



Who is at Risk of TB?

Annie Kizilbash, MD, MPH

August 25, 2026

Clinical Management of TB for Physicians • August 25, 2026 • San Antonio, Texas



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Has the following disclosures to make:

- No conflict of interests
- No relevant financial relationships with any commercial companies pertaining to this activity



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Heartland National TB Center,
San Antonio, Texas



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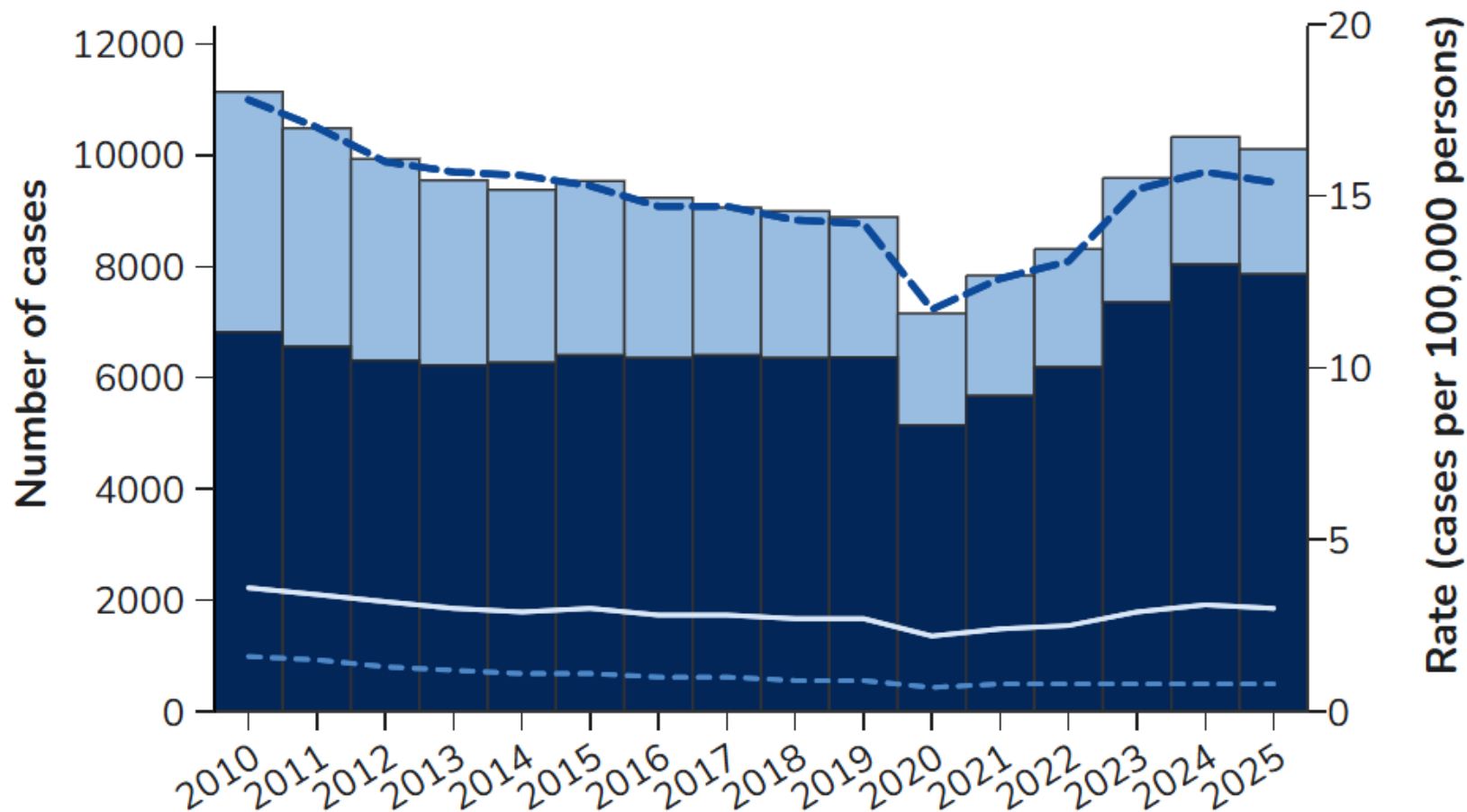
Objectives

