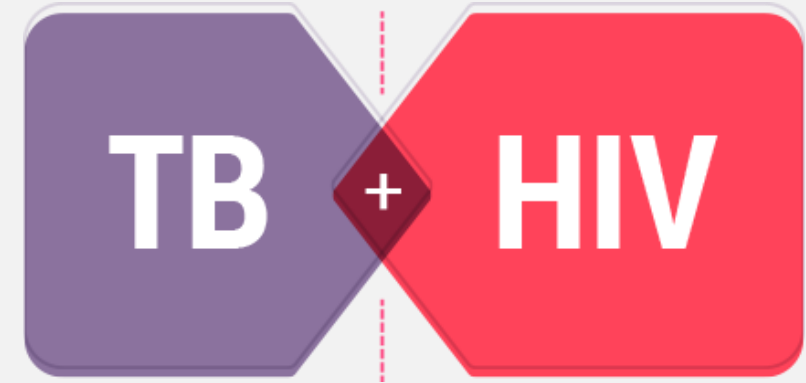
B, C and D

# TB in the US – 1990-present

## 1990's

TB re-emerges as a threat

- TB-HIV co-infection
- Drug-resistant TB
- Globalization allows TB to travel

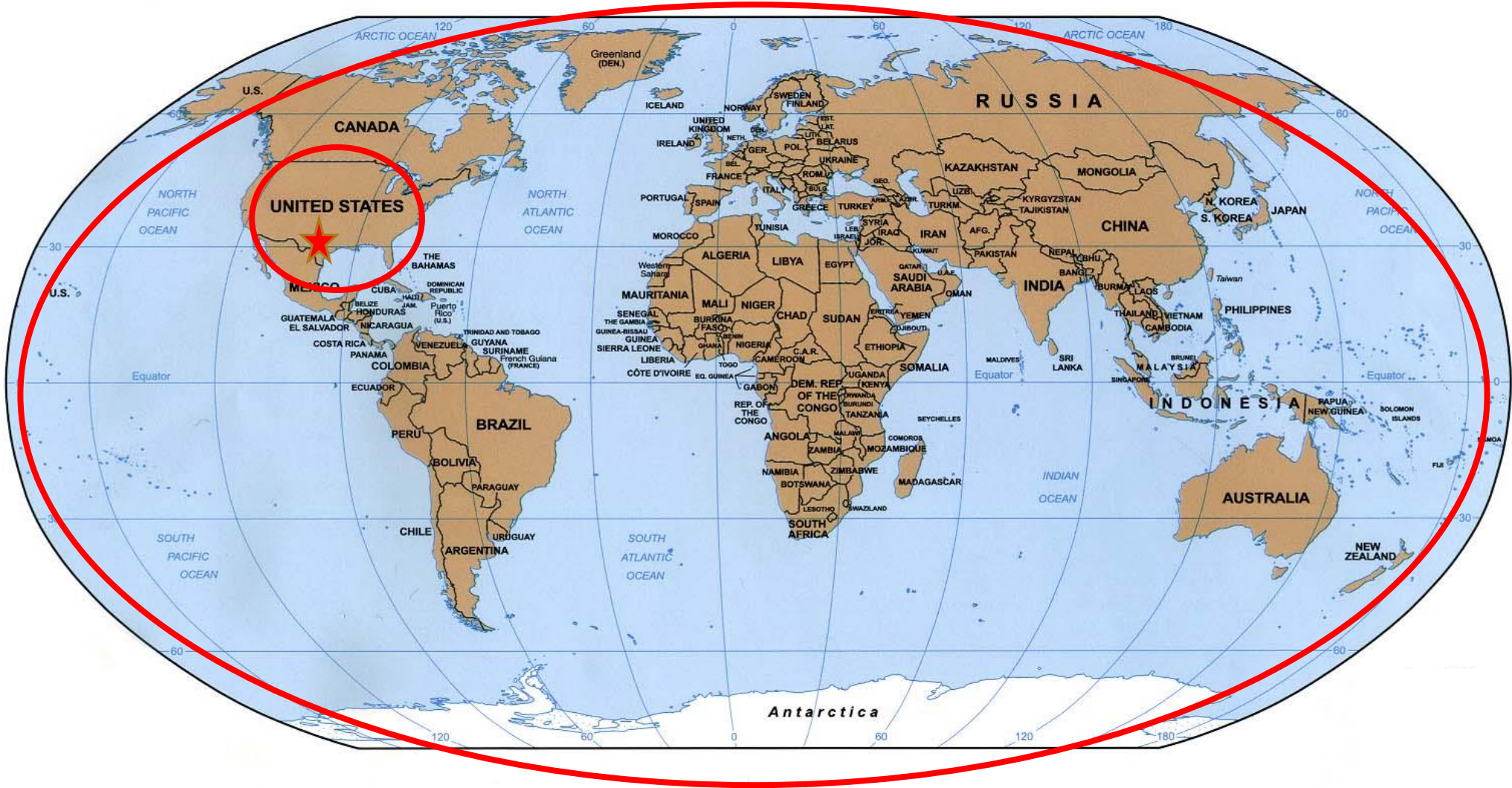


Increased support for TB prevention and control

- Funding for public health efforts (case management, contact investigations, directly observed therapy - DOT)
- Better diagnostic and patient management tools (NAAT, TB PCR, reporting)

## 2017 - present

- Lowest number of reported cases in US
- Funding declining
- New focus on treating LTBI



**TUBERCULOSIS**

— IS THE WORLD'S —

**TOP**

INFECTIOUS DISEASE

**KILLER**

CLAIMING NEARLY

**2 MILLION**

LIVES A YEAR

March 2017



© David Hyatt/CDC Foundation



[CDC.GOV/GLOBALHIVTB](http://CDC.GOV/GLOBALHIVTB)

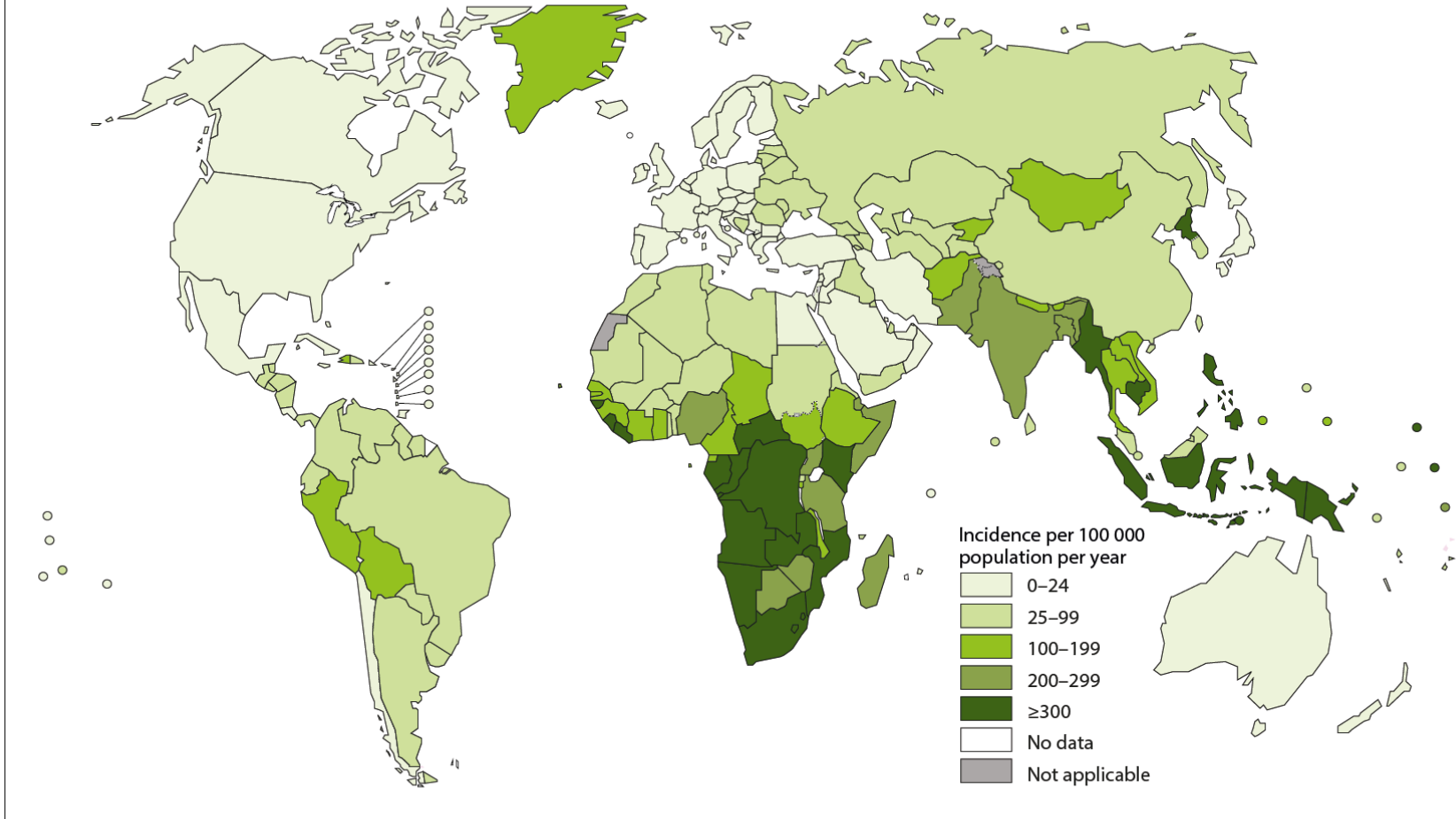
#fightingHIVTB



# World TB Statistics

- Tuberculosis (TB) is one of the top 10 causes of death worldwide, and #1 for infectious diseases.
- In 2017, 10 million people fell ill with TB, and 1.6 million died from the disease (including 0.3 million among people with HIV).
- In 2017, an estimated 1 million children became ill with TB and 230,000 children died of TB (including children with HIV associated TB).
- TB is a leading killer of HIV-positive people.
- Multidrug-resistant TB (MDR-TB) remains a public health crisis and a health security threat. WHO estimates that there were 558,000 new cases with resistance to rifampicin – the most effective first-line drug, of which - 82% had MDR-TB.
- Globally, TB incidence is falling at about 2% per year. This needs to accelerate to a 4–5% annual decline to reach the 2035 milestones of the End TB Strategy.
- An estimated 54 million lives were saved through TB diagnosis and treatment between 2000 and 2017.

## Estimated TB incidence rates, 2017



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

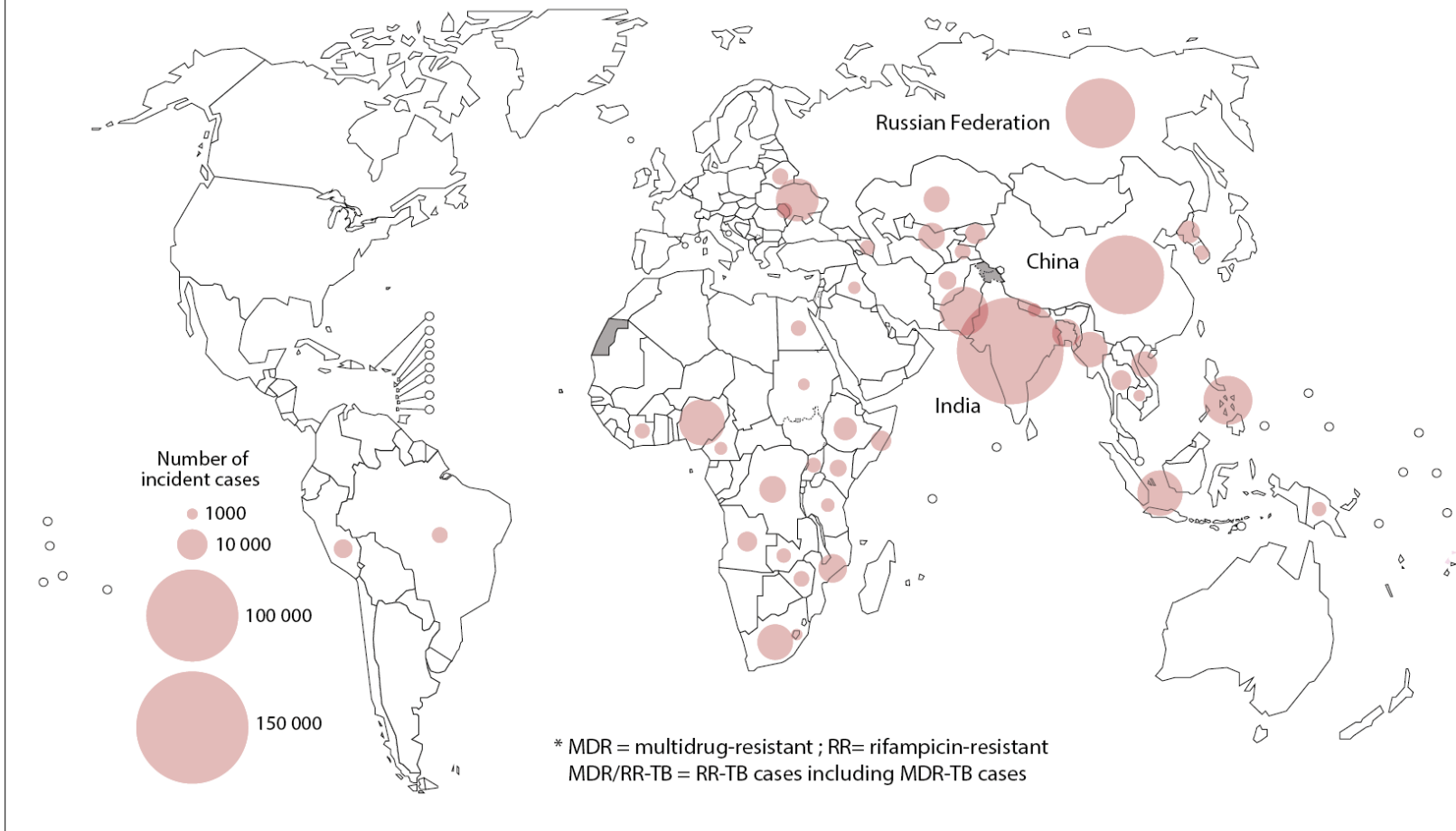
Data Source: *Global Tuberculosis Report 2018*. WHO, 2018.

© WHO 2018. All rights reserved.



World Health Organization

**Estimated incidence of MDR/RR-TB in 2017, for countries with at least 1000 incident cases\***



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: *Global Tuberculosis Report 2018*. WHO, 2018.

© WHO 2018. All rights reserved.



# TB BURDEN IN CHILDREN IS HUGE AND UNRECOGNIZED



**1 million**



children fell ill with TB in 2017  
(10% of total burden)



**52% <5 year olds**

**233 000**

child TB deaths in 2017



**80% in children  
<5 years**

# Vaccination Options

---

BCG vaccine – Bacille Calmette-Guerin: an attenuated vaccine strain produced by the sequential passage of a virulent *M. bovis strain* by Calmette and Guerin in Paris in the 1920s.

The BCG vaccine, developed almost 100 years ago, has been shown to prevent severe forms of TB in children, is still widely used in *high-burdened countries*.

However, there is currently no vaccine that is effective in preventing TB disease in adults, either before or after exposure to TB infection.

There are currently 12 TB vaccines in Phase I, Phase II or Phase III trials.

# Why don't we give the BCG vaccine in the US?

It's too expensive.

We don't have enough TB to make it worth the public health effort.

It's not that effective.

All of the above.

