



TUBERCULOSIS IN HEALTHCARE SETTINGS

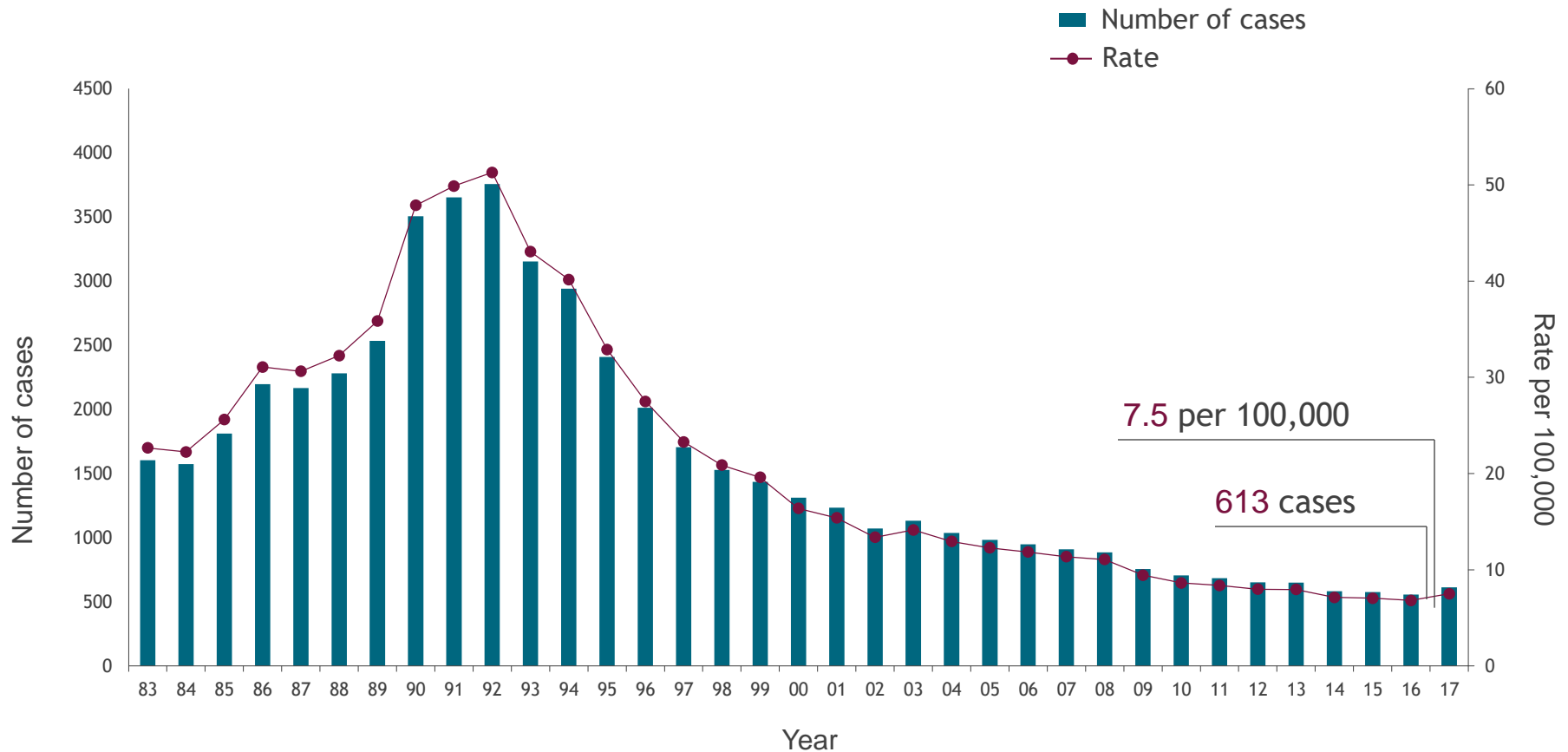
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TODAY'S PRESENTATION