1. Describe the current epidemiology of TB in Texas, the United States and globally
2. List the groups of people who are more likely to be exposed to or infected with *Mycobacterium tuberculosis*



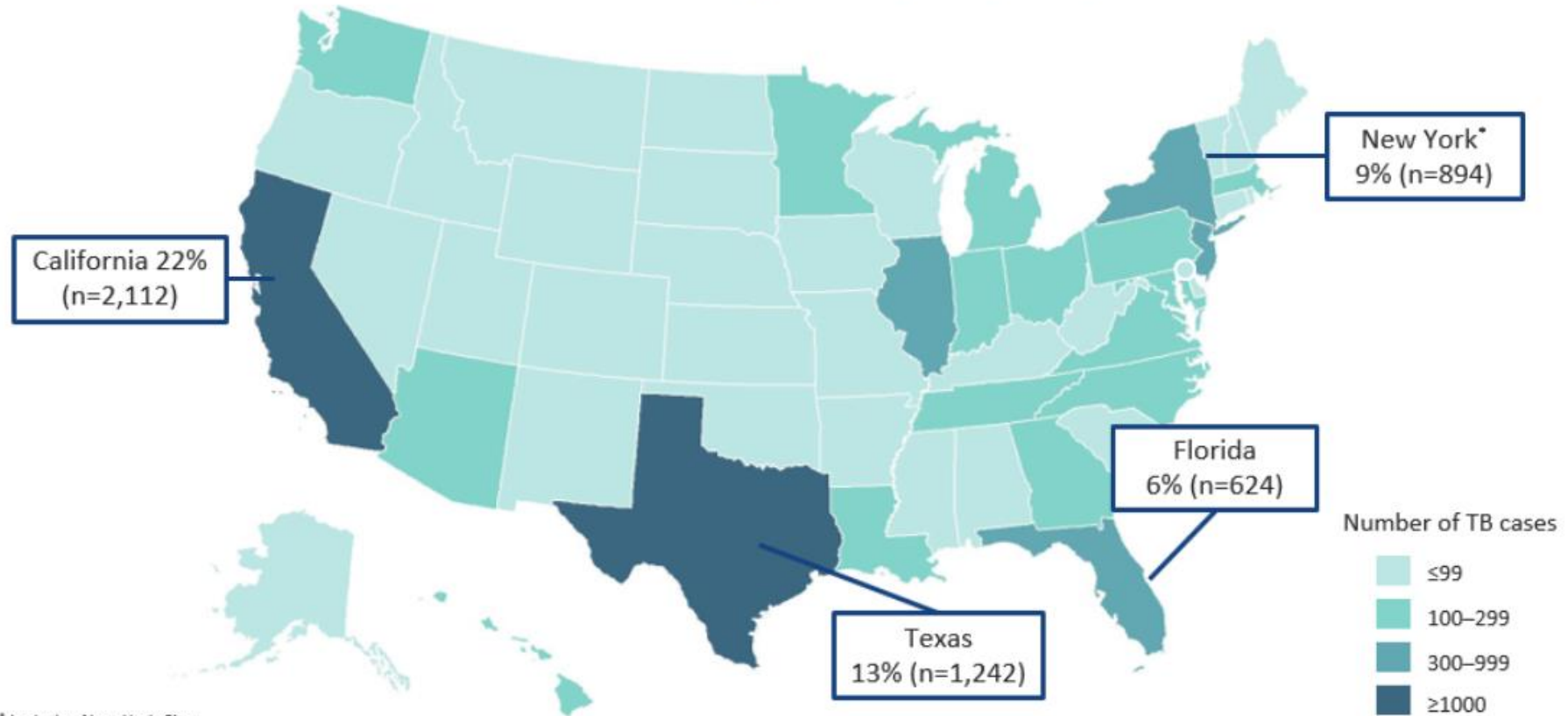


What is the Current Epidemiology of
TB in the US and along the
US/Mexico Border?



TB case counts and rates declined for nearly three decades with a sharp decrease in 2020, before increasing from 2021 to 2024. Compared with 2024, case counts and rates declined slightly among both U.S.-born and non-U.S.-born persons in 2025 from 10,395 (3.1 per 100k) to 10,260 (3 per 100k).