B and C

A and C

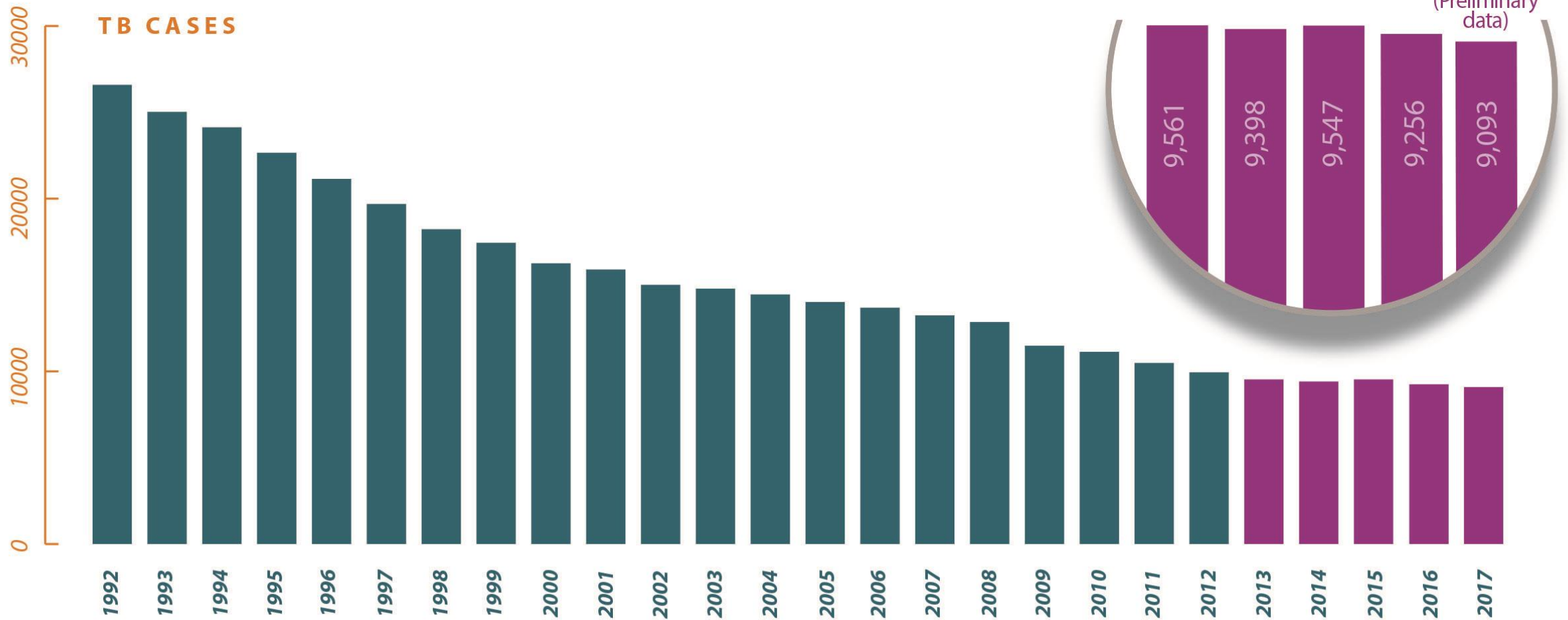
# TB in the United States

## In the US in 2017

- 9,105 new cases of TB were reported
  - 1.6% decrease from 2016
- Incidence rate of 2.8/100,000
  - 2.3% decrease from 2016
- 11 states, District of Columbia and New York City = incidence rate >2.8/100,000
- Texas, California, New York (including NY City) and Florida account for approx. 50% of national total
- Minority populations continue to disproportionately bear the burden of TB disease w/ 70.1% in foreign born persons in 2017
- 123 MDR-TB cases
  - Increase of 26 from 2016
- **Approximately 13M in US are infected with *Mycobacterium tuberculosis* – (latent TB infection – LTBI) Reservoir of TB and therefore a major focus for ending TB**

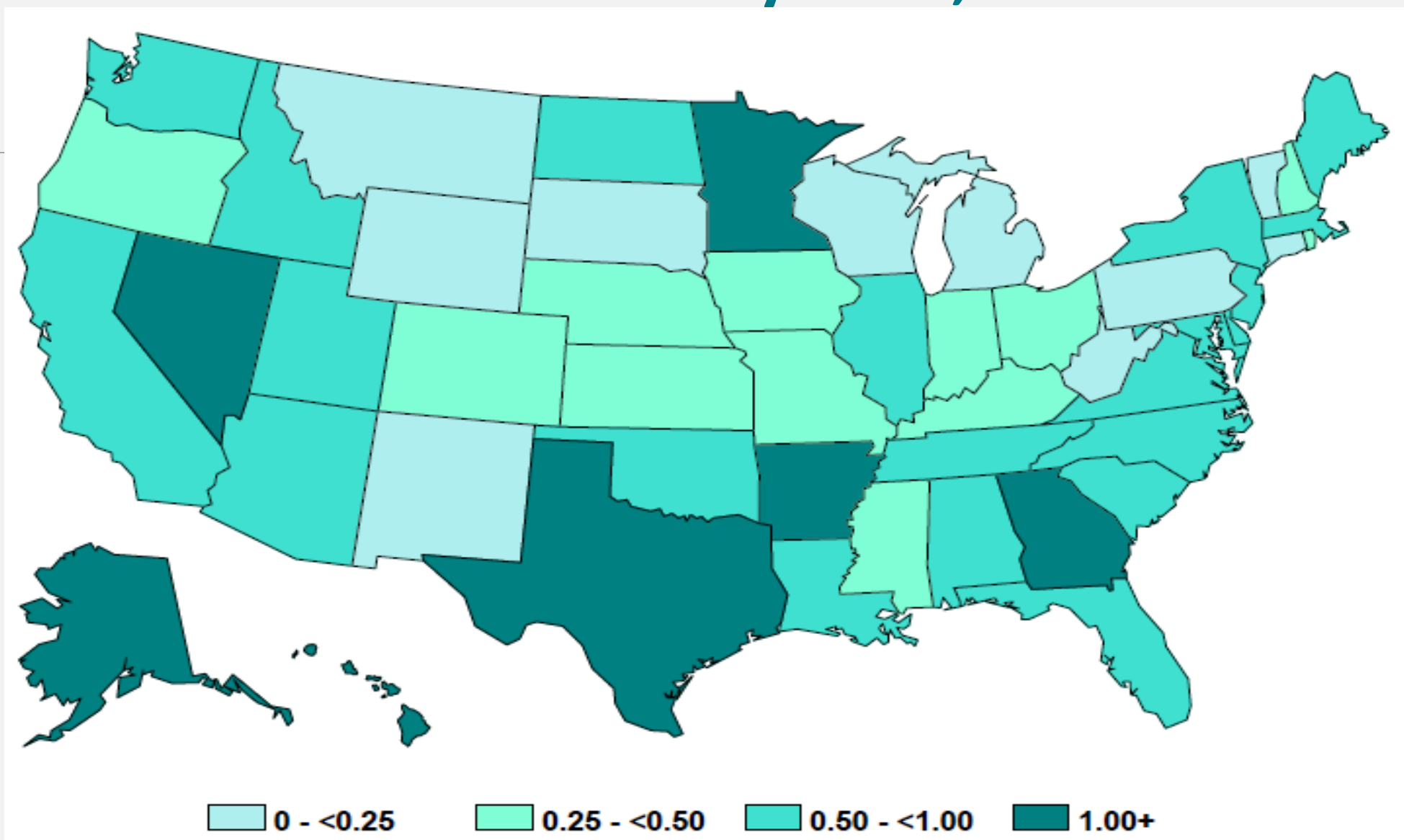
Ending TB requires maintaining and strengthening current TB control priorities while increasing efforts to identify and treat latent TB infection (LTBI) among high-risk populations.

# Trends in TB Cases, 1992-2017





# U.S. Pediatric TB Case Rates\* by State, 2013–2017



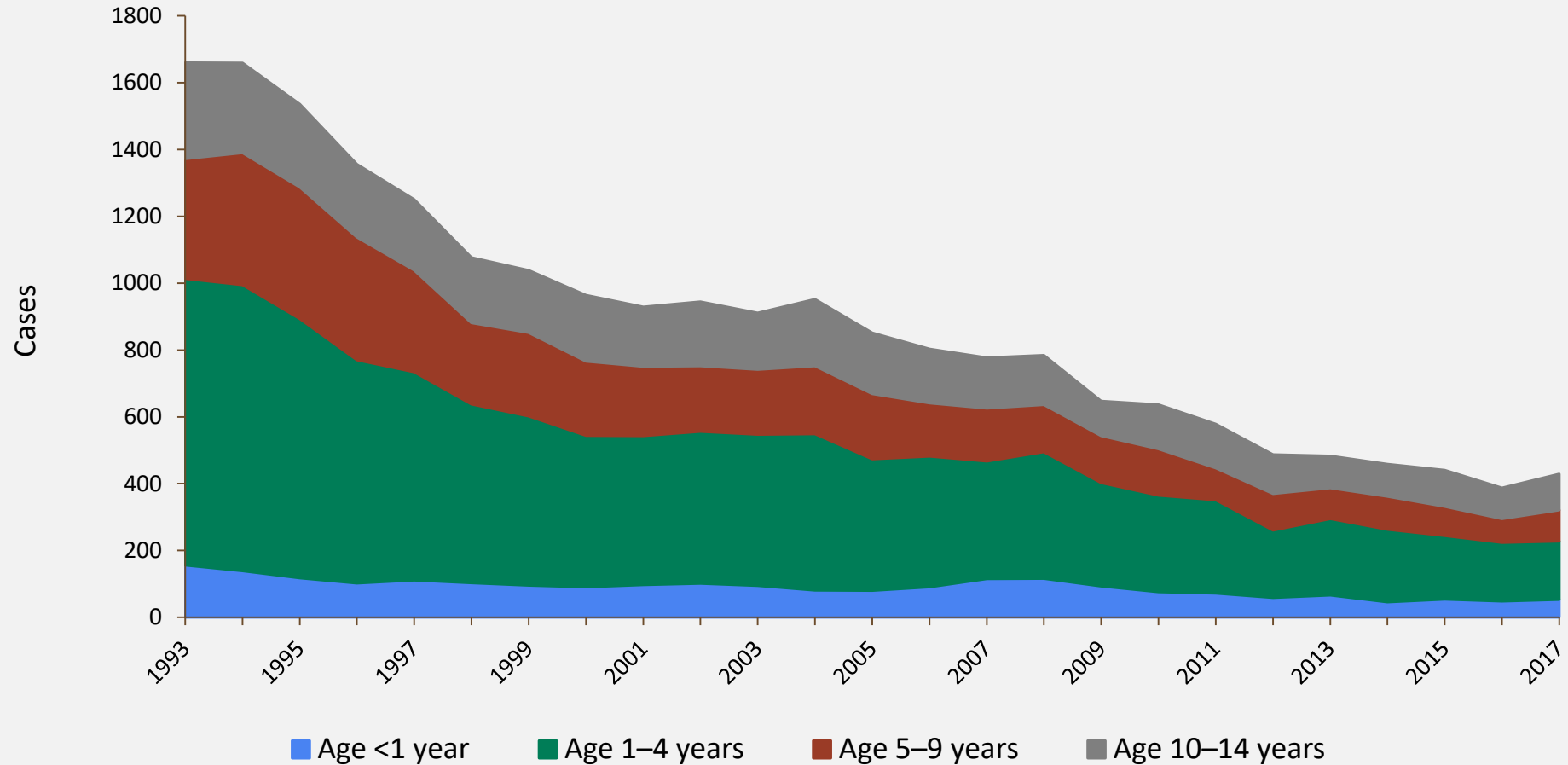
# Background: Pediatric Tuberculosis

- **Definition of pediatric tuberculosis (TB):**
  - TB disease in a person <15 years old
- **In 2017:**
  - 9,105 TB cases were reported among all age groups
  - 429 (4.7%) were pediatric

Age group	N	Percentage of all cases
0–1 years	53	0.6%
1–4 years	175	1.9%
5–9 years	93	1.0%
10–14 years	108	1.2%

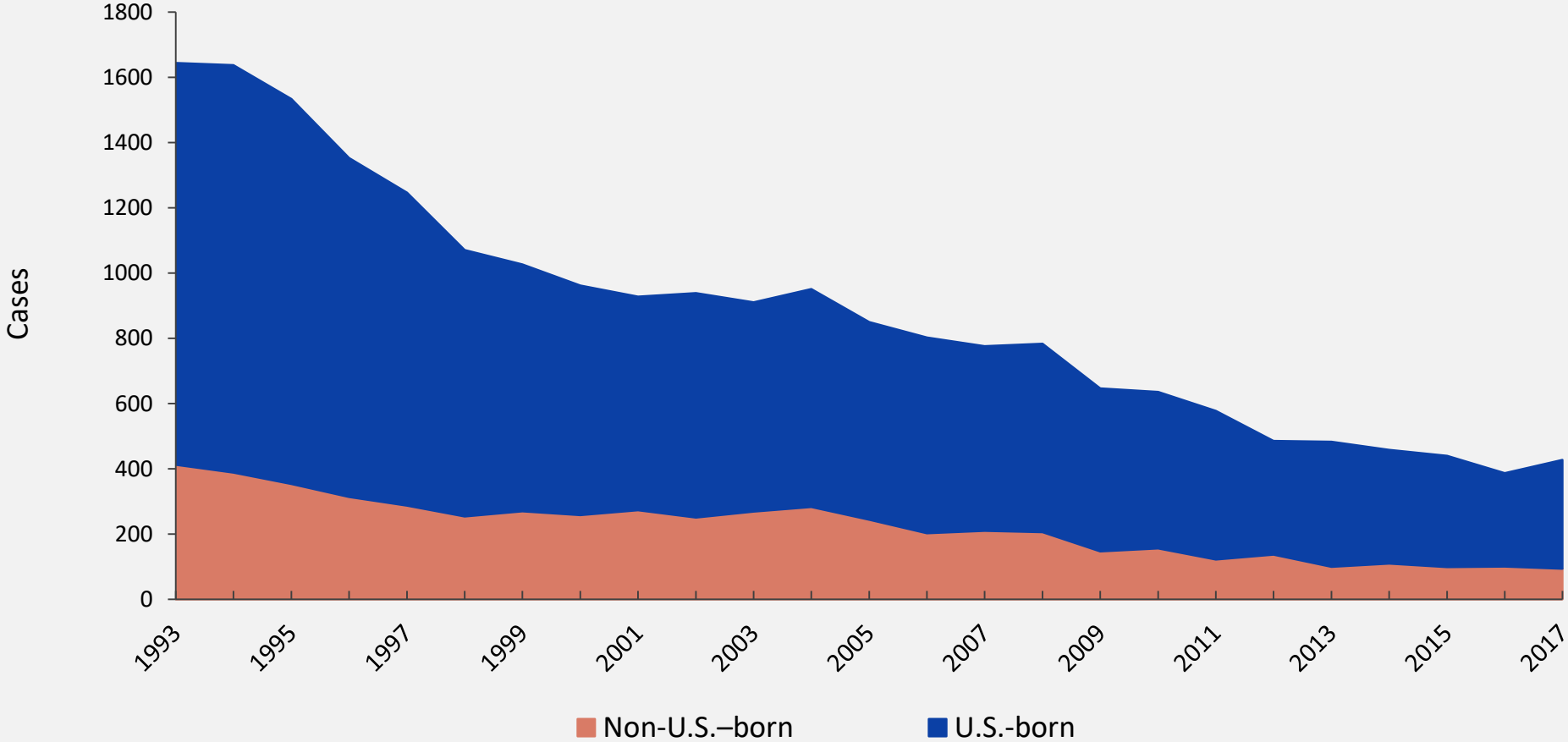
# U.S. Pediatric TB Cases by Age Group, 1993–2017