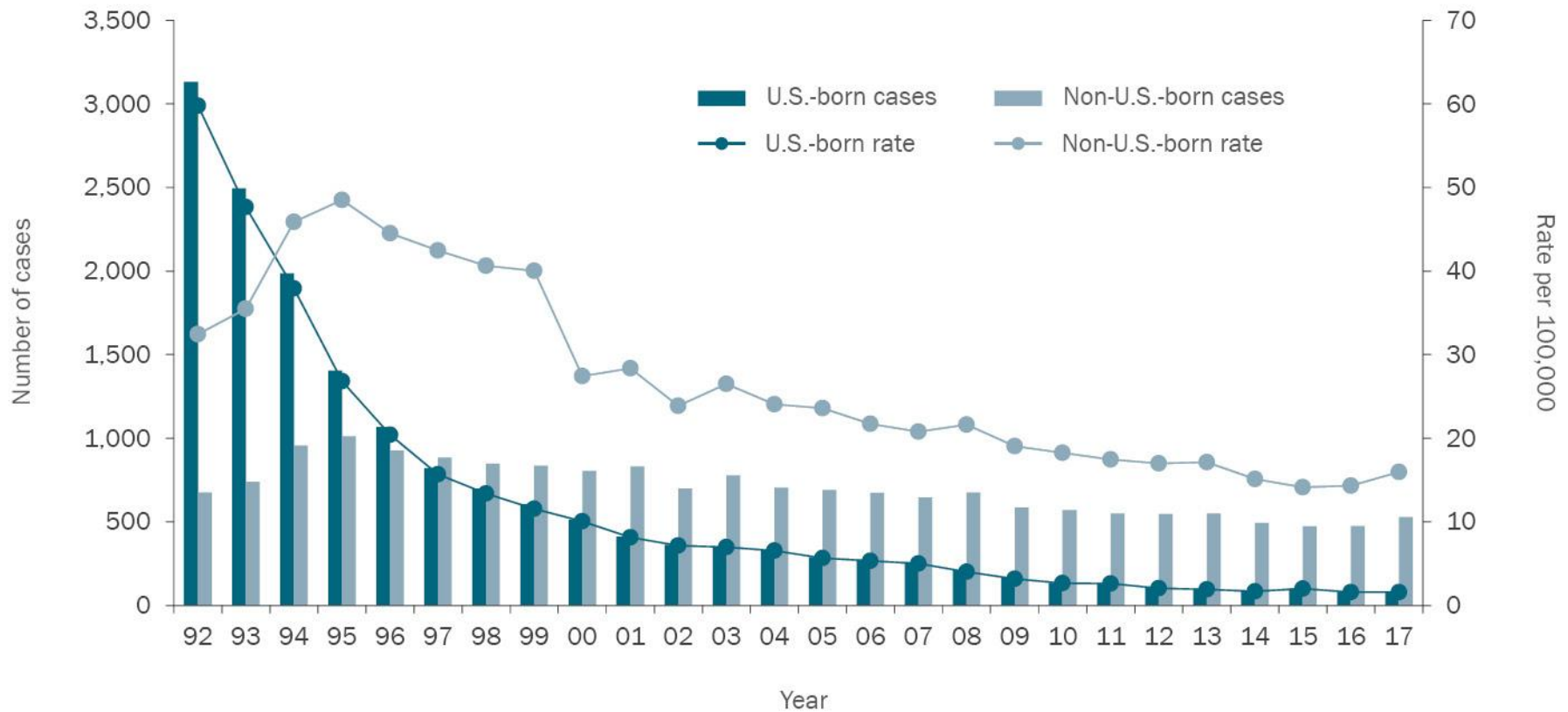
- Epidemiology of tuberculosis (TB)
- Mandated Reporting of TB
- TB in health care settings
- Treatment of Latent TB Infection (LTBI)
- Discharge of infectious TB patients

TUBERCULOSIS CASES AND RATES,¹ NEW YORK CITY, 1983-2017



1. Rates are based on decennial Census data

TUBERCULOSIS CASES AND RATES¹ BY BIRTH IN THE UNITED STATES (U.S.),² NEW YORK CITY, 1992-2017



1. Rates prior to 2000 are based on 1990 U.S. Census data. Rates for 2000-2005 are based on 2000 U.S. Census data. Rates after 2005 are based on one-year American Community Survey data for the given year or the most recent available data. 2. U.S.-born includes individuals born in the U.S. and U.S. territories. 3. Excludes cases with unknown country of birth.

TOP TEN COUNTRIES OF BIRTH BY TUBERCULOSIS BURDEN AND INCIDENCE IN NEW YORK CITY,^{1,2,3} 2017

COUNTRY OF BIRTH	# OF NYC TB CASES	COUNTRY OF BIRTH	NYC TB RATE (PER 100,000)¹
China ⁴	116	Eritrea	360
United States ⁵	83	Sierra Leone	225
Mexico	42	Bolivia	130
India	38	Burma	118
Ecuador	36	Indonesia	112
Dominican Republic	31	Ethiopia	93
Bangladesh	27	Nepal	86
Philippines	25	Liberia	78
Haiti	19	Afghanistan	66
Nigeria	15	Nigeria	57