TB Cases and Percentages by Reporting Area, United States, 2023 (N=9,633)



* Includes New York City



US/Mexico Border States

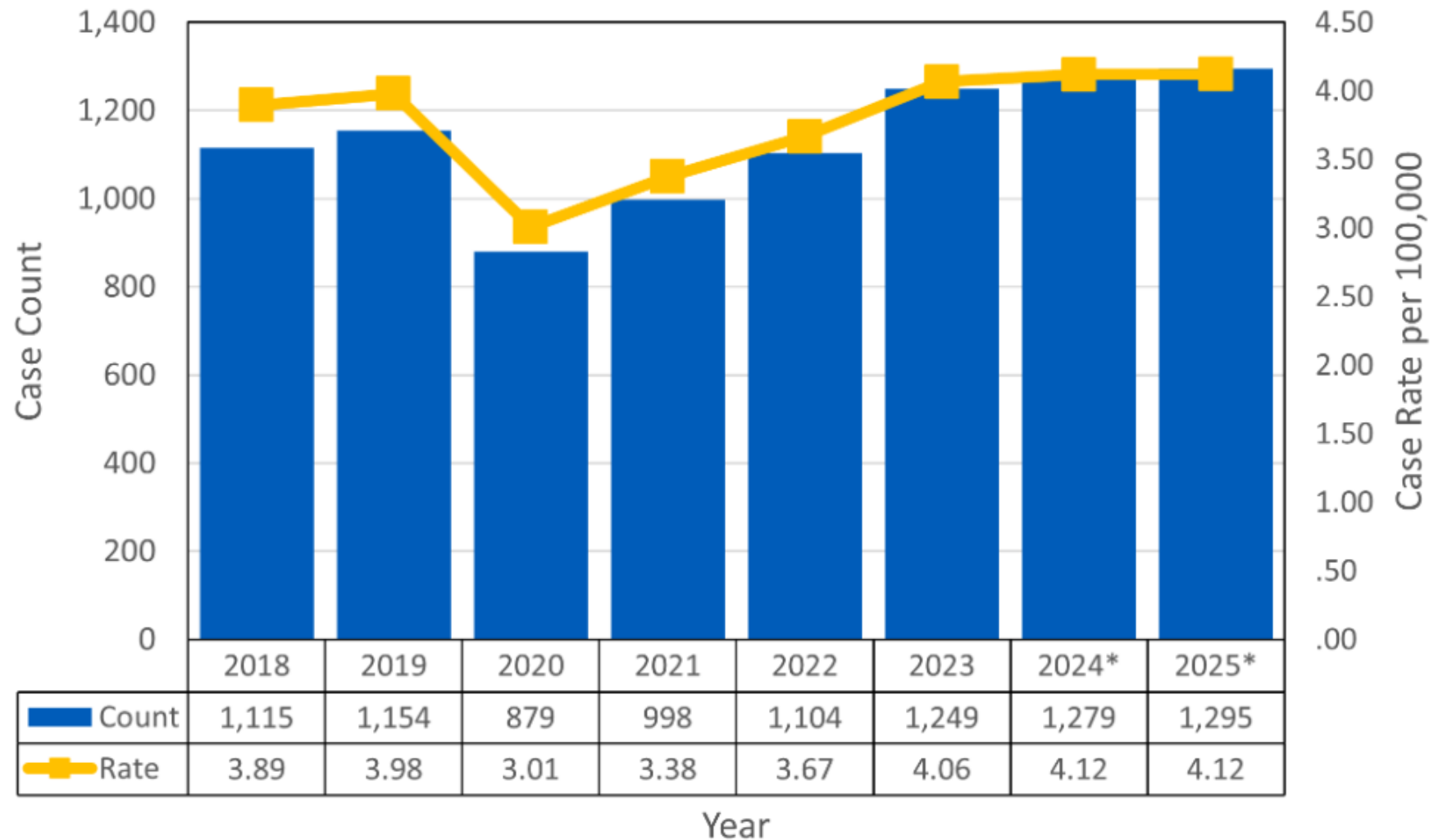




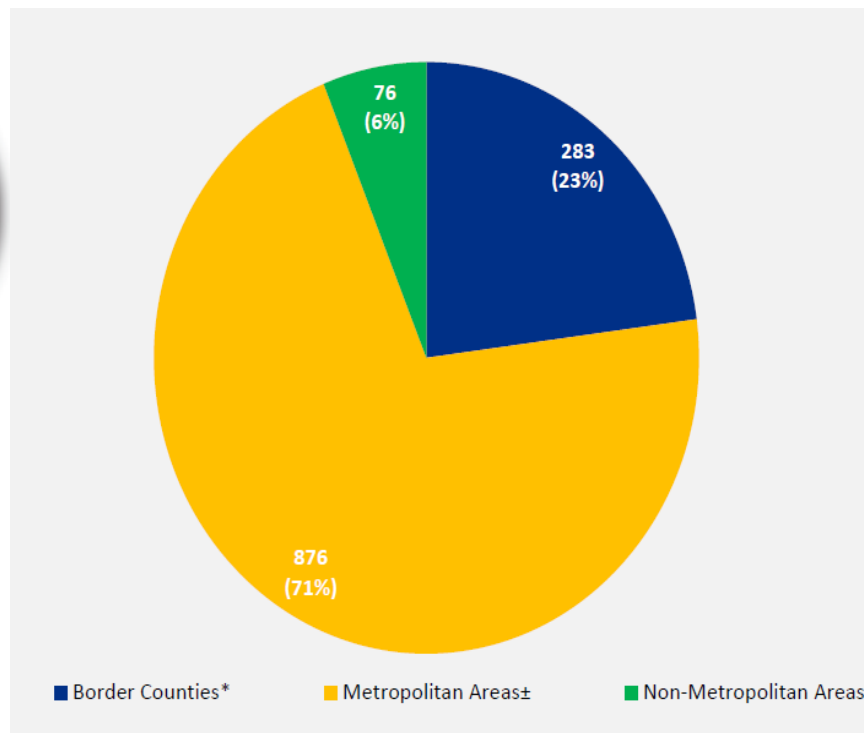
TEXAS
Health and Human Services

Texas Department of State
Health Services