N=22,037

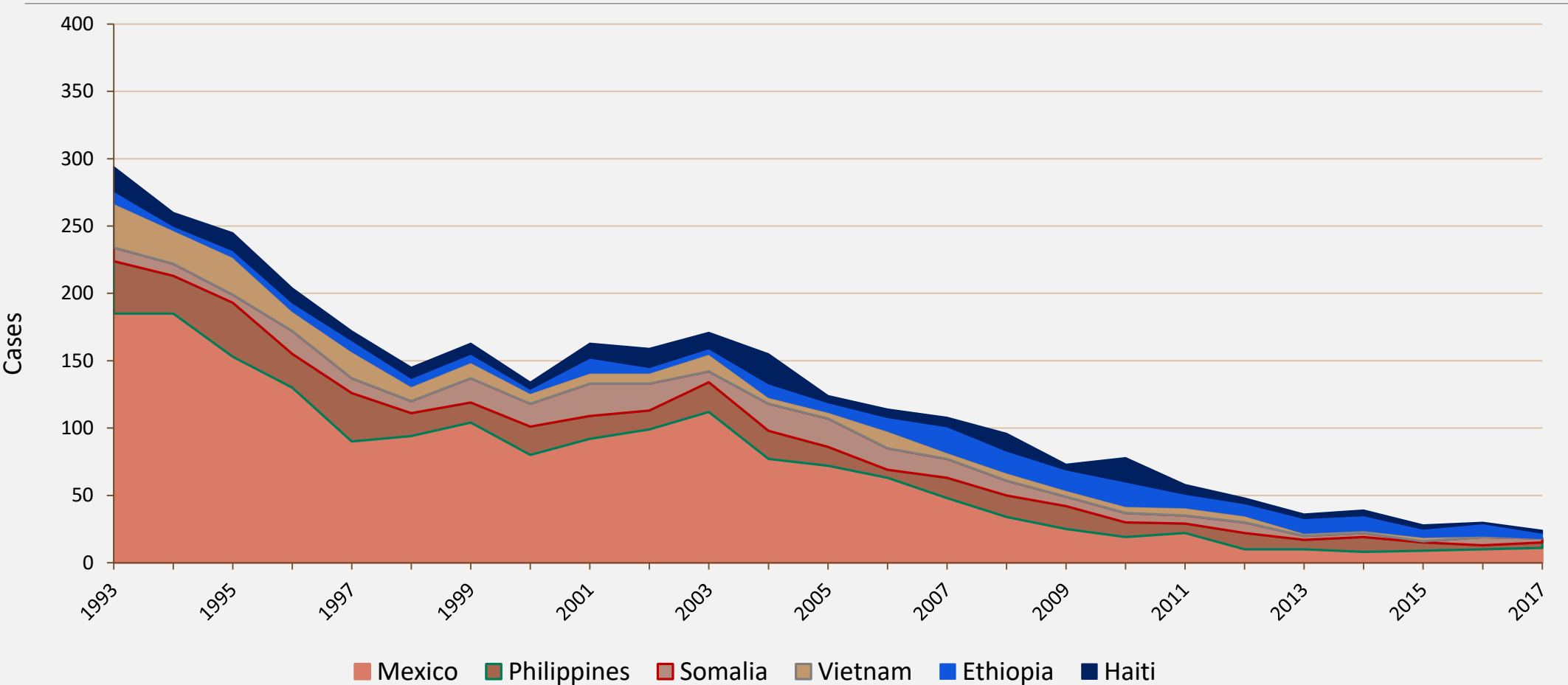


# Number of U.S. Pediatric TB Cases among U.S.-Born and Non-U.S.-Born\* Children, 1993–2017

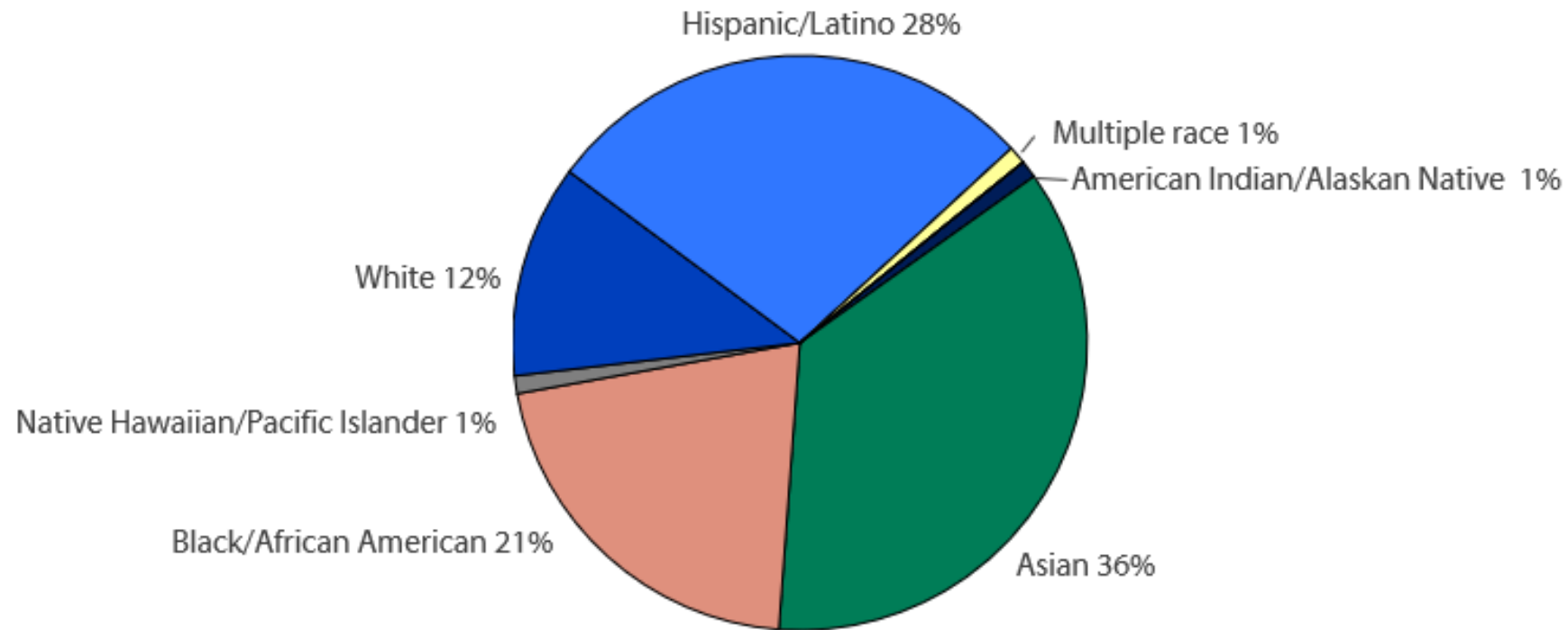
N=22,037



# Top Six Countries of Birth for Non-U.S.–born U.S. Pediatric TB Cases, 1993-2017



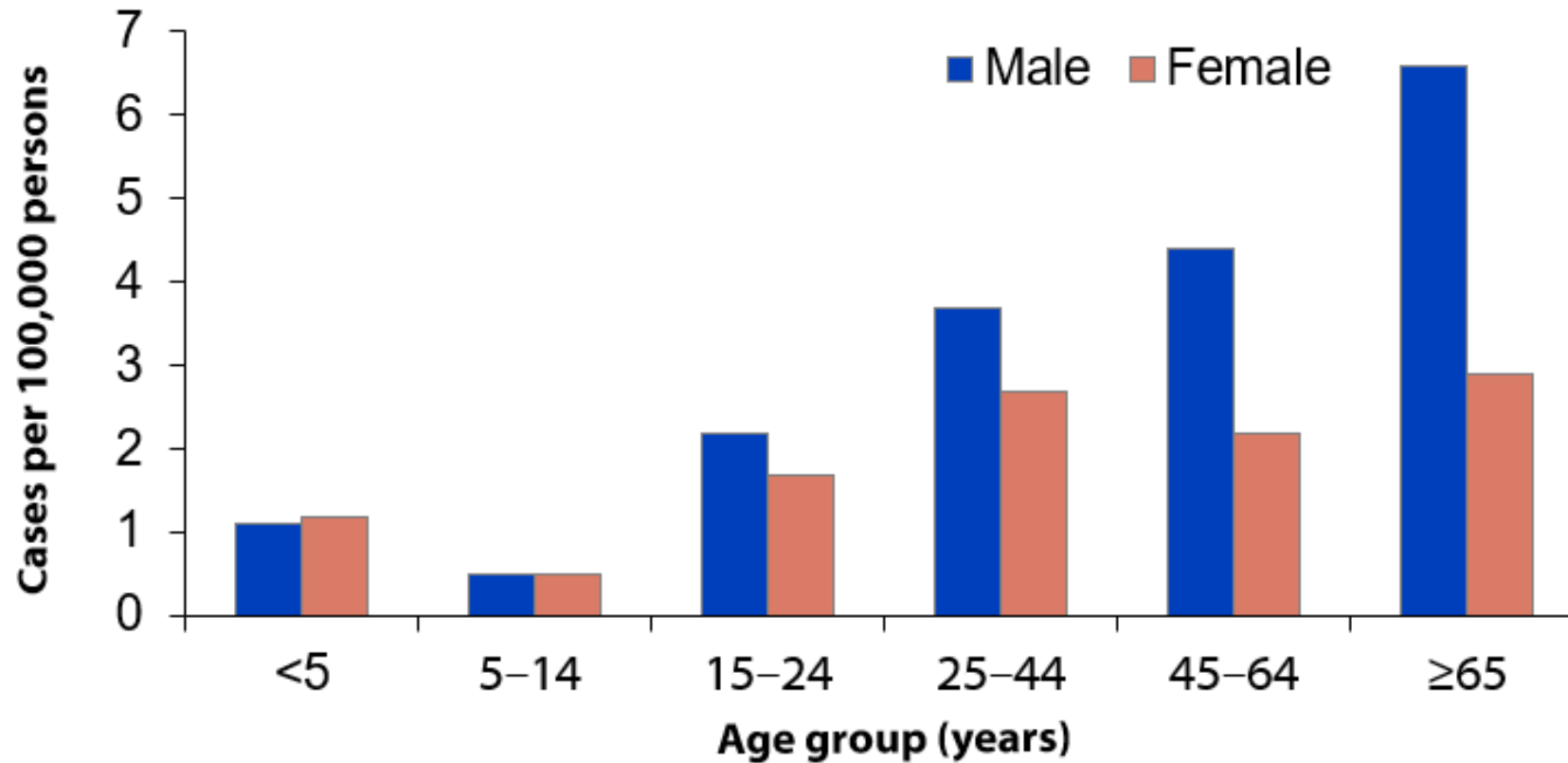
## Reported TB Cases by Race/Ethnicity,\* United States, 2017<sup>†</sup>



\* All races are non-Hispanic; multiple race indicates two or more races reported for a person, but does not include persons of Hispanic/Latino origin.

<sup>†</sup> Percentages are rounded.

## TB Case Rates by Age Group and Sex, United States, 2017\*



\*Cases per 100,000 population



## **Start the presentation to activate live content**

If you see this message in presentation mode, install the add-in or get help at [PollEv.com/app](https://PollEv.com/app)



# TB Deaths in United States

---



In 2016, the most recent data available, 528 deaths in the United States were attributed to TB. This is an increase from 470 deaths attributed to TB in 2015.



One of those deaths occurred in Williamson County.

# TB in Texas

Census division/State	No. of reported TB cases*			TB incidence†		
	2017	2018	% Change	2017	2018	% Change§
Texas	1,127	1,129	0.2	4.0	3.9	-1.1

- 8 people were diagnosed with multidrug resistant TB (MDR) – one of those people lives in Williamson County
- There were no cases of extensively drug-resistant TB (XDR).
- 53% of reported cases were Hispanic
- 20% - Asian
- 19% - African American
- 9% - Caucasian

# Figure 1: Texas TB Cases and Rates by Report Year, 2012-2017

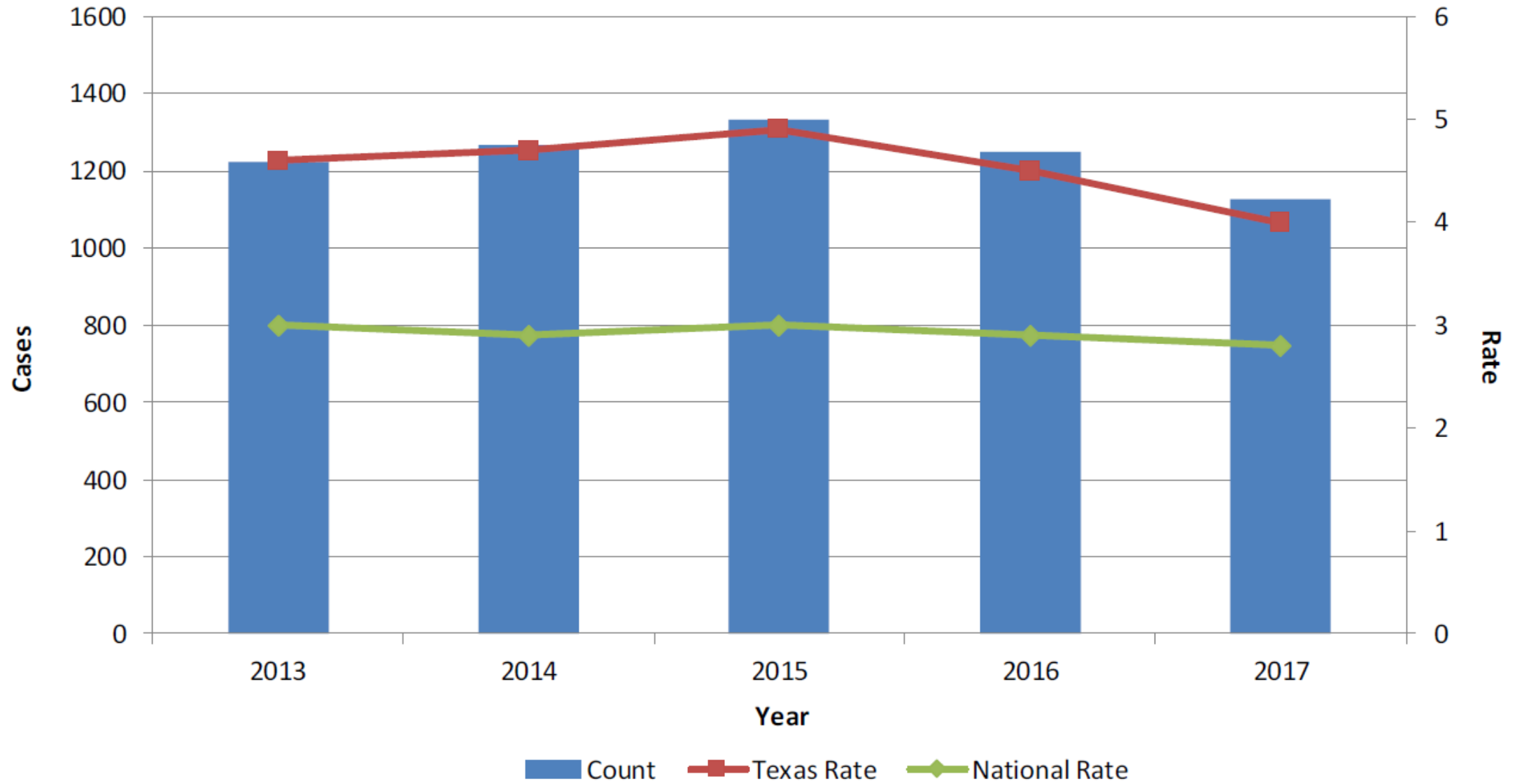
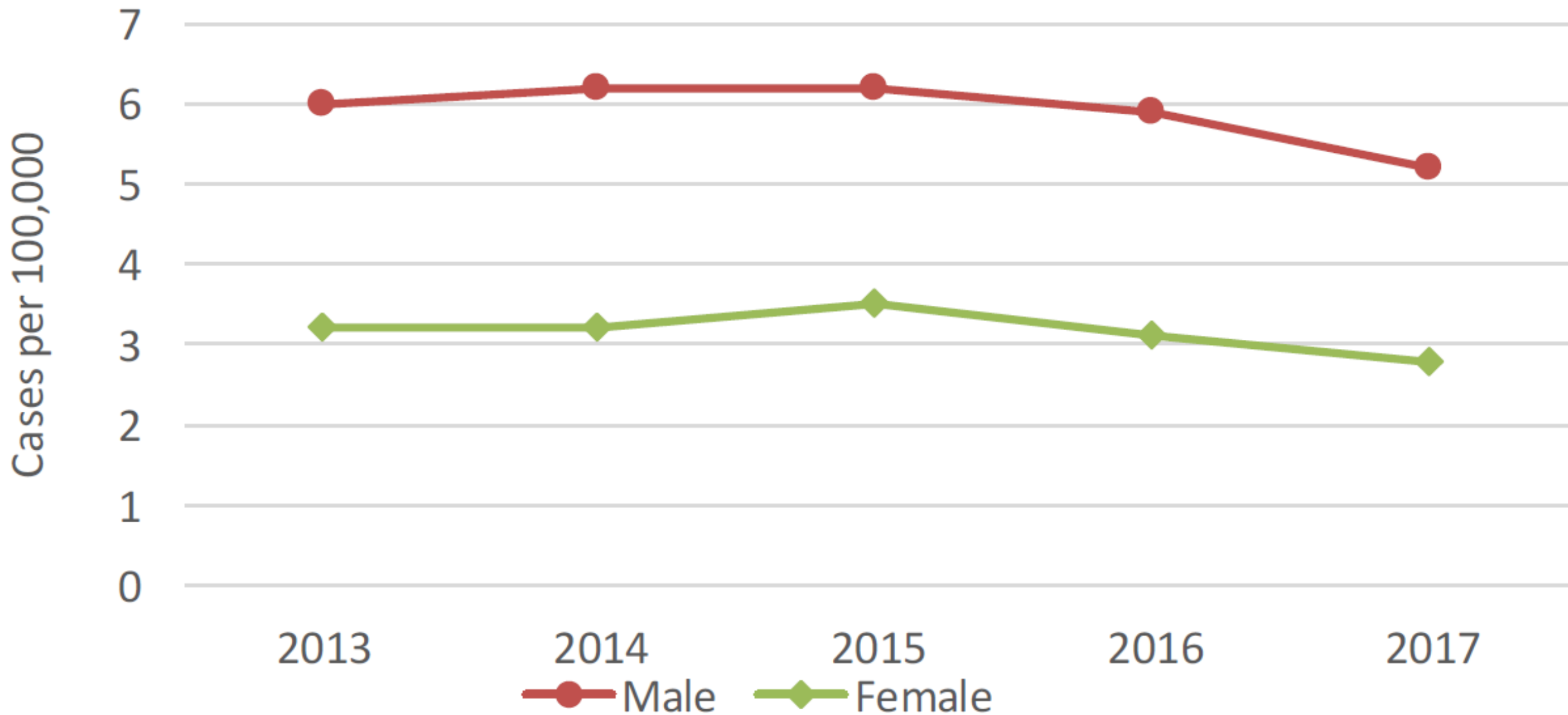
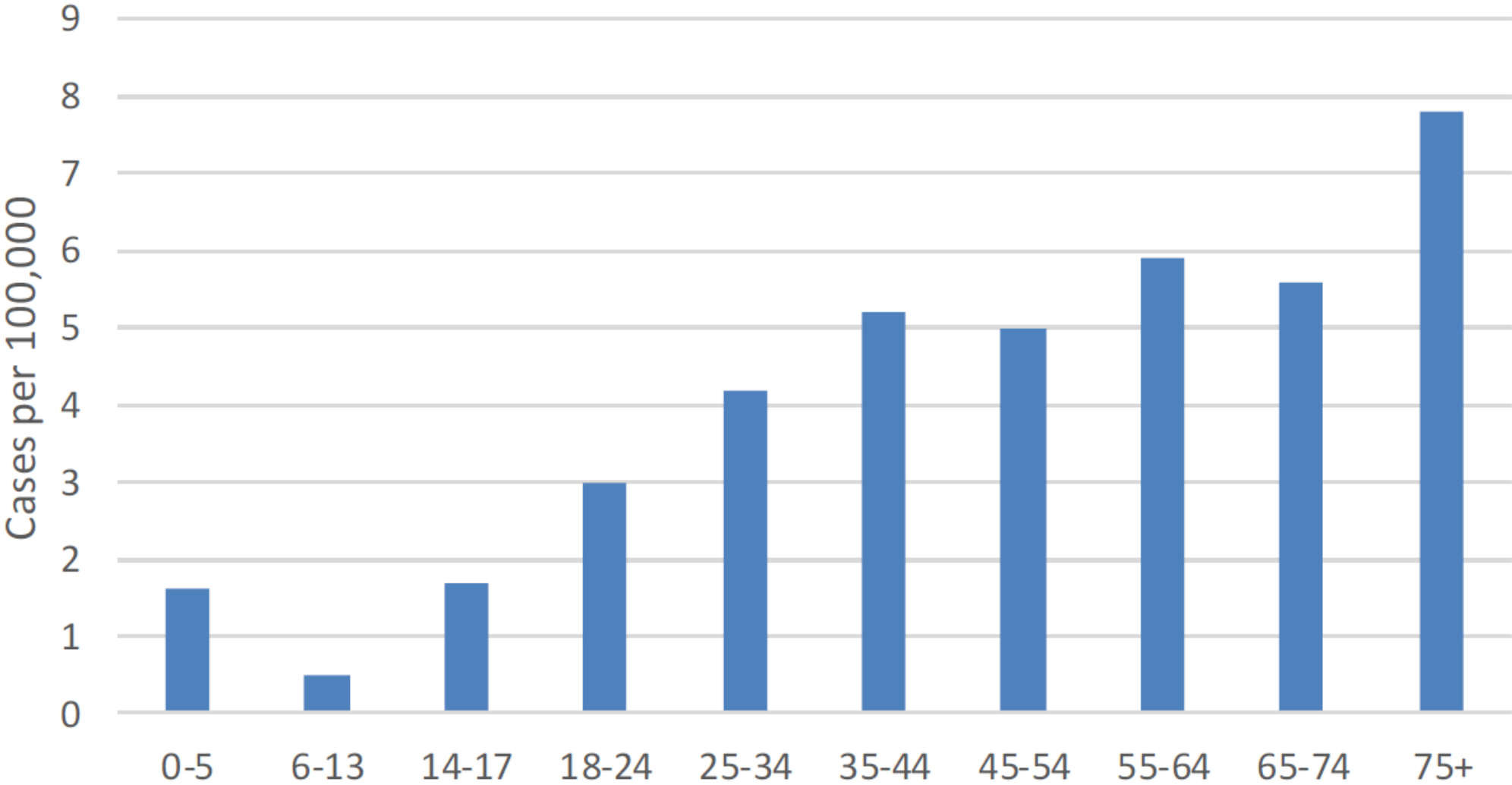