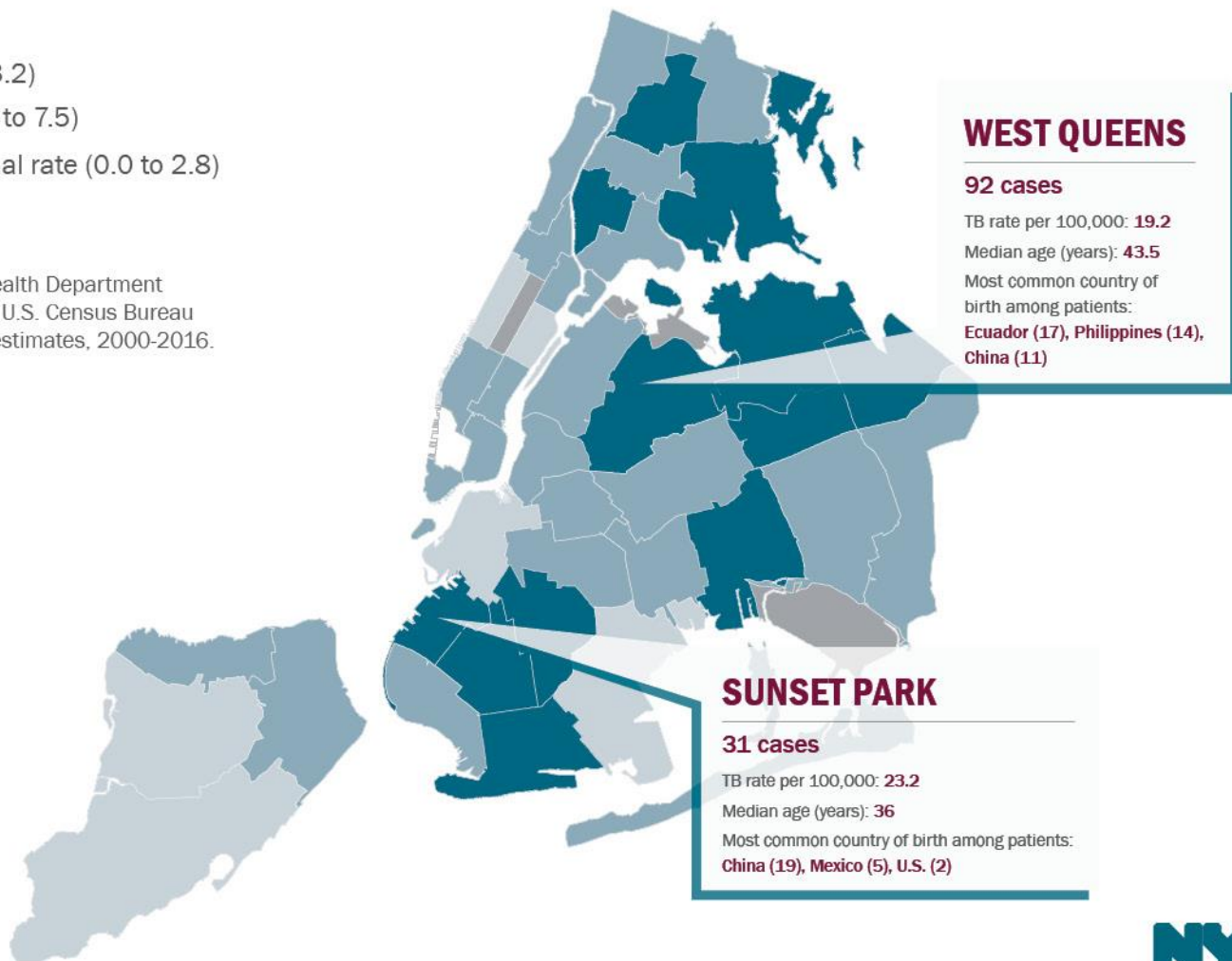
1. Rates are based on 2016 American Community Survey one-year sample data. 2. Two cases in 2017 were among patients with unknown country of birth. 3. There were 16 countries for which rate could not be calculated due to insufficient population data. 4. China includes individuals born in mainland China, Hong Kong, Taiwan and Macau. 5. U.S.-born includes individuals born in the U.S. and U.S. territories.

TUBERCULOSIS RATES¹ BY NEW YORK CITY NEIGHBORHOOD, NEW YORK CITY, 2017

Rate per 100,000

- Above citywide rate (7.6 to 23.2)
- At or below citywide rate (2.9 to 7.5)
- At or below provisional national rate (0.0 to 2.8)
- No NYC TB cases

1. Rates are based on New York City Health Department population estimates, modified from U.S. Census Bureau interpolated intercensal population estimates, 2000-2016. Updated September 2017.