Tuberculosis Case Counts and Rates in Texas, 2018–2025



Geographic Distribution of TB in Texas Communities, 2025



Top 10 Texas counties with the most TB cases - 2025

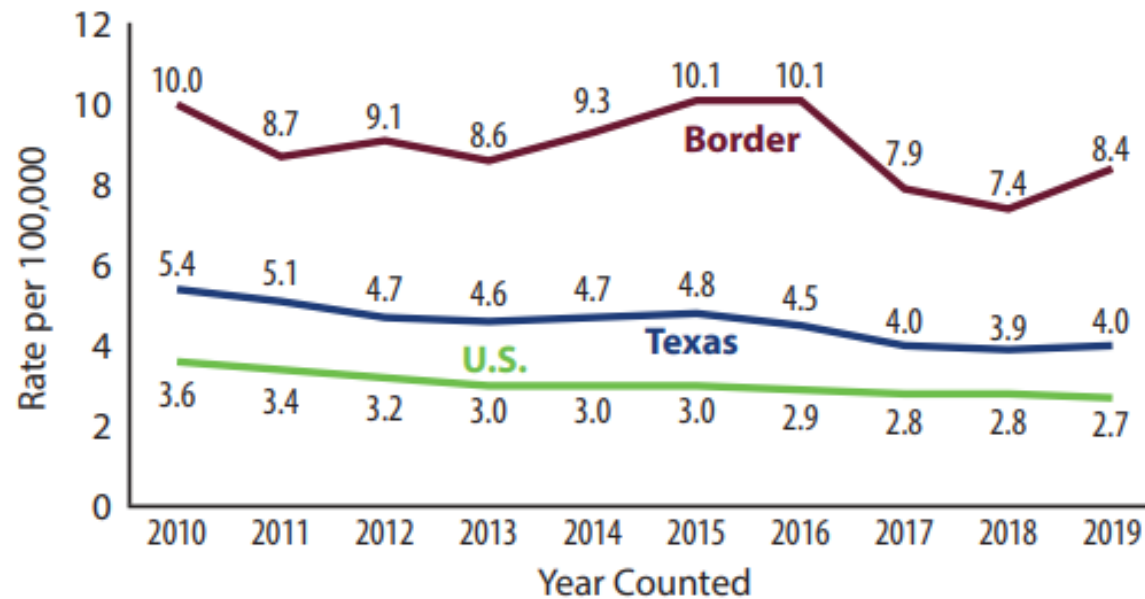
- Harris: 302
- Dallas: 156
- Tarrant: 87
- Bexar: 75
- Hidalgo: 64
- Travis: 58
- Walker: 50
- Collin: 43
- Cameron: 39
- Denton: 34