Figure 3: Texas TB Case Rate by Sex and Report Year, 2013-2017



### Figure 4: Texas TB Case Rate by Age Group, 2017



# TB Case Counts in Children – TX

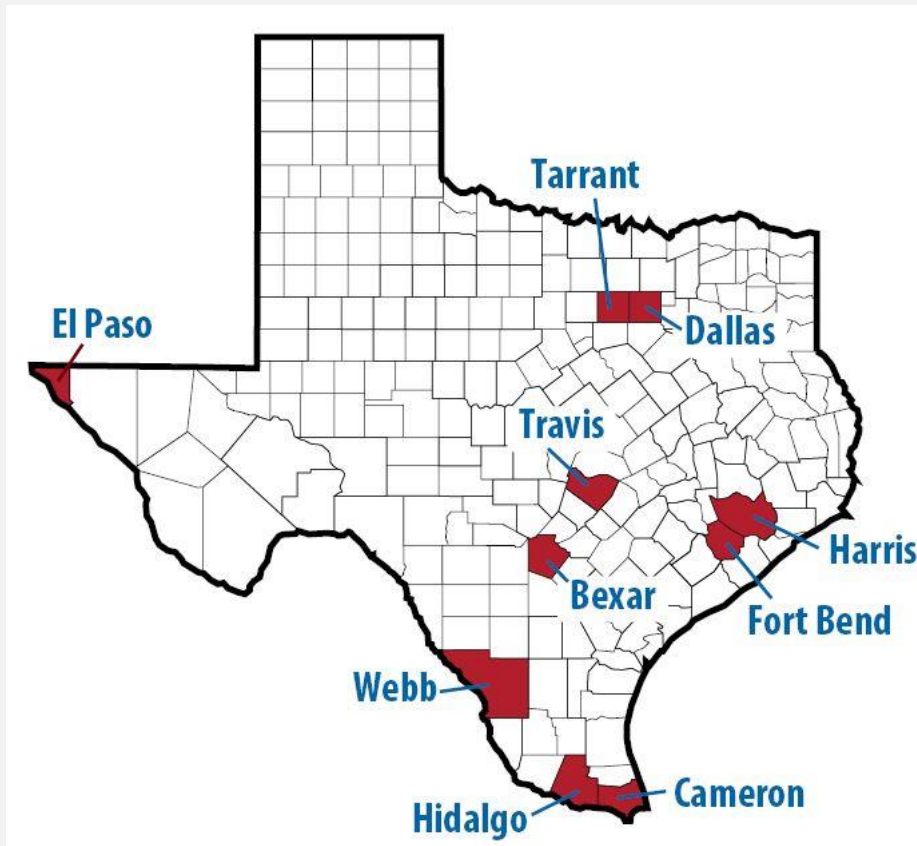
**Table 1: TB Case Count and Rate by Sex, Race/Ethnicity and Age Group, 2013-2017**

	2013		2014		2015		2016		2017	
	Count	Rate*	Count	Rate*	Count	Rate*	Count	Rate*	Count	Rate*
<b>Age Group</b>										
0-5	55	2.4	52	2.2	49	2.1	48	2	38	1.6
6-13	15	0.5	20	0.6	27	0.8	19	0.6	16	0.5
14-17	28	1.8	25	1.6	31	1.9	29	1.8	28	1.7

98

82

# TB in Texas Counties in 2017

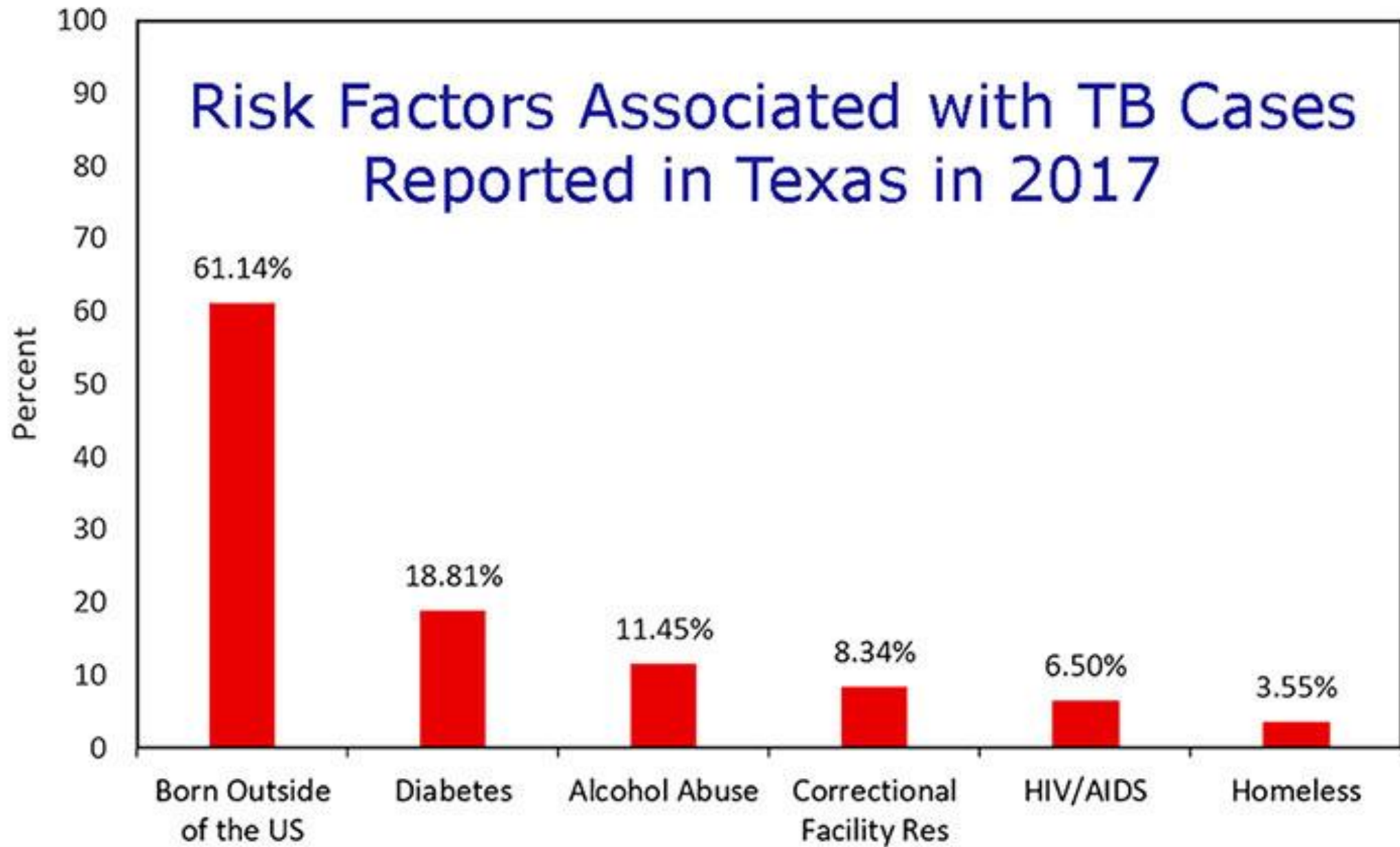


County	Case Number
Harris	281
Dallas	158
Tarrant	80
Bexar	73
Hidalgo	57
Cameron	52
El Paso	36
Travis	35
Fort Bend	35
Webb	25

# TB Case Counts and Rates in Region 13 Education Service Center Counties

	2013	2013	2014	2014	2015	2015	2016	2016	2017	2017
County	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Bastrop	1	1.3	2	2.6	1	1.2	0	0	1	1.2
Bell	3	0.9	3	0.9	7	2.1	6	1.8	4	1.1
Blanco	0	0	0	0	0	0	0	0	0	0
Burnet	0	0	3	6.8	0	0	0	0	1	2.1
Caldwell	1	2.6	3	7.6	1	2.5	1	2.4	0	0
Comal	2	1.7	0	0	0	0	2	1.5	1	0.7
Fayette	0	0	0	0	1	4.0	1	4.0	0	0
Gillespie	0	0	0	0	1	3.9	0	0	0	0
Gonzales	1	5.0	0	0	0	0	1	4.8	0	0
Guadalupe	1	0.7	1	0.7	2	1.3	2	1.3	3	1.9
Hays	2	1.1	2	1.1	2	1.0	3	1.5	2	0.9
Kendall	0	0	0	0	1	2.5	0	0	0	0
Lee	0	0	0	0	1	5.9	1	5.9	1	5.8
Llano	0	0	0	0	0	0	0	0	0	0
Milam	0	0	0	0	0	0	1	4.0	2	8.0
Travis	41	3.7	49	4.3	59	5.0	52	4.3	35	2.9
Williamson	11	2.3	8	1.6	14	2.8	9	1.7	11	2.0





AGADIA POSTING CO.

# TUBERCULOSIS

IS CURABLE AND  
PREVENTABLE

*If You are Rundown or have a Cough get a Medical Examination*

Maritime Tuberculosis Educational Committee.



# If this is true today, why is progress so slow?

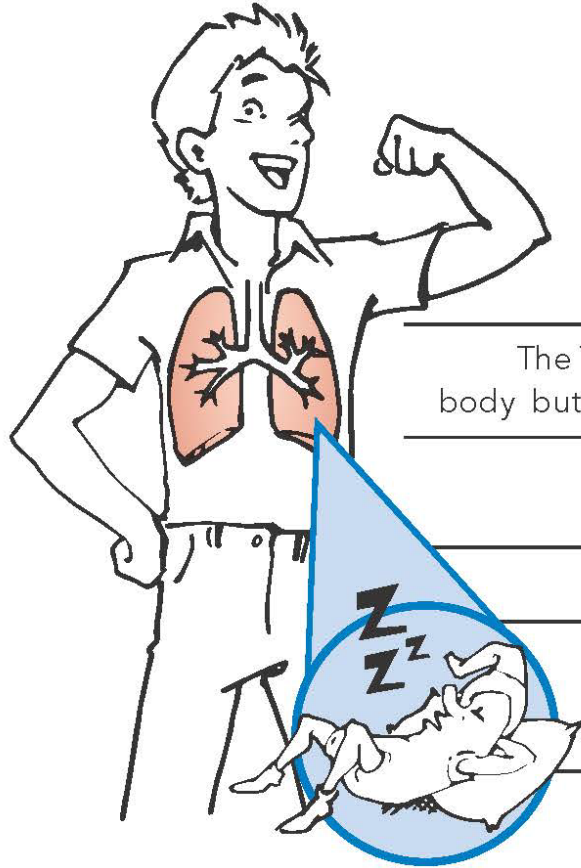
No one seems to know much or care about TB.

We can't eradicate TB without treating latent TB.

We're not putting enough resources into TB.

Medical and nursing students aren't learning about TB anymore.

# Overview of LTBI vs Active TB Disease



## Latent TB Infection

I am healthy.

The TB germs are “sleeping” in my body but could “wake up” in the future.

I have no symptoms.

My chest x-ray is normal.

I am not contagious.

I have a positive result on a TB skin test or blood test.

Can my **Latent TB Infection** (sleeping

## Active TB Disease

I have a serious illness that could kill me if left untreated.

The TB germs have “woken up”.

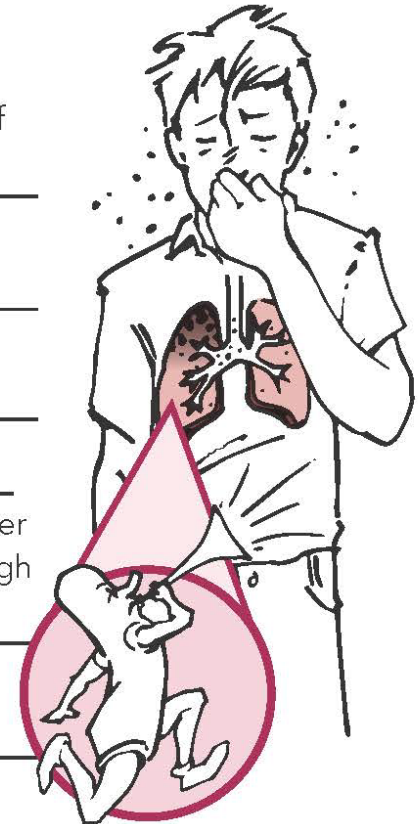
I may have symptoms – cough, fever, weight loss, night sweats.

My chest x-ray may be abnormal.