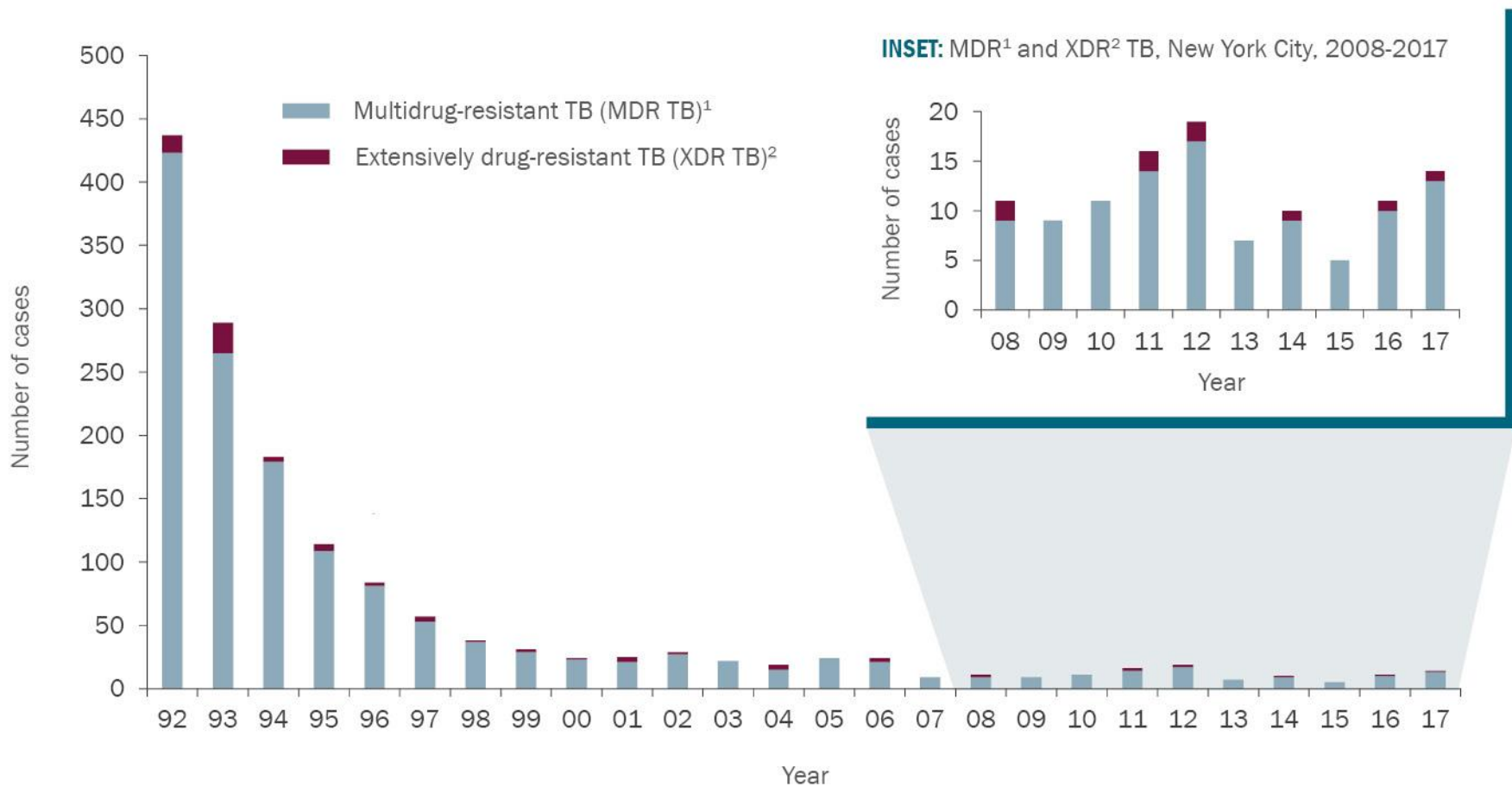


HIV INFECTION AMONG TUBERCULOSIS CASES BY BIRTH IN THE UNITED STATES (U.S.), NEW YORK CITY, 2008-2017



1. Excludes cases with unknown country of birth. 2. U.S.-born includes individuals born in the U.S. and U.S. territories. 3. 110 patients in 2017 had an unknown HIV status.

MULTIDRUG RESISTANCE¹ AMONG TUBERCULOSIS CASES, NEW YORK CITY, 1992-2017



1. MDR TB is defined as resistance to at least isoniazid and rifampin. 2. XDR TB is defined as resistance to at least isoniazid and rifampin plus a fluoroquinolone and a second-line injectable anti-TB medication.



TB REPORTING REQUIREMENTS

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Article 22 of the New York State Public Health Law and Articles 11 and 13 of the New York City Health Code require that suspected and confirmed cases of tuberculosis be reported to the local health authority, i.e., DOHMH, within 24 hours

REPORTING BY HEALTHCARE PROVIDERS

Providers are required by law to report within 24 hours any case or suspect with:

- AFB+ smear from any site
- Nucleic Acid Amplification (NAA) test + for *Mycobacterium tuberculosis* (*M. tb*)
- Culture + for *M. tb*
- Treatment started with 2 or more anti-TB medications for suspected or confirmed TB
- Clinically suspected TB
- Pathology findings consistent with TB
- Child < 5 years old with + TST or IGRA (regardless of prior BCG vaccination status)

REPORTING BY LABORATORIES

Laboratories are required by law* to report within 24 hours:

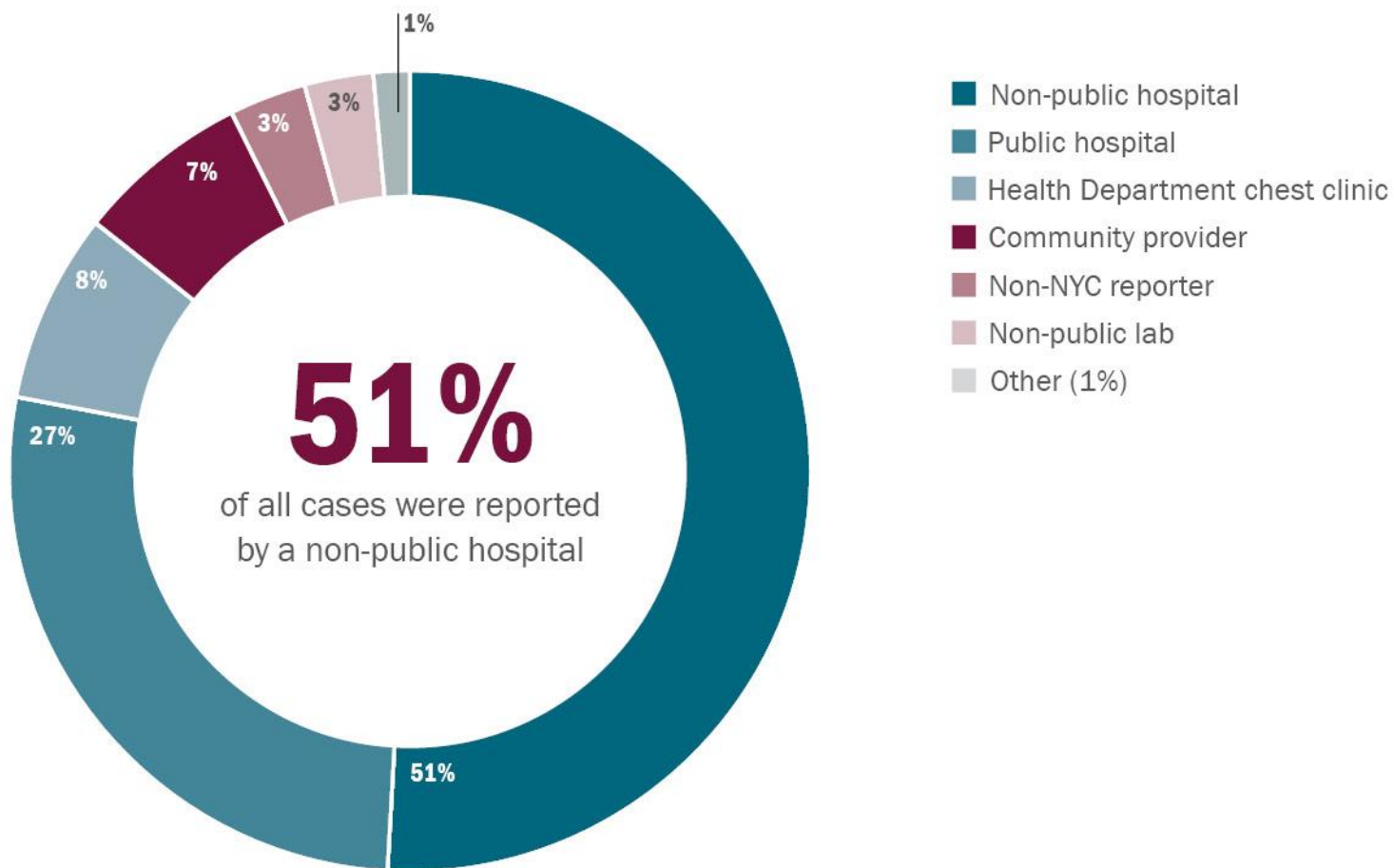
- AFB + smears
- Cultures + for *M. tuberculosis (M. tb)*
- Any culture result associated with an AFB+ smear (even if negative for *M. tb*)
- Rapid diagnostic (NAA) tests identifying *M. tb*
- Results of susceptibility tests on *M. tb* cultures
- Pathology findings consistent w/ TB

*Articles 11 and 13, Sections 11.03, 11.05 and 13.03 NYC Public Health Code

PATHOLOGY FINDINGS SUGGESTIVE OF TB

- Presence of acid-fast bacilli (AFB)
- Caseating/non-caseating granuloma
- Tubercles
- Fibrocaseous lesions
- Necrotizing/non-necrotizing granuloma
- Langhans giant cells/multinucleated Langhans cells
- Epithelioid cells/Epithelioid granuloma
- Necrotizing inflammation
- Chronic granulomatous lesions/chronic inflammation with granuloma formation
- Giant cells

INITIAL REPORTER OF CONFIRMED TUBERCULOSIS CASES VERIFIED IN 2017 BY REPORTER TYPE





TB IN HEALTHCARE SETTINGS

TB CONTROL MEASURES IN HEALTHCARE SETTINGS

- Mandated annual TB screening of healthcare workers
- Administrative Controls
 - Airborne isolation of patients suspected of having TB
 - HEPA filtration; UV lights
 - Use of personal protective equipment by staff and visitors (N95 respirators)
- Post-exposure evaluation
 - Infection Control Practitioner (ICP) identifies exposed staff/patients
 - Health department or private healthcare provider evaluates discharged patient contacts
 - Employee health evaluates staff contacts
 - ICP/Employee Health provide DOHMH details of investigation

MANDATED TB SCREENING OF HEALTHCARE STAFF

- Established by various federal and state regulations
- Prophylaxis for individuals diagnosed with latent TB infection (LTBI) not mandated
- Either tuberculin skin test (TST) or interferon-gamma release assays (IGRA) are acceptable as a test for TB infection
 - QuantiFERON[®]-TB Gold Plus (QFT-Plus)
 - T-SPOT[®].TB test

POST-EXPOSURE EVALUATION

- Identify contacts
 - Difficult when:
 - Exposure identified at a time remote from hospitalization
 - Unclear which staff had contact with patient
 - When case is healthcare worker, need to involve other departments
 - Test close contacts before expanding investigation
- Varying levels of exposure
 - More patient interaction in intensive care vs. floor
 - Patient's ability to perform activities of daily living
 - Intensive exposure during certain procedures