TB in Border Counties

- In 2025, only 9.5% of the Texas population lived in a border county
- Border counties accounted for 15.0% of the patients with TB in Texas



Figure 2: TB Incident Rate Comparison Among Texas, U.S., and Texas-Mexico Border Counties



In 2019, the 32 border counties had an average TB incidence rate of 8.4/100,000, which was more than double the Texas TB rate of 4.0/100,000, and nearly triple the national rate 2.7/100,000.¹

**Table 2: Risk Factors Among Persons
Diagnosed with TB Along the Border and
Non-Border Counties, 2019**

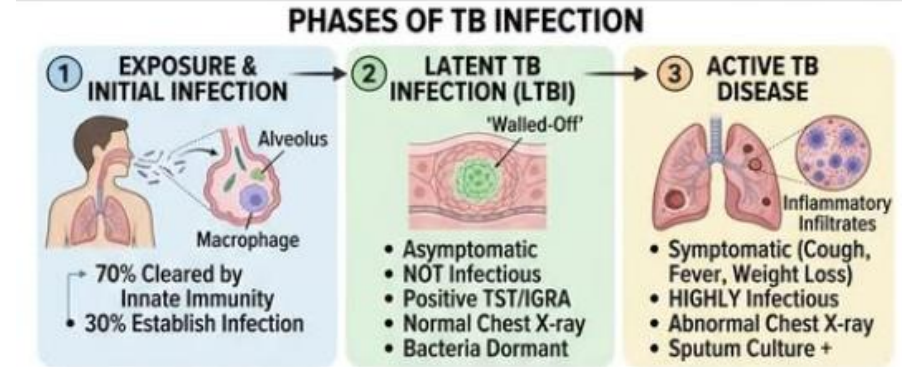
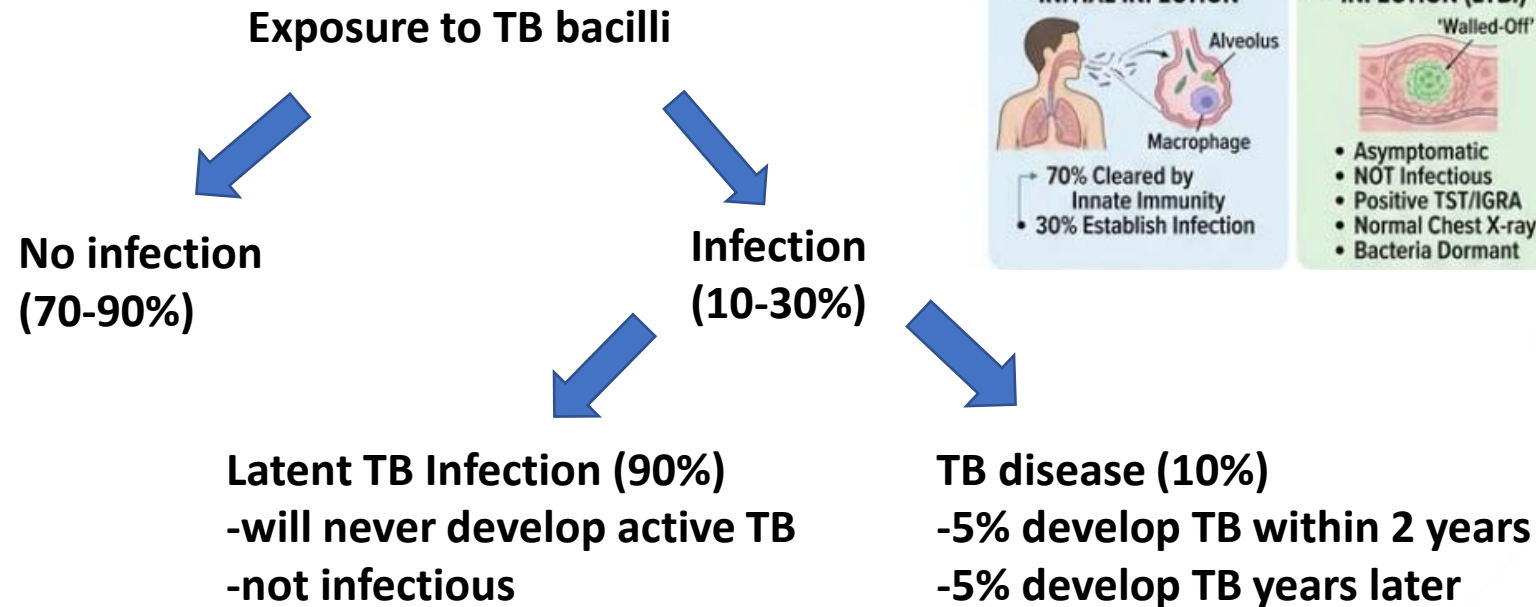
	Border	Non-Border
Alcohol Abuse	10%	10%
Non-Injection Drug Use	10%	9%
Injection Drug Use	1%	1%
Non-U.S. born	69%	61%
Homelessness	2%	4%
HIV	2%	5%
Diabetes	27%	20%
Resistant to Any Drugs	10%	6%