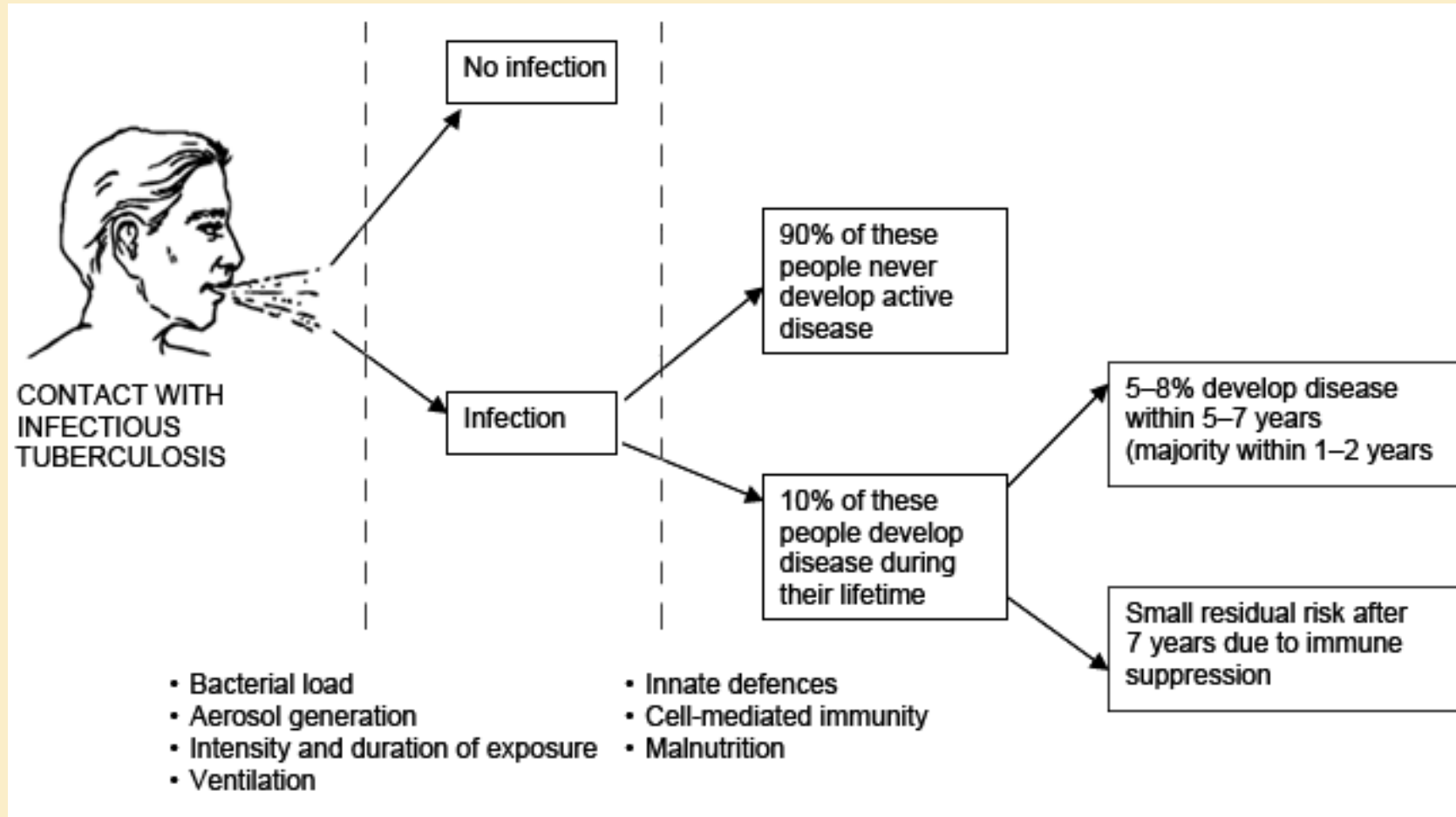
I may be contagious and could infect other people when TB germs are spread through the air when I cough, laugh or speak.

I may have a positive result on tests of my phlegm.

If I have **Latent TB Infection**,



# Natural History of LTBI

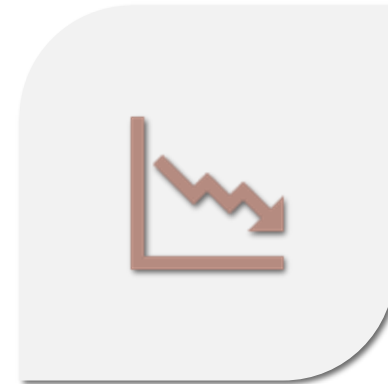


# TB Transmission

---



CDC ESTIMATES THAT ABOUT 13% OF U.S. TB CASES WITH GENOTYPE DATA ARE ATTRIBUTED TO RECENT TRANSMISSION.



RECENT TRANSMISSION VS. THOSE LIKELY DUE TO REACTIVATION OF LONGSTANDING, UNTREATED LATENT TB INFECTION.

Percent Risk of Disease by Age	
Age at Infection	Risk of Active TB
Birth – 1 year*	43%
1 – 5 years*	24%
6 – 10 years*	2%
11 – 15 years*	16%
Health Adults	5-10% lifetime risk
HIV Infected Adults <sup>+</sup>	30-50% lifetime risk

Children  
at  
Increased  
Risk of TB  
Disease if  
Infected

Reference: \*Miller, *Tuberculosis in Children* Little Brown, Boston, 1963  
<sup>+</sup>WHO, 2004

# Why Do We Care About LTBI?

If we identify an LTBI case:

- We can treat it and prevent an active TB case
- We can prevent all the secondary cases that one active TB case would have caused

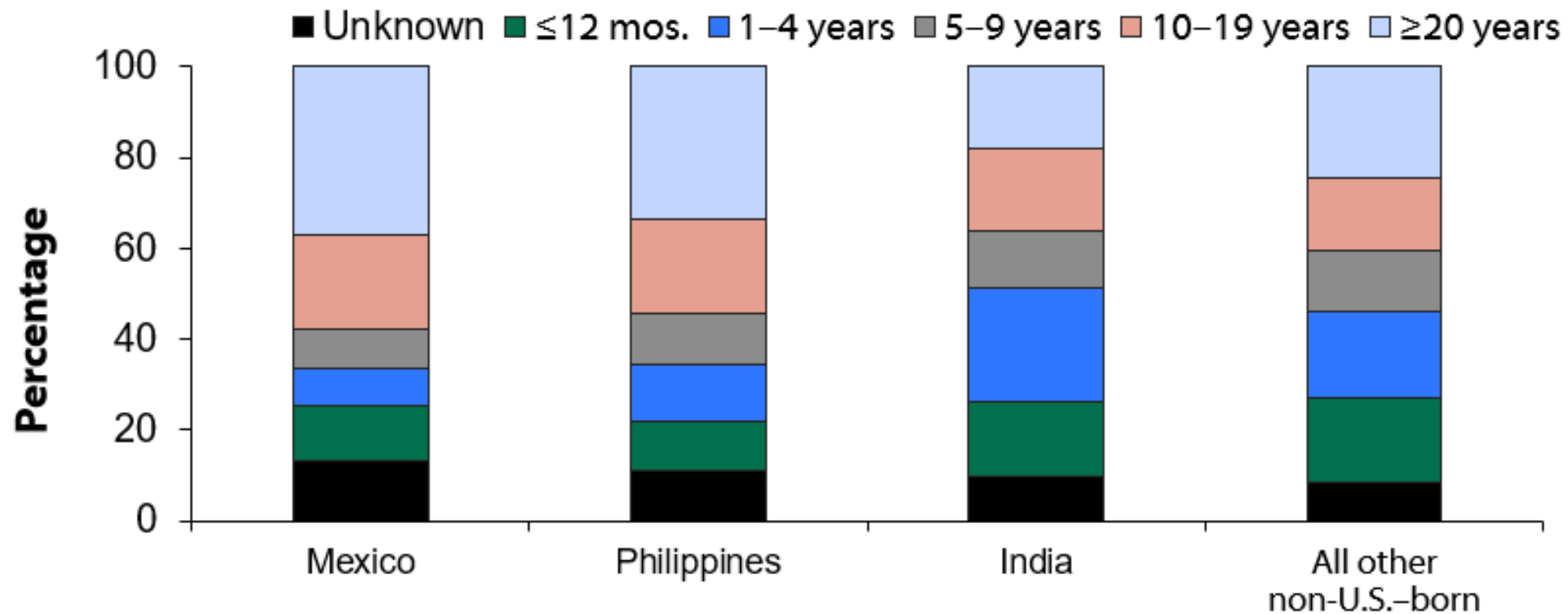
Cost of treating TB per patient in 2016:

- Active TB disease = **\$18,000**
- MDR TB case = **\$160,000**
- XDR TB case = **\$513,000**
- LTBI case = **\$600**

Treatment of LTBI is an important part of TB elimination



## Percentage of Non-U.S.–Born Persons with TB, by Time of Residence in U.S. Before Diagnosis, 2017

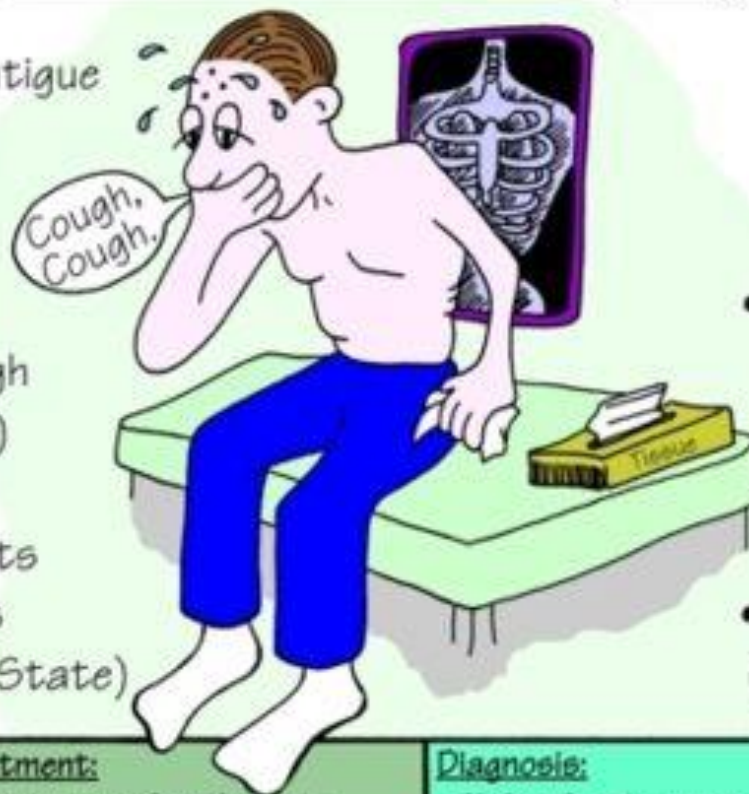


# Pulmonary TUBERCULOSIS (TB)

- Progressive Fatigue
- Malaise
- Anorexia
- Wt. Loss

- Chronic Cough  
(Productive)

- Night Sweats
- Hemoptysis  
(Advanced State)



- Pleuritic  
Chest Pain

- Low Grade Temp  
(Late Afternoon)

## Treatment:

TB Medications 6 to 12 Months  
Decreased Activity  
Resp Isolation Until Negative Sputum  
Frequently Out-PT Basis

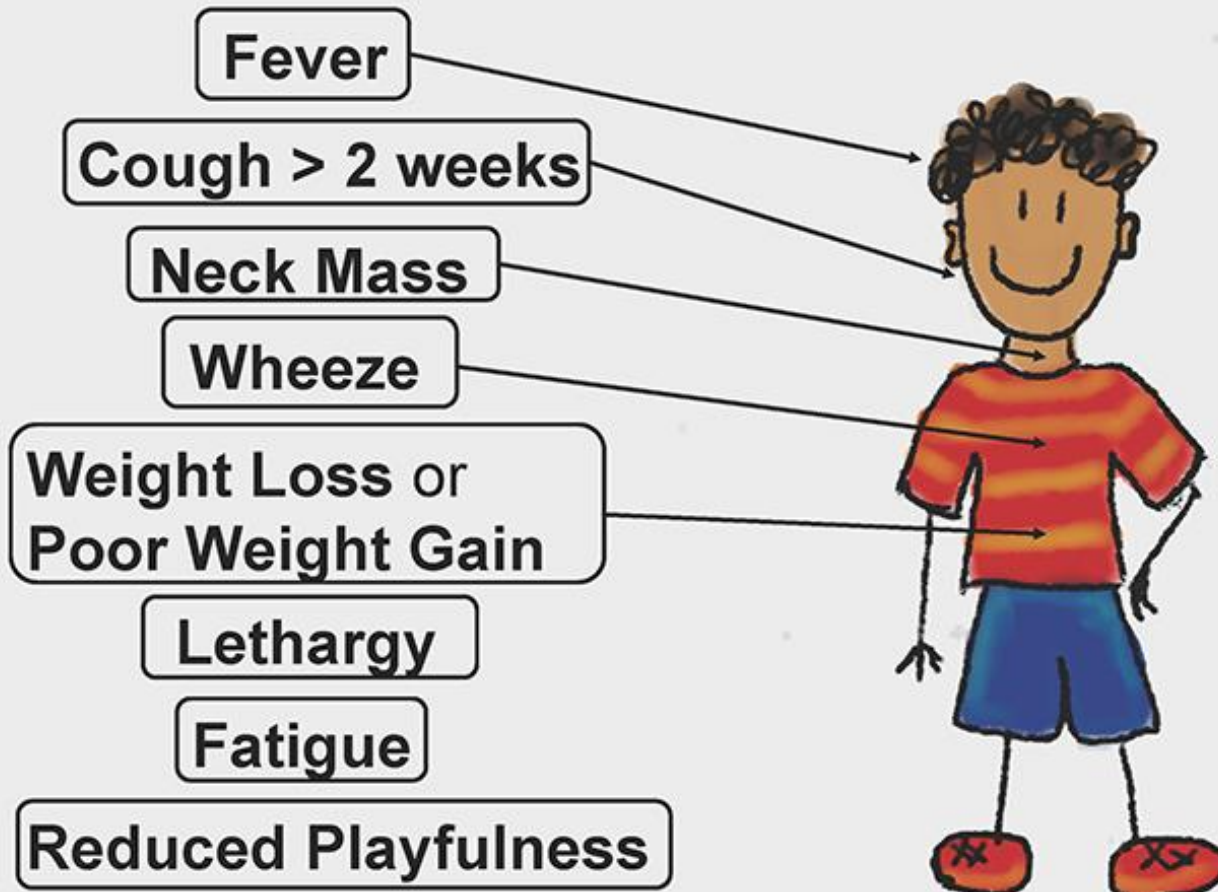
## Diagnosis:

TB Skin Test (screening)  
Chest X-Ray  
Sputum Studies  
(3 specimens collected  
on different days)

# TB in Children

Children manifest TB differently than adults and are usually discovered and diagnosed during contact investigations.