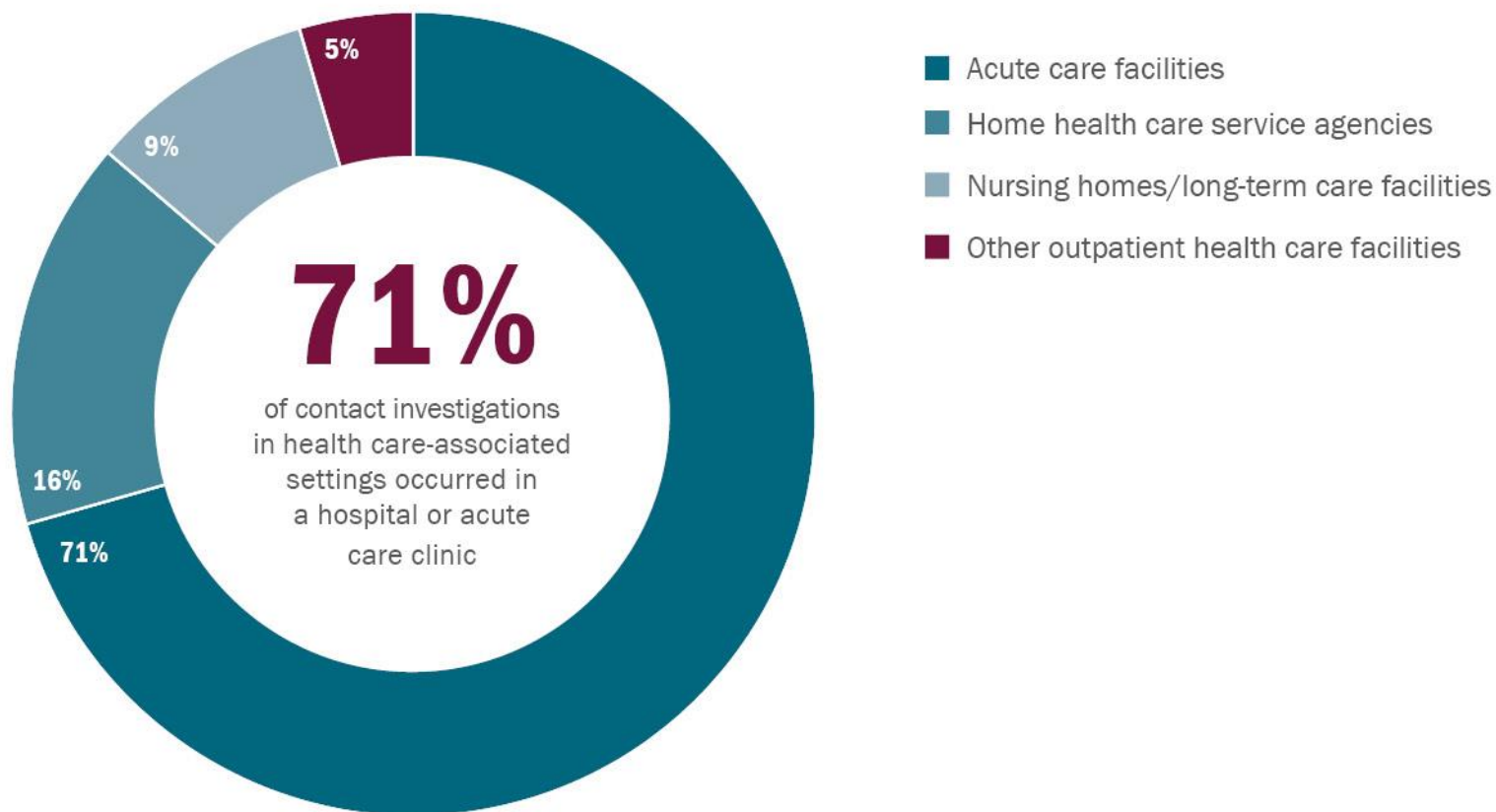
FACTORS AFFECTING TB TRANSMISSION

- Environment
 - Indoors
 - Ventilation adequacy
 - Duration and intensity of exposure
- Infectiousness of source case
 - Symptoms (cough)
 - Extent of disease (bacillary load)
 - Virulence of TB strain
 - Acid-fast bacilli (AFB) smear grade
- Host factors influencing progression to disease once infected
 - Immunosuppression (e.g., HIV infection, TNF-alpha medications, steroids, organ transplant)
 - Age, especially children < 5 years of age

CONGREGATE SETTING EXPOSURES

- Health Departments have the public health responsibility and authority to conduct contact investigations
- If individuals with infectious TB attended a congregate setting during their infectious period (12 weeks prior to diagnosis), DOHMH determines the need to initiate an investigation
- The DOHMH works with HR, employee health services, and management to identify employees with close (> 8 hours/week) or other-than-close (< 8 hours/week) exposure
 - Testing occurs no sooner than 8 weeks after last day of exposure

CONTACT INVESTIGATIONS IN HEALTHCARE-ASSOCIATED SETTINGS BY SITE TYPE, NEW YORK CITY, 2017 (N=153)



Transmission was likely ~4% of patients with healthcare-associated exposure

GENOTYPING AND CLUSTER DETERMINATION

- DOHMH conducts universal genotyping for all culture positive cases
- Genotyping permits determination of TB strain
 - Same strain *supports* likelihood of transmission
 - Different strain *refutes* likelihood of transmission
 - Not all persons with TB are culture positive
 - Not all TB isolates are genotyped
- Isolates with matching genotype are assigned to the same cluster
- Cluster investigations conducted to determine epidemiological links between cluster cases
- Clustered case that was a known contact to another cluster case is the strongest epidemiologic evidence for transmission

MAINTAIN TB VIGILANCE

- As the number of TB cases decline, clinicians are less likely to “think TB”
- Become familiar with the local epidemiology of TB (annual report by DOHMH)
- Review TB cases with hospital administration, infection control director, employee health, and with infectious disease/pulmonology departments