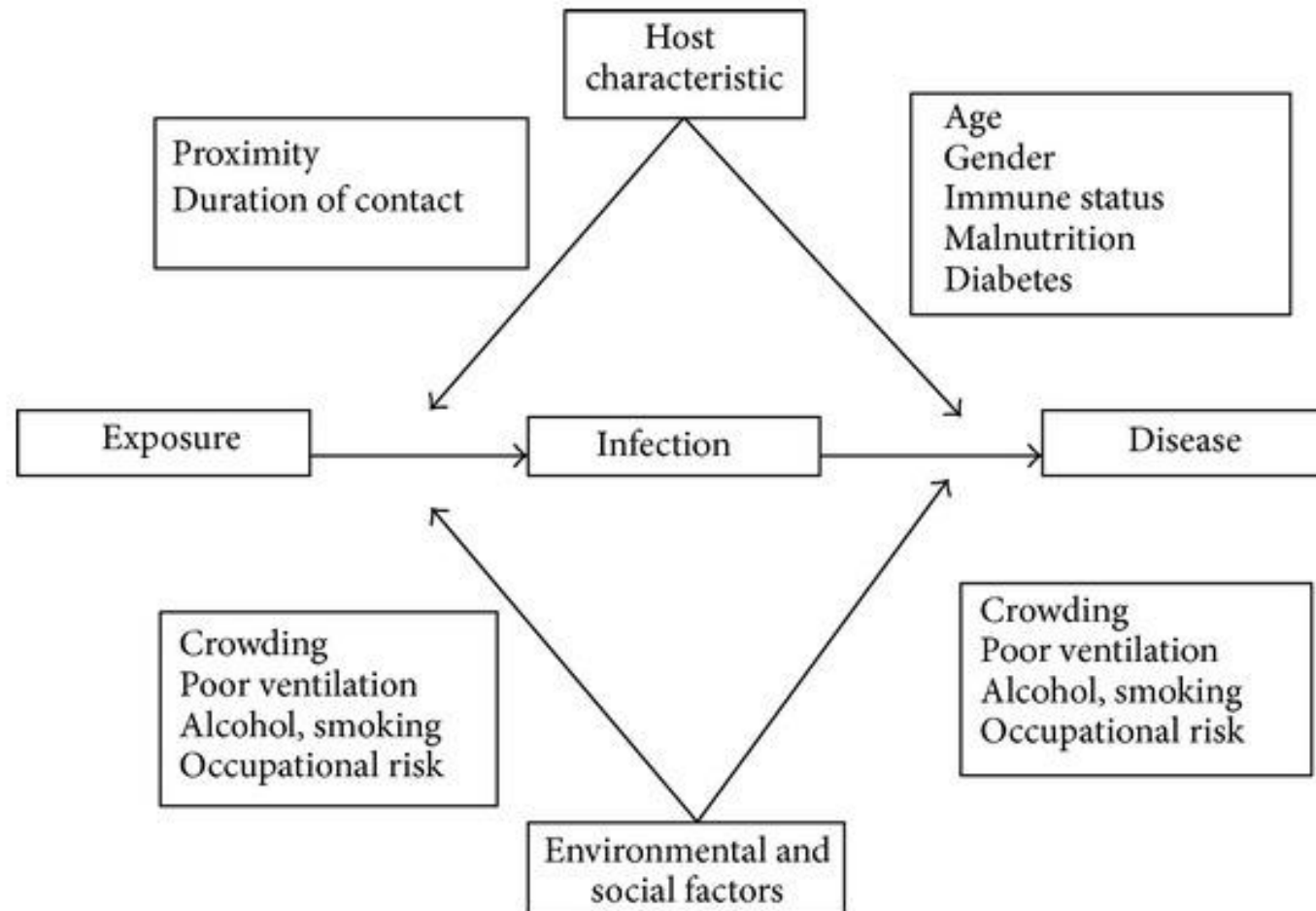


Who is more likely to be
exposed or infected with
*Mycobacterium
tuberculosis* ?

Pathogenesis of Tuberculosis

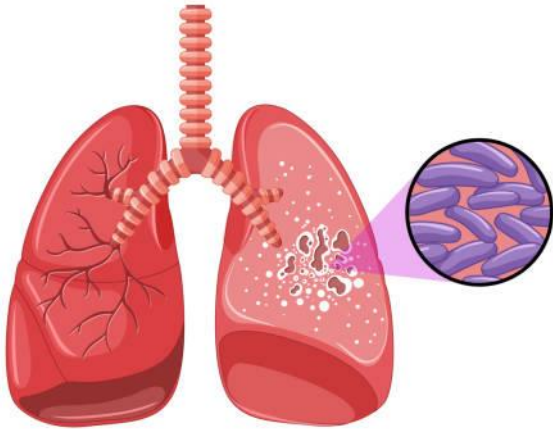


Risk Factors for Tuberculosis



Who is more likely to be exposed to *M. tuberculosis*?

TUBERCULOSIS (TB)



- Foreign born persons from countries with a high incidence of TB disease
- Residents and employees of high-risk congregate settings (e.g. correctional facilities, long term care facilities)