- Often asymptomatic
- If symptoms: fever, cough, and weight loss or failure to gain weight



## Main sites of Extrapulmonary tuberculosis

### Central nervous system

- Meningitis

### Lymphatics

- Scrofula (of the neck)

### Pleura

- Tuberculosis pleurisy

### Disseminated

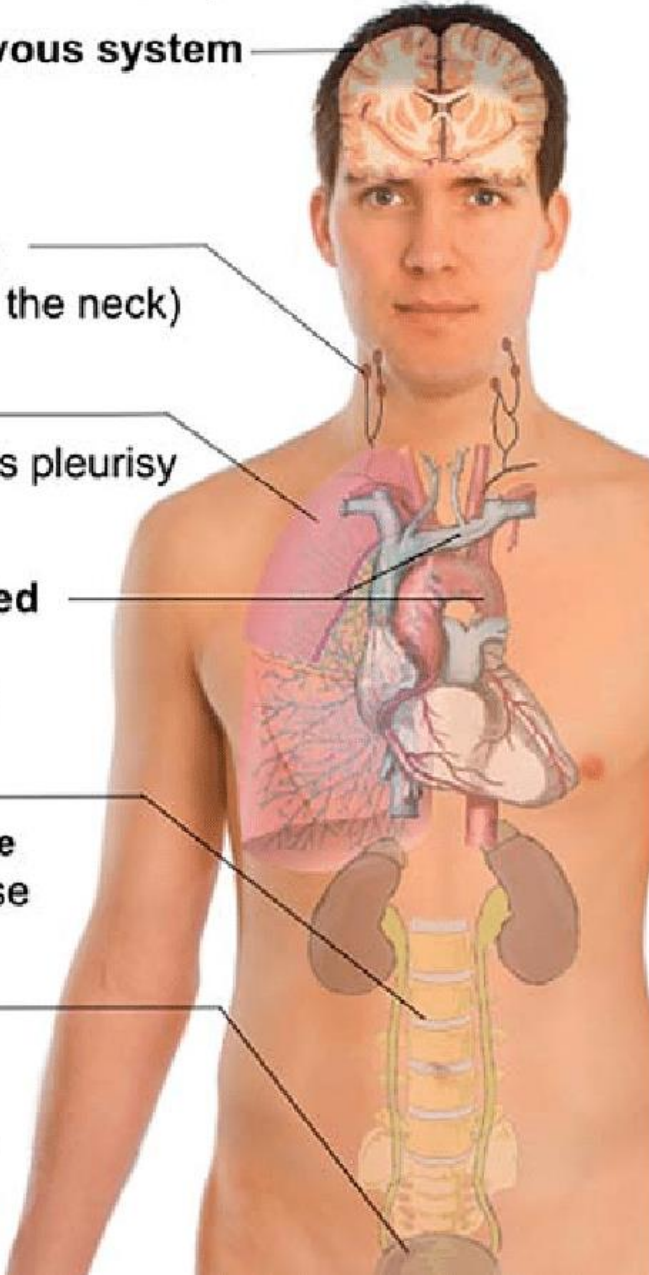
- Miliary tuberculosis

### Bones and joints of spine

- Pott's disease

### Genito-urinary

- Urogenital tuberculosis

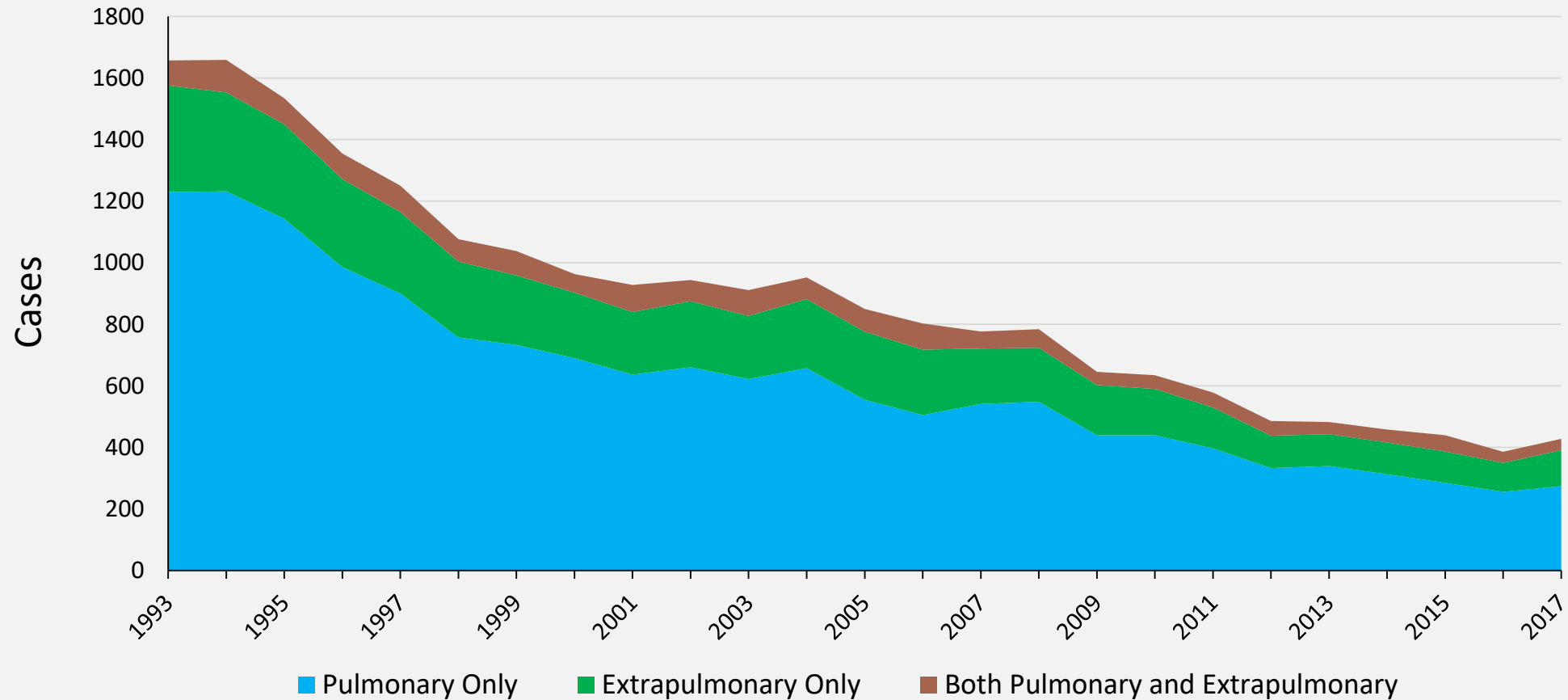


# Extrapulmonary Tuberculosis

THE TB BACTERIA TRAVELS FROM THE LUNGS TO ANOTHER SITE IN THE BODY.

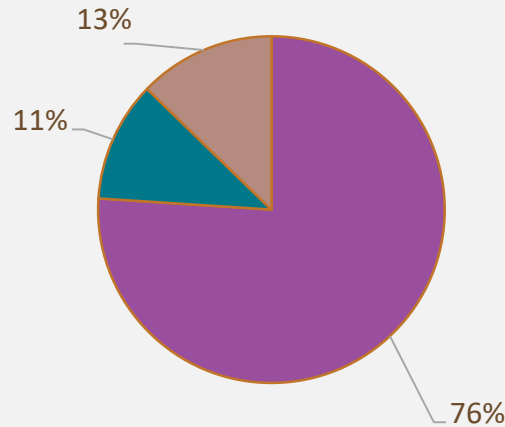
- TB of the kidney may cause blood in the urine
- TB meningitis may cause headache or confusion
- TB of the spine may cause back pain
- TB of the larynx can cause hoarseness

# U.S. Pediatric TB Cases by Site of Disease, 1993–2017

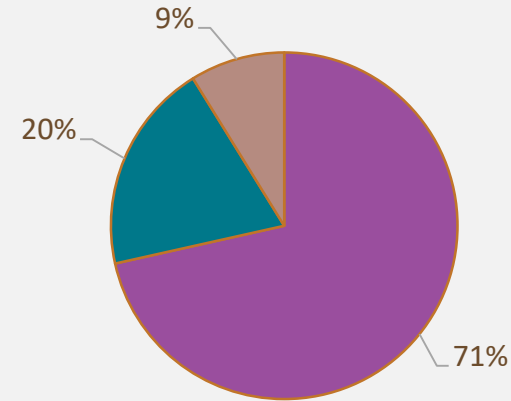


# U.S. Pediatric TB Cases by Site of Disease and Age Group, Summed and Averaged Over 2013–2017

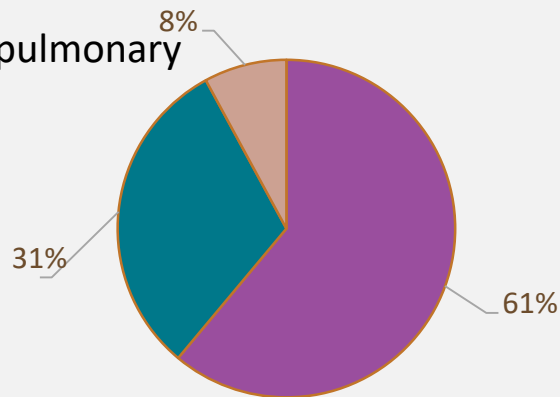
Age <1, n=267



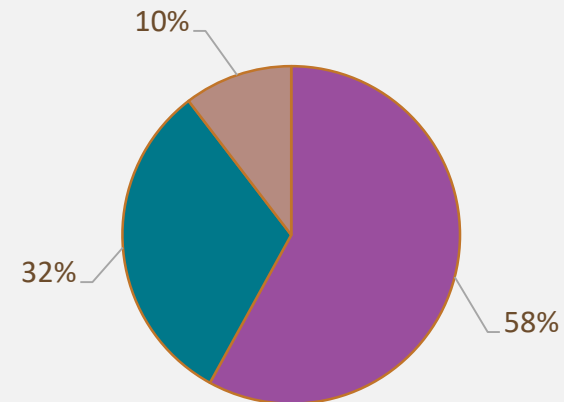
Age 1–4, n=987



Age 5–9, n=443



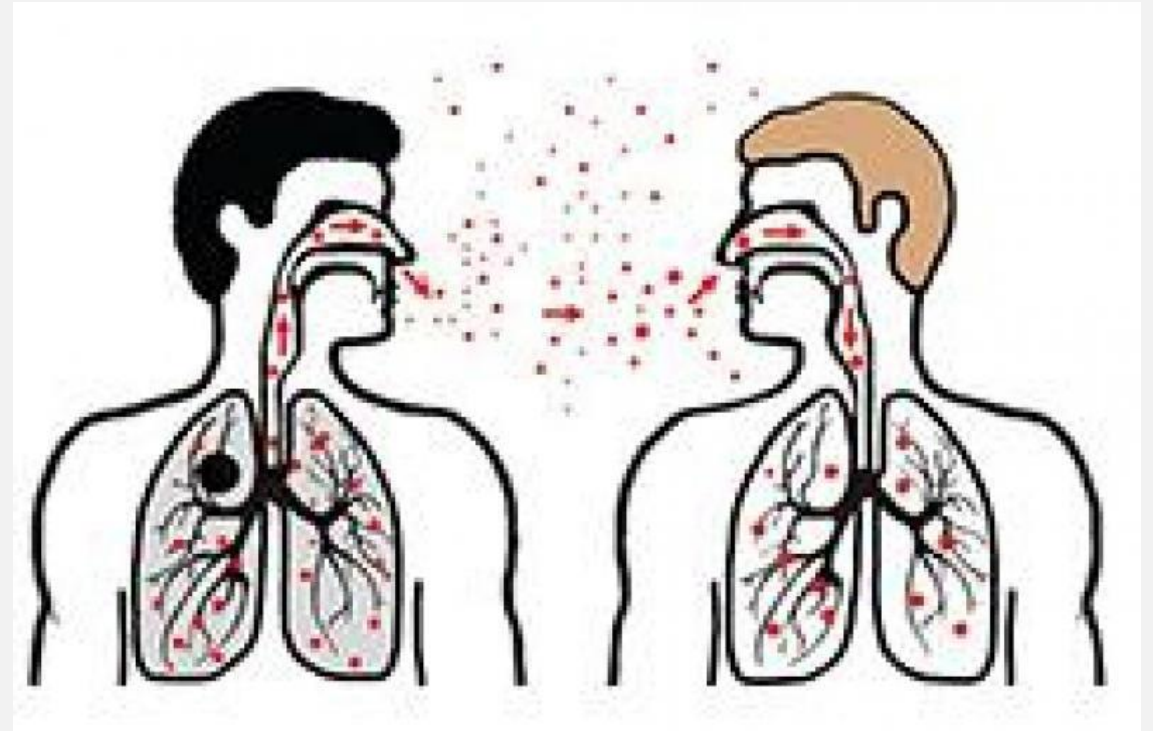
Age 10–14, n=500



- Both Pulmonary and Extrapulmonary
- Extrapulmonary Only
- Pulmonary Only

# Adults - Who is at Risk for TB?

- Close contacts, i.e. family member, classmates, co-workers, etc.
- People who come from an area where TB is common such as Asia, Africa, Russia, Eastern Europe, and Latin America.
- People in settings for a limited or extended period of time and are close together such as:
  - Nursing homes and hospitals
  - Prisons and jails
  - Homeless shelters
- People struggling with substance abuse
- Someone with medical conditions that weaken immune system, such as HIV, diabetes and pregnancy.
- Those on medications that weaken the immune system such as Prednisone and Biologics.



# Biologics and TB

Treatment with **biologic** agents, in particular tumor necrosis factor alpha (TNF- $\alpha$ ) inhibitors, is associated with an increased risk of **TB**, and screening and treatment for **LTBI** in patients undergoing such treatment is therefore indicated.

## Some available biologics

tocilizumab (Actemra)  
certolizumab (Cimzia)  
etanercept (Enbrel)  
adalimumab (Humira)  
anakinra (Kineret)  
abatacept (Orencia)  
infliximab (Remicade)  
rituximab (Rituxan)

## Some Autoimmune Disorders

Rheumatoid arthritis  
Lupus  
IBD  
MS  
Psoriasis  
Scleroderma



# Which Children Are Most at Risk for TB?



**TB can grow and cause an active disease in a child with a weak immune system. This can include children who:**

- - Have HIV
- - Have Diabetes
- - Are being treated with medicine that can weaken the immune system, such as corticosteroids or chemo



**Very young children are more likely than older children to have TB spread through their bloodstream and cause complications, such as meningitis.**



**A child is more at risk for TB if he or she:**

- Lives with someone who has TB
- Is homeless
- Comes from a country where TB is common - most common: Mexico, Philippines, Vietnam, but varies depending on immigration patterns, i.e., recent increases in cases among children from Sub-Saharan Africa and Eastern Europe
- Has a weak immune system

# TB Testing Once Mandatory for All Texas Students

---

- Texas students were all once required to be tested for tuberculosis prior to the start of the school year, but that practice ended 30 years ago.
- State health officials determined in 1987 the need for mandatory TB testing for children was no longer necessary due to the number of cases seen in Texas at the time.
- The tests in the 1980s also produced a high number of false-positive results which lead to more complications.
- Parents were taking children who tested positive for TB to hospitals for chest X-rays and other intensive treatment when the kids never actually had TB.

## Current Recommendations for Testing School Children in TX

- CDC and American Academy of Pediatrics recommends targeted TB testing only in areas of high TB prevalence.
- Routine TB testing does not need to be done in low prevalence areas.
- Consult with your school district and health department for TB testing guidelines in your area.
- School nurses may be required to administer skin tests or read results of skin tests for a provider.
- If child has documented history of previously positive TB test, school nurse should inquire about history of treatment/completion.
  - If no documented history of treatment completion, child should be referred to health department.
  - If documented treatment completion history is present, child need not be TB tested nor chest X-rayed again, though symptom screening should be performed, and child/parents and school nurse should be instructed to watch for S&S of TB in future.
- Refer to DSHS Recommendations for TB Screening for School Aged Children  
<https://www.dshs.texas.gov/idcu/disease/tb/faqs/#schoolemployees>

# Symptom Assessment for the School Nurse

---

- Children with risk factors
- Chronic respiratory illness and cough that is not improving
- Weight loss or failure to gain weight
- Fever
- Fatigue
- Multiple absences



# How infectious are children?

Very! Anyone coughing with TB is contagious.

Somewhat - The sicker the child, the more contagious.

Not much if at all - Children's coughs aren't strong enough to be contagious.

# Infectiousness

---

- Children have few tubercle bacilli in lungs, therefore, are rarely infectious
- Children less than 12 years of age usually lack pulmonary force to produce airborne bacilli
- For cases of childhood TB infection, it is likely that an adolescent or adult transmitted TB bacilli to the child
- Important to find source case

# TB Testing

## Tuberculin Skin Test (TST or PPD)

- Uses Purified Protein Derivative (PPD)
- Given via intradermal injection

---

- Read in 48-72 hours

## Interferon Gamma Release Assay (IGRA – Tspot or QuantiFERON Gold [QFT])

- Blood test
- Results in 3-4 days

Pros and cons of each – when to use which?

What results are considered positive?