TESTS FOR LTBI

SELECTING A TEST FOR TB INFECTION

- **IGRAs** are preferred for:
 - Persons 2 years of age and older (*new Red Book guidance*)
 - Persons unable to return for TST reading
 - Non-U.S.–born persons who likely received the Bacille Calmette-Guérin (BCG) vaccine
- **TSTs** are preferred for:
 - Children under the age of 5 years (*CDC*)

Routine testing with both TST and IGRA is NOT recommended

Tests cannot distinguish LTBI from TB disease

ADVANTAGES OF IGRA OVER TST

IGRA	vs.	TST
In vitro (controlled laboratory test with minimal inter-reader variability)		In vivo (subject to errors during implantation and interpretation)
TB-specific antigens used		Less specific PPD used
No boosting; 2 step testing not needed		Boosting, with repeated testing
1 patient visit possible		2 patient visits minimum
Unaffected by BCG or most environmental mycobacteria		Affected by BCG vaccine and most environmental mycobacteria
Simple yes/no result		Interpretation based on patient's risk for TB exposure or development of disease



TREATMENT OF LTBI

MEDICAL EVALUATION FOR LATENT TB INFECTION (LTBI)

- Medical history/exam
- Test for TB infection (IGRA/TST)
- Chest x-ray
 - Normal → Treat for LTBI
 - Abnormal → Evaluate for TB disease

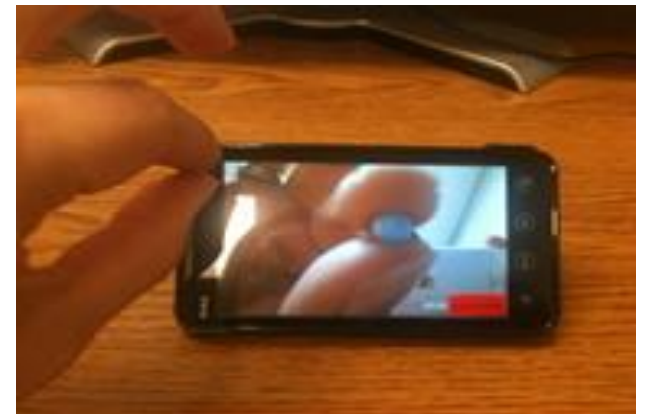
LTBI TREATMENT REGIMENS

Drug(s)	Duration	Interval	Minimum Doses
Rifampin (4R)	4 months	Daily	120
Isoniazid & Rifapentine (3HP)	3 months	Once weekly (DOT/SAT)	12
Isoniazid (9H)	9 months	Daily	270
		Twice weekly (DOT)	76

**DOT= directly observed therapy; SAT=self-administered therapy*

LTBI TREATMENT

- Shorter course treatments
 - Rifampin (4R)
 - Isoniazid & Rifapentine (3HP)
- Video Directly Observed Therapy (VDOT)
 - Live and Recorded



Completing LTBI treatment can reduce the chance of developing TB disease by 90%

INH AND RIFAPENTINE (3HP)

- 3HP
 - Non-inferior to 9 months of daily self-administered INH
 - Once weekly x 12 weeks
 - DOT vs SAT

- Use for treating LTBI in healthy patients ≥ 2 years

DOSING 3HP

BOX 1. Dosage for a combination regimen of Isoniazid and rifapentine in 12 once-weekly doses under direct observation for treating latent *Mycobacterium tuberculosis* Infection.

Isoniazid

15 mg/kg rounded up to the nearest 50 or 100 mg;
900 mg maximum

Rifapentine

10.0–14.0 kg 300 mg
14.1–25.0 kg 450 mg
25.1–32.0 kg 600 mg
32.1–49.9 kg 750 mg
≥50.0 kg 900 mg maximum

Isoniazid (INH) is formulated as 100 mg and 300 mg tablets. Rifapentine (RPT) is formulated as 150 mg tablets packed in blister packs that should be kept sealed until usage. New formulations with larger dosage per tablet and fixed-dose INH-RPT combinations are in development.

Source: Three months of weekly rifapentine and isoniazid for *Mycobacterium tuberculosis* infection (PREVENT TB). Information available at <http://clinicaltrials.gov/ct2/show/nct00023452?term=rifapentine&rank=9>.

MONTHLY MONITORING DURING LTBI TREATMENT

- Evaluate for signs and symptoms of active TB
- Monitor adherence to prescribed regimen
- Inquire about treatment side effects
- Review all medications and assess for potential drug interactions
- Remind patient of signs and symptoms of hepatotoxicity

MONTHLY MONITORING DURING LTBI TREATMENT

Conduct baseline laboratory evaluations and repeat liver function tests for:

- Persons living with **HIV infection**
 - **Pregnant and post-partum women** (up to 2-3 months after delivery)
 - Persons with a history/risk of **liver disease**
 - Chronic alcohol ingestion
 - Chronic hepatitis
 - History of injection drug use
 - Persons on **two or more meds**, or other non-TB meds
 - At physician discretion
-



DISCHARGE OF PATIENTS WITH INFECTIOUS TB

DISCHARGE OF PATIENTS WITH INFECTIOUS TB

- Hospitals/providers must obtain approval from health department at least 72 business hours before discharging infectious TB patients
(NYC Health Code Article 11 Section 21(4) amended June 16, 2010)
- Infectious patients could be discharged in the appropriate circumstances
 - TB can be dangerous for other hospitalized patients
 - Patients should be treated as OUTPATIENTS unless they meet certain criteria
 - Patients become noninfectious quickly once on treatment