Pros	Cons
Inexpensive	Must return in 48-72 hours
Simple to perform (if you know what you're doing...)	Interpretation is somewhat subjective
More sensitive than IGRA	False negatives <ul style="list-style-type: none"><li>* elderly</li><li>* immunosuppressed</li></ul>
	False positives <ul style="list-style-type: none"><li>* low risk populations</li><li>* non-tuberculosis mycobacteria (NTM)</li><li>* BCG vaccination</li></ul>



# TB Skin Test (TST)



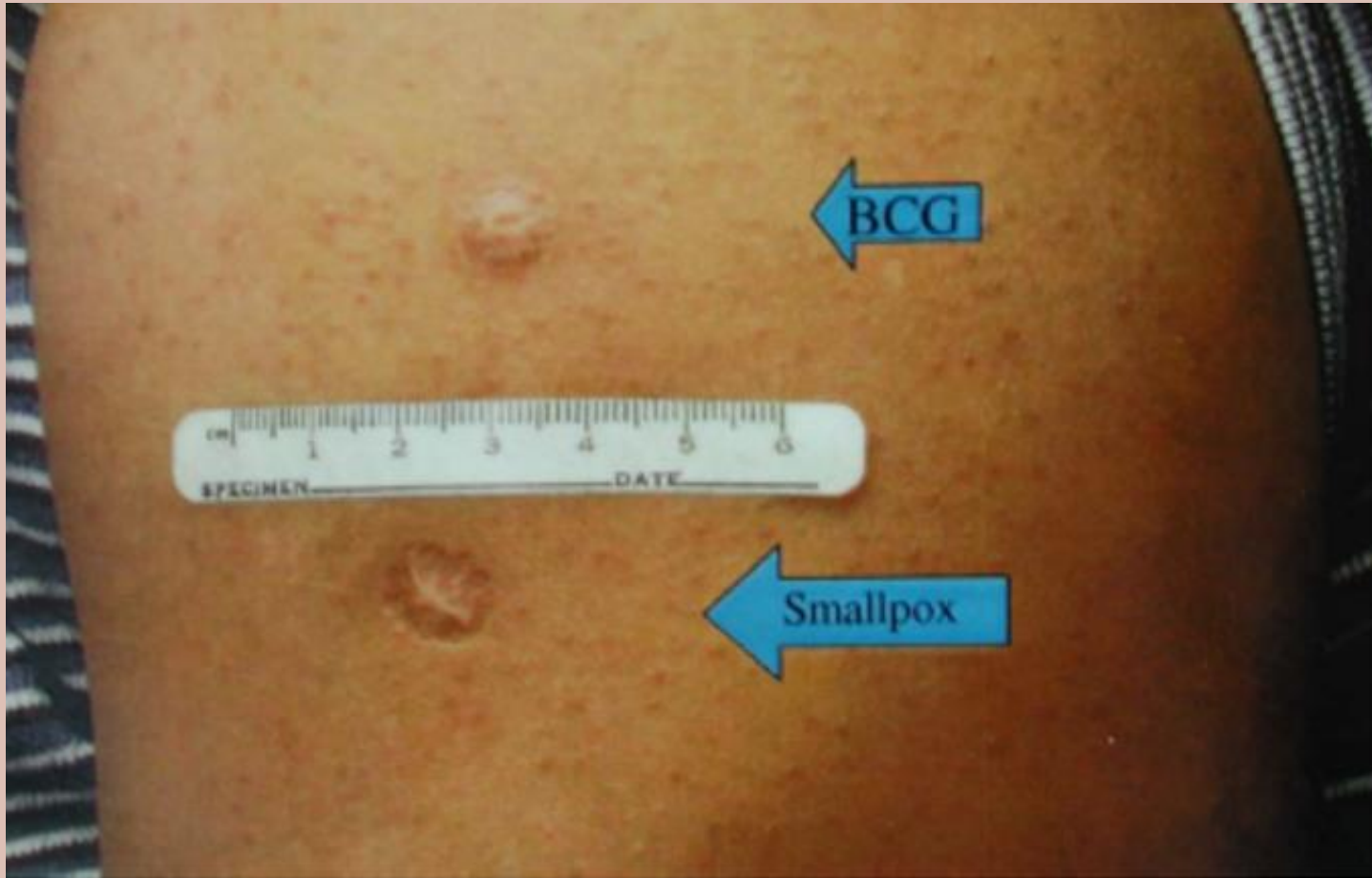
# IGRA (QFT or Tspot)

Pros	Cons
Requires only one visit	
Can now be used in children $\geq 2$ years*	
More specific than TST	Expensive
No cross-reactivity with BCG vaccine Less cross-reactivity with NTM's	False positives * low risk populations * non-tuberculosis mycobacteria (NTM)

\* Updated in the Pediatric Red Book, 2018



# BCG and TB Testing



- TST's and IGRA's are not contraindicated for persons who have been vaccinated with BCG. However...
- BCG vaccination may cause a false-positive reaction to the TST, which may complicate decisions about prescribing treatment.
- IGRA's, unlike TST's, are not affected by prior BCG vaccination and are less likely to give false-positive results.
- CDC reports **if more than 5 years have elapsed** since the administration of a BCG vaccine, a positive TST reaction is most likely a result of *M. tuberculosis* infection, as **TST reactivity caused by a BCG vaccine generally wanes over time.**

# When can a TST or IGRA be placed/administered when administering a live virus vaccine?

On the same day. **A**

Same day or one day before or after. **B**

Four - six weeks after. **C**

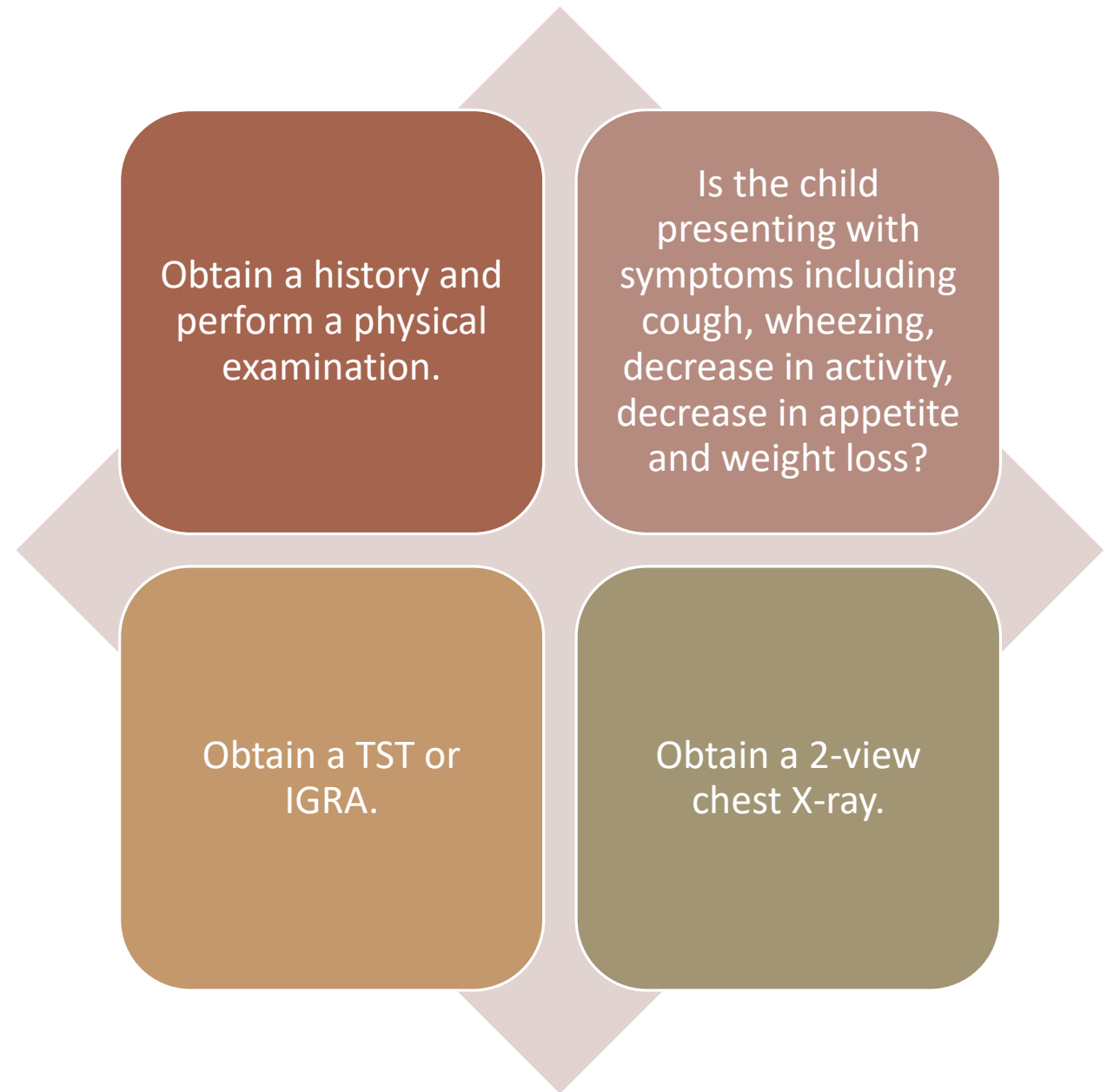
Both A and B. **D**

Both A and C. **E**

# Live Virus Vaccines and TB Testing

- Inactivated vaccines can be given on the same day or at any time after a TST is done.
- A TST can be applied before or on the same day that live virus vaccines (e.g., MMR, varicella) are given.
- However, if one of these live vaccines is given on the previous day or earlier, the TST should be delayed for at least 4 weeks (28 days).
- If any of these live vaccines are given prior to the application of a TST, they can reduce the reactivity of the skin test because of mild suppression of the immune system and result in a false negative TST.
- A more specific test for diagnosis of tuberculosis or latent tuberculosis infection is the IGRA.
- The same timing guidelines that apply to the interval between a live vaccine and TST apply to IGRA (i.e., 28 days between live vaccine and IGRA if they do not occur on the same day), because IGRA (like TST) might be suppressed through immunologic mechanisms.

# Evaluation for TB in Children



# Rational for Treating LTBI in Children

- Young children are at greater risk of progression from latent infection to TB disease once infected as their immune systems are less able to control infection.
- Infection is likely to have been recent. Recently infected persons are at a greater risk for developing TB disease.
- Children have more years to potentially develop TB disease.
- Medications used to treat LTBI are well tolerated by children and there is a low risk of toxicity.



# Identify When to Delay School Entry

---

Know the difference between children with latent TB infection versus TB disease.

Perform risk assessments on children returning to school after long absences abroad to high risk countries.

Asymptomatic children with pending chest x-ray results for positive TST or IGRA should not be excluded from school.

A good TB Risk Assessment Form can be found <https://dshs.texas.gov/region2-3/programs/TBScreen.shtm> or ask your local health department.

# Treatment Options for LTBI

- ❖ Isoniazid (INH) and Rifapentine (RPT) – 3HP..... 12 weeks (12 doses)
  - 3HP is recommended 1<sup>st</sup> option for those who qualify in Texas
  - Approved for patients >2 years old
  - Pediatric arm published in 2018 shows safety and efficacy down to age 2
    - Completion rates higher
    - No child had hepatotoxicity
    - Effective
  - Not recommended for:
    - Children under 2 years old
    - HIV infected persons on ART
    - Presumed IHN or Rifampin resistance in index case
    - Pregnant women

❖ Rifampin..... 4 months (120 doses)

❖ Isoniazid..... 9 months (270 doses)

- Recommended for HIV patients on ART

**The longer the duration/more doses, the less likely a client is to complete treatment. Fewer than 60% complete 9 months of INH.**

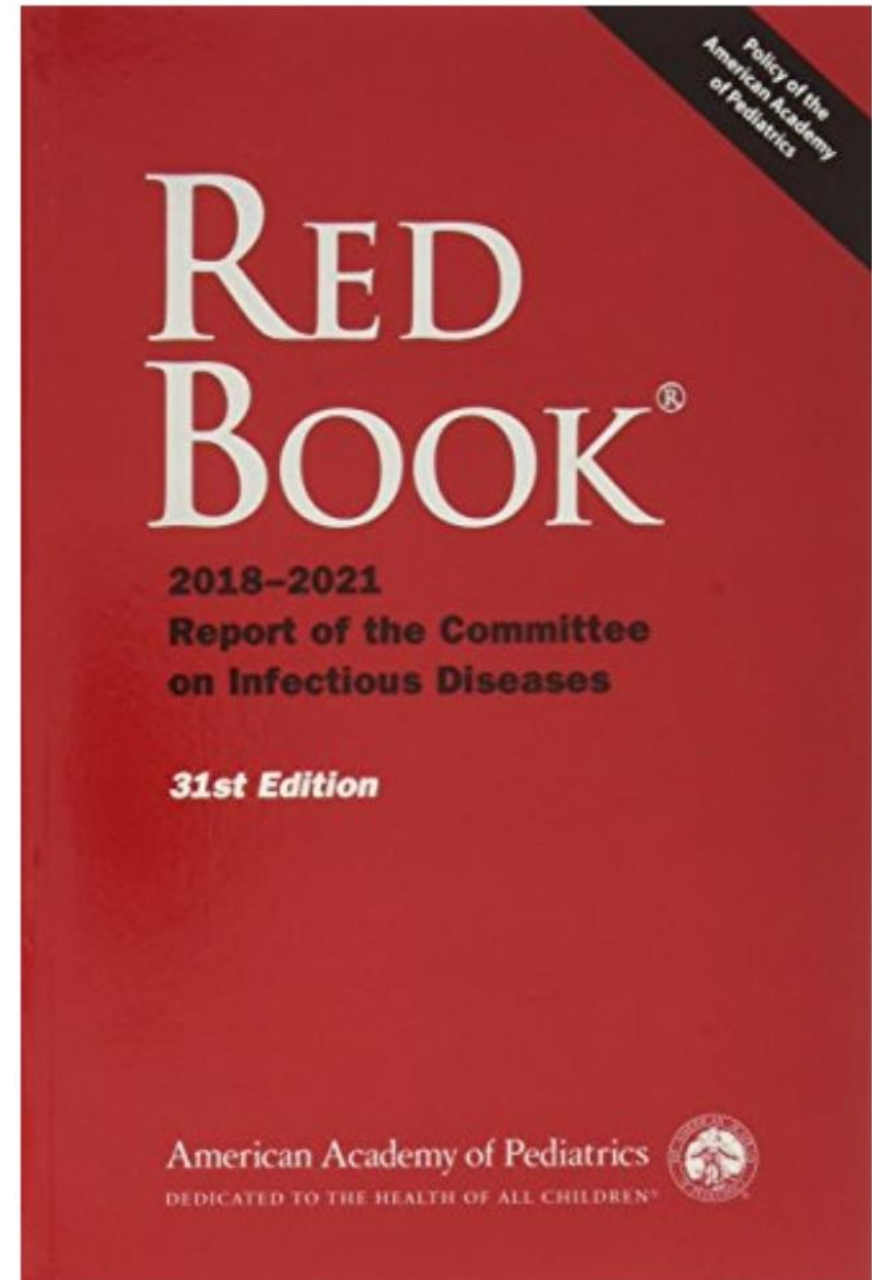


# New MDR TB Regimens

- Most most common form of primary resistance = isoniazid (INH) resistance.
  - 608 INH resistance cases in 2017.
- Multidrug-resistant TB (MDR TB) resistant to at least isoniazid (INH) and rifampin (RIF).
  - 123 MDR TB cases in 2017.
- Extensively drug-resistant TB (XDR TB) resistant to INH and RIF, any fluoroquinolone, and at least three of the injectable second-line anti-TB drugs.
  - 2 cases of XDR TB in 2017.
- New 2018 WHO recommendations - injectable agents no longer among priority medicines when designing longer MDR-TB regimens and fully oral regimens preferred option for most patients.
- Fluoroquinolones (levofloxacin or moxifloxacin), bedaquiline and linezolid strongly recommended for use in longer regimens, and completed with other medicines ranked by their relative balance of effectiveness to potential toxicity.
- Expensive! - Bedaquiline costs approx. \$25,000 for 6 months

# 2018 Updates to the Red Book

- The published experience testing children with IGRA demonstrates that IGRA's consistently perform well in children 2 years and older, and some data support their use for even younger children.
- Rifampin daily dosing increased to 15-20mg/kg w/ 600mg daily max.
- Many experts recommend using a daily rifampin dose of 20-30mg/kg/day for infants and toddlers, and for serious forms of tuberculosis such as meningitis and disseminated disease. CDC categorizes toddlers as children between the ages of 1-2.
- Most experts consider 3HP to be the preferred regimen for treatment of LTBI for children  $\geq 5$  years, and some experts prefer 3HP for LTBI in children  $\geq 2$  years.



# Directly Observed Therapy (DOT)



## DOT...

- is watching ingestion of anti-TB medications by trained healthcare worker, school nurse or outreach worker
- is standard of care for patients with:
  - TB disease
  - Directly observed preventative therapy (DOPT)
  - LTBI treated with 3HP
- can improve adherence in children with LTBI
- is a priority for very young children, adolescents, immunocompromised children and those with evidence of non-adherence
- in a school setting is ideal
- can not be administered by a family member

# School Nursing Responsibilities with DOT

- Clinician will provide regimen for school nurse to follow.
- DOT is provided by working with referring agency, i.e. health department.
- School Nurse should be given appropriate forms for documentation/permission:
  - Medication orders/Parental Consent Form
  - DOT / Adherence Log
- Ensure medications are labeled in accordance with school health policies.
- Monitor side effects of medications.
- Monitor adherence.
- Provide feedback to provider as to best time of day for meds to be given, etc.
- Assist with contact investigations.
- It's important to maintain good relationships and clear communication. Problems or concerns about medication administration or the child's health should be communicated expediently and all communication should be documented.

# Possible Adverse Reactions to TB Medications

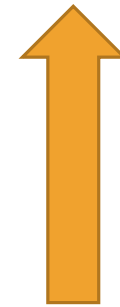
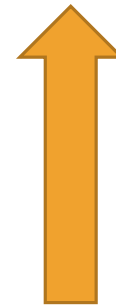
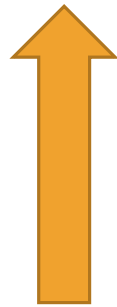
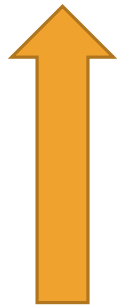
---

In general, children tolerate medications used to treat tuberculosis and adverse reactions are rare. It is important though to monitor for such reactions, as they are reversible when detected early.

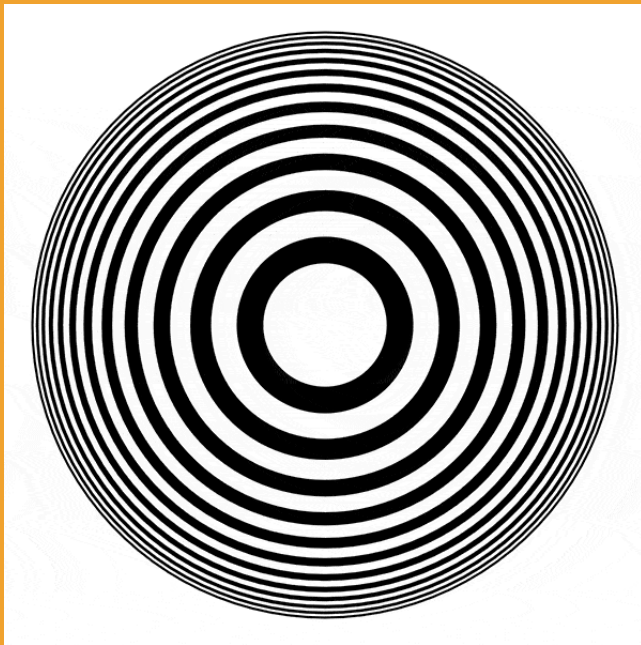
Parents should be educated about recognition of early signs of hepatotoxicity such as nausea, vomiting, abdominal pain, decreased appetite or activity level, or yellowing of the eyes or skin. In addition, flu-like symptoms may precede clinical jaundice.

Medications should be stopped immediately if patient develops significant nausea, vomiting, anorexia, abdominal pain, or jaundice.

Tell parents to seek advice from the child's healthcare provider if any of these symptoms occur.



# Contact Investigations



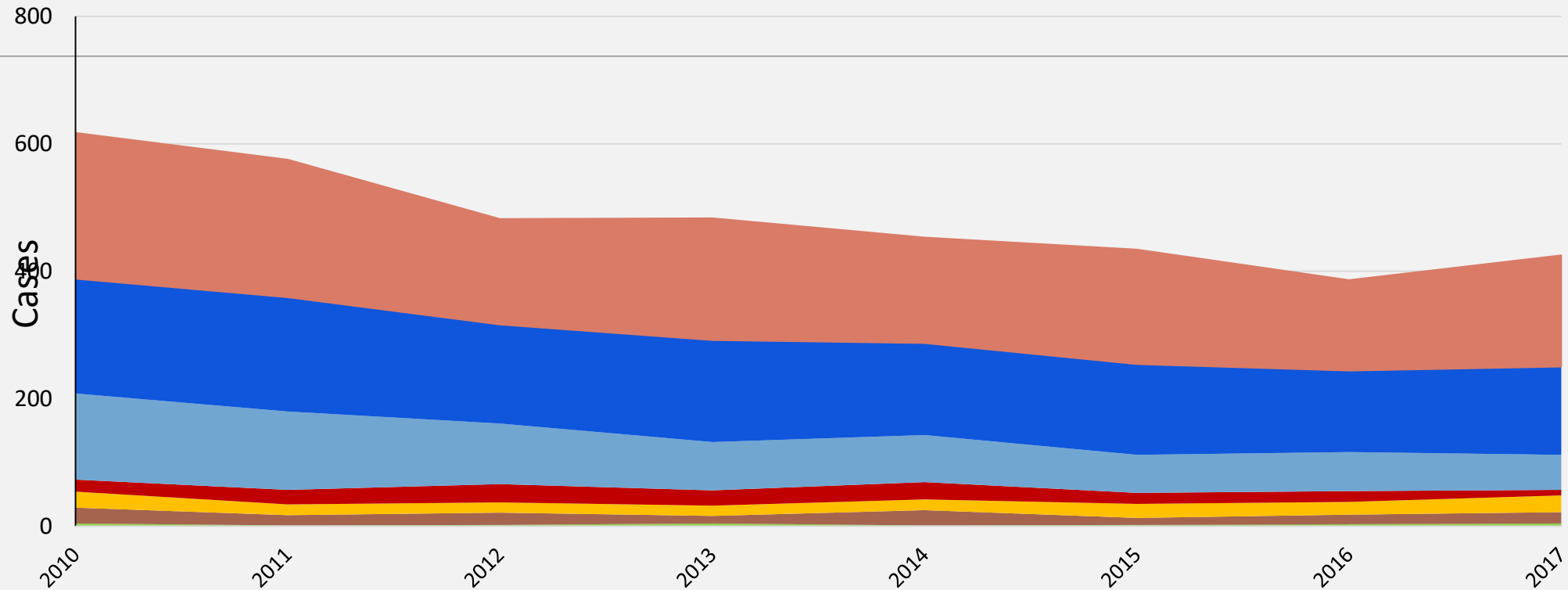
- Systematic evaluation of contacts of known TB patients.
- Identify active disease or LTBI.
- Onset of disease may occur early, within 8-10 weeks, or many years later.
- Contact investigations are undertaken to detect and prevent these cases.
- Use concentric circle approach.
- 1<sup>st</sup> round testing immediately
- 2<sup>nd</sup> round testing 8-10 wks after last exposure

# Every Case of TB



**was once a contact!**

# U.S. Pediatric TB Cases by Reason Evaluated, 2010\*–2017



- Employee Testing
- Immigrant Exam
- Contact Investigation
- Targeted Testing
- Abnormal Chest X-ray
- Incidental Laboratory Finding
- TB Symptoms



# School Nurse Responsibilities with Contact Investigations

---

- State, regional or local TB Nurse Case Manager functions as consultant to schools for case investigations and contact investigations.
- Provides education for school personnel and families in collaboration with TB Nurse Case Manager.
- Collaborates with TB Nurse Case Manager to obtain class schedules for students and identifying possible contacts.
- Assists TB Nurse Case Manager with organizing contact investigations.



# TB Prevention

---

- Good nutrition
- Good ventilation
- Avoid overcrowding
- Healthy lifestyle
- Some countries vaccinate children
- Avoid contact with chronically coughing individuals
- Carry mask with you – what if someone is coughing next to you on a bus?
- Cover your mouth when you cough with the inside of your arm/elbow or a tissue.

# TB In Children – Important Points

1. ■ TB disease in children under 15 years of age is a public health problem and considered “a sentinel healthcare event” because it is a marker for recent transmission of TB in the community.
2. ■ Infants and young children are more likely than older children and adults to develop life-threatening forms of TB disease (e.g., disseminated TB, TB meningitis).
3. ■ The greatest numbers of TB cases are seen in children less than 5 years of age, and in adolescents older than 10 years of age.
4. ■ The WHO estimates are that 1 million children (<15 years) currently suffer from TB worldwide, and that 239,000 die each year. This is the estimate for HIV negative children.
5. ■ Children who have TB and who are also HIV positive when they die (i.e. they have TB/HIV co-infection), are internationally classified as having died from HIV.
6. ■ A 2016 study estimated that 67 million children have latent TB.
7. ■ 70-80% of children with TB have the disease in their lungs (pulmonary TB). The rest are affected by TB disease in other parts of their body (extra pulmonary TB).
8. ■ In high burden TB settings it has been noted that 15-20% of all TB cases are among children, whereas in low burden TB settings it is estimated that 2-7% of all TB cases are among children.

## In Summary

TB is still a concerning disease in the US

Treating LTBI is an important component of TB elimination.

Although TB is more prevalent in adults, it is more serious in children.

Young children, especially under the age of 4, have difficulty fighting off infections and can have serious forms of TB if left untreated.

Treating latent TB infection can prevent children from getting active TB disease in the future.

The school nurse's role is important in controlling TB in our schools, county, state, US.

**It's time** to test and treat latent TB infection.

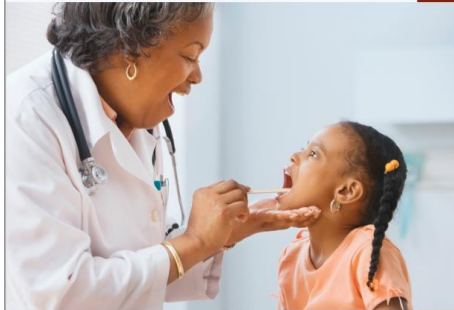
**It's time** we strengthen TB education and awareness among health care providers.

**It's time** to speak up.

**It's time** for school nurses to lead the fight to **END TB**.



## TUBERCULOSIS HANDBOOK FOR SCHOOL NURSES



## WHAT PARENTS NEED TO KNOW ABOUT TUBERCULOSIS (TB) INFECTION IN CHILDREN



# TB Resources for School Nurses

<http://globaltb.njms.rutgers.edu/downloads/products/tbpedsbrochure.pdf>

## What Parents Need to Know About Tuberculosis Infection in Children

<https://npin.cdc.gov/publication/tuberculosis-handbook-school-nurses>

## Tuberculosis: Handbook for School Nurses



Together We Will Make it Happen

---

**THANK YOU!**

We appreciate school nurses and their partnership w/ WCCHD in eradicating tuberculosis!

# References

---

- American Academy of Pediatrics. Committee on Infectious Diseases. (2018-2021). *Red book : report of the Committee on Infectious Diseases*. 31<sup>st</sup> ed. Itasca, IL :American Academy of Pediatrics
- Armitige, L. (2017, September 20). [presentation] Who should be treated and how should we treat them. *Heartland National TB Center*. Retrieved from [http://www.heartlandntbc.org/assets/training/archive/scfotbin\\_20170920\\_1400.pdf](http://www.heartlandntbc.org/assets/training/archive/scfotbin_20170920_1400.pdf)
- Ashkin, D., Murray, E.R., (2019). NTCA Nurses Webinar: Trials, Tribulations and Triumphs with LTBI [PowerPoint]
- Bibbins-Domingo, K., Grossman, D. C., Curry, S. J., Bauman, L., Davidson, K. W., Epling, J. J., & ... Pignone, M. P. (2016). Screening for Latent Tuberculosis Infection in Adults: US Preventive Services Task Force Recommendation Statement. *Jama*, 316(9), 962-969. doi:10.1001/jama.2016.11046
- Borisov, A., et al., (2018, June 29), **Update of Recommendations for Use of Once-Weekly Isoniazid-Rifapentine Regimen to Treat Latent *Mycobacterium tuberculosis* Infection**, 67(25);723–726. Retrieved from <https://www.cdc.gov/mmwr/volumes/67/wr/mm6725a5.htm>
- Centers for Disease Control and Prevention. (2014, November 21). Fact sheet: The difference between latent TB infection and TB disease. Retrieved from <https://www.cdc.gov/tb/publications/factsheets/general/lbdiandactivetb.htm>
- Centers for Disease Control and Prevention. (2015, August 17). Interferon-gamma release assays (IGRAs) –Blood tests for TB infection. Retrieved from <https://www.cdc.gov/tb/publications/factsheets/testing/igra.htm>
- Centers for Disease Control and Prevention. (2016, August 5). Latent tuberculosis infection: A Guide for Primary Health Care Providers. Retrieved from <https://www.cdc.gov/tb/publications/lbdi/treatment.htm>
- Centers for Disease Control and Prevention (2017, November). The costly burden of drug-resistant TB in the US. Retrieved from <https://www.cdc.gov/nchhstp/newsroom/docs/factsheets/costly-burden-dr-tb-508.pdf>
- Centers for Disease Control and Prevention. (2018, March 9). Wanted: Leaders for a TB-free United States. We can make history. End TB. Retrieved from <https://www.cdc.gov/tb/worldtbd/default.htm>
- Centers for Disease Control and Prevention. (2018). *Reported Tuberculosis in the United States, 2017*. Atlanta, GA: US Department of Health and Human Services. Retrieved from [https://www.cdc.gov/tb/statistics/reports/2017/2017\\_Surveillance\\_FullReport.pdf](https://www.cdc.gov/tb/statistics/reports/2017/2017_Surveillance_FullReport.pdf)



# References

---

Diagnostic standards and classification of tuberculosis in adults and children. (n.d). *American Journal of Respiratory and Critical Care Medicine*, 161(4), 1376-1395. doi.org/10.1164/ajrccm.161.4.16141

Gerald H., M., John, J., Andrew, V., Phillip, L., Stefan, G., & Kenneth, C. (2010). Updated Guidelines for Using Interferon Gamma Release Assays to Detect Mycobacterium tuberculosis Infection —United States, 2010. *Morbidity And Mortality Weekly Report: Recommendations And Reports*, (RR-5), 1. Retrieved from <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5905a1.htm>

Hartman-Adams, H., Clark, K., & Juckett, G. (n.d). Update on Latent Tuberculosis Infection. *American Family Physician*, 89(11), 889-896. Retrieved from <https://www.aafp.org/afp/2014/0601/p889.html>

Lewinsohn, D. M., Lewinsohn, D. A., Leonard, M. K., LoBue, P. A., Mazurek, G. H., Shinnick, T. M., & ... Woods, G. L. (2017). Official American Thoracic Society/Infectious Diseases Society of America/Centers for Disease Control and Prevention Clinical Practice Guidelines: Diagnosis of Tuberculosis in Adults and Children. *Clinical Infectious Diseases*, 64(2), E1-E33.doi:10.1093/cid/ciw694

Nahid, P., et al., (2016, Oct 1). Official American Thoracic Society/Centers for Disease Control and Prevention/Infectious Diseases Society of America Clinical Practice Guidelines: Treatment of Drug-Susceptible Tuberculosis, *Clinical Infectious Diseases*, 63(7), e147–e195. Retrieved from <https://doi.org/10.1093/cid/ciw376>

Nguyen MH, Levy NS, Ahuja SD, Trieu L, Proops DC, Achkar JM. (2019). Factors Associated With Sputum Culture-Negative vs Culture-Positive Diagnosis of Pulmonary Tuberculosis. *JAMA Netw Open*; 2(2):e187617. doi:10.1001/jamanetworkopen.2018.7617

Seaworth, B. (2018). [presentation]. Tuberculosis – the challenges of outsmarting this disease.

Schmit, K. M., Wansaula, Z., Pratt, R., Price, S. F., & Langer, A. J. (2017). Tuberculosis -United States, 2016. *MMWR: Morbidity & Mortality Weekly Report*, 66(11), 289-294.

# References

---

- Starke, J. R. (2014). Interferon- $\gamma$  release assays for diagnosis of tuberculosis infection and disease in children. *Pediatrics*, *134*(6), e1763-e1773. doi:10.1542/peds.2014-2983. doi:10.15585/mmwr.mm6611a2
- Stop TB Partnership. (2018). Wanted: Leaders for a TB-free world. Retrieved from [http://www.stoptb.org/news/stories/2017/ns17\\_082.asp](http://www.stoptb.org/news/stories/2017/ns17_082.asp)
- Talbot, E. (2018). [presentation]. Diagnosing tuberculosis in the US – You have a vital role!
- Talwar A, Tsang CA, Price SF, et al. (2018). Tuberculosis — United States, 2018. *MMWR: Morbidity & Mortality Weekly Report*, *68*:257–262. DOI: <http://dx.doi.org/10.15585/mmwr.mm6811a2External>.
- Texas Department of State Health Services (DSHS). (2017, November 2). TB statistics. Retrieved from <https://www.dshs.texas.gov/idcu/disease/tb/statistics/>
- Texas Department of State Health Services (DSHS). (2018, February 21). Infectious disease control reporting. Retrieved from <https://www.dshs.texas.gov/idcu/investigation/conditions/>
- Tsang, C. A., Langer, A. J., Navin, T. R., & Armstrong, L. R. (2017). Tuberculosis Among Foreign-Born Persons Diagnosed  $\geq 10$  Years After Arrival in the United States, 2010-2015. *MMWR: Morbidity & Mortality Weekly Report*, *66*(11), 295-298. doi:10.15585/mmwr.mm6611a3
- World Health Organization (WHO), (2019), WHO consolidated guidelines on drug-resistant tuberculosis treatment. Geneva: License: CC BY-NC-SA 3.0 IGO.