CRITERIA FOR DISCHARGING PATIENTS WITH SUSPECTED OR CONFIRMED TB WHILE INFECTIOUS

- Shown clinical improvement on anti-TB medications
- Have had chest x-ray and sputa performed
- Will not be discharged to a congregate setting or living with immunosuppressed individuals while infectious
- Willing to follow up as an outpatient and be on directly observed therapy (DOT)
- Multidrug-resistant TB is not suspected
- No children <5 years in the home or a plan in place for evaluation and LTBI treatment if indicated
- Patient agrees to risk reduction behavior while infectious

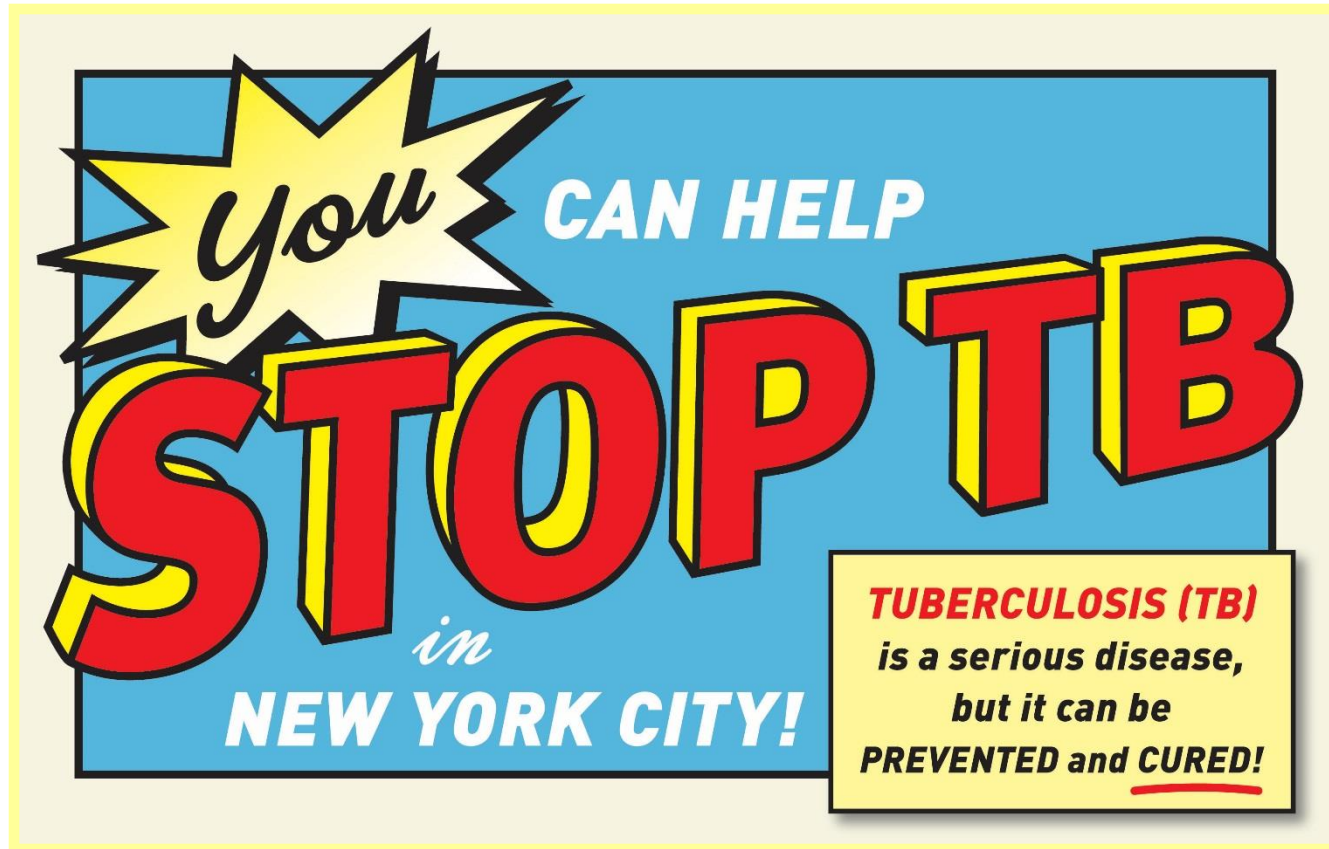
ADDITIONAL CRITERIA FOR DISCHARGE

- Patient may be reported over the phone to DOHMH (347-396-7400), but must also be reported via Universal Reporting Form (URF)
 - Electronic URF filled out within 24 hours
- Involvement of DOHMH in discharge planning with submission of discharge plan to DOHMH
 - Referral to DOHMH Chest Clinic and DOT
- Instructions given to patient and household members if they were exposed to an infectious patient

INFECTION CONTROL PRACTITIONERS COLLABORATION WITH HEALTH DEPARTMENT

- “Go-to” person for many health department staff
- Reporting of confirmed or suspected TB cases
- Assisting DOHMH field staff with chart review
- Facilitating case management including referral for DOT
- Identifying potential patients who have been lost to care or who leave against medical advice
- Assisting DOHMH outbreak staff with health care-associated investigations

Thank you!



Call 311

DOHMH TB Hotline 844-713-0560

www.nyc.gov/health/tb