- Healthcare workers
- Contacts to persons with infectious TB disease
- Persons who spend time in shelters
- Persons who use illicit drugs



Incidence of TB Global vs. USA

- **Globally: In 2024**

- 10.7 million estimated cases of TB disease
- 131 per 100,000 population

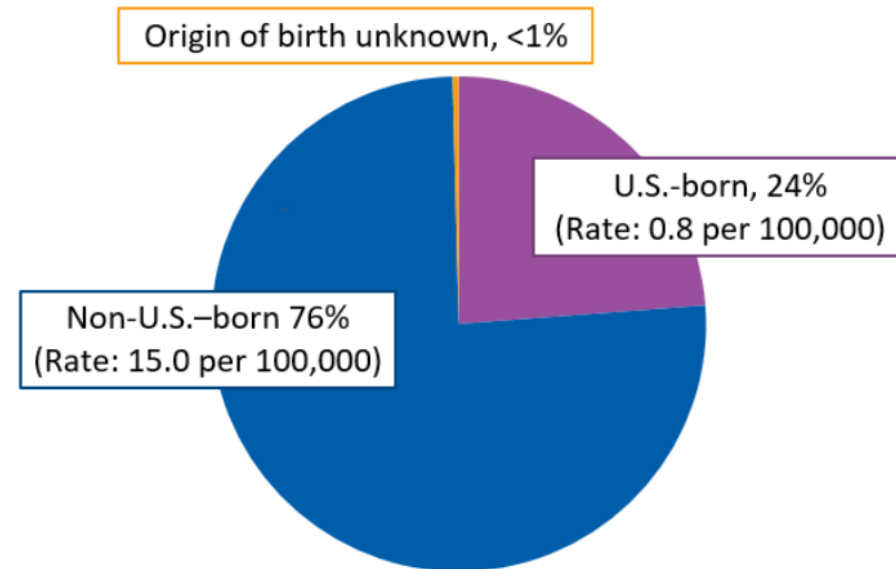
Global Tuberculosis Report WHO Report 2025

- **USA: In 2024**

- 10,388 TB disease cases reported
- 3.1 cases per 100,000 population

MMWR March 2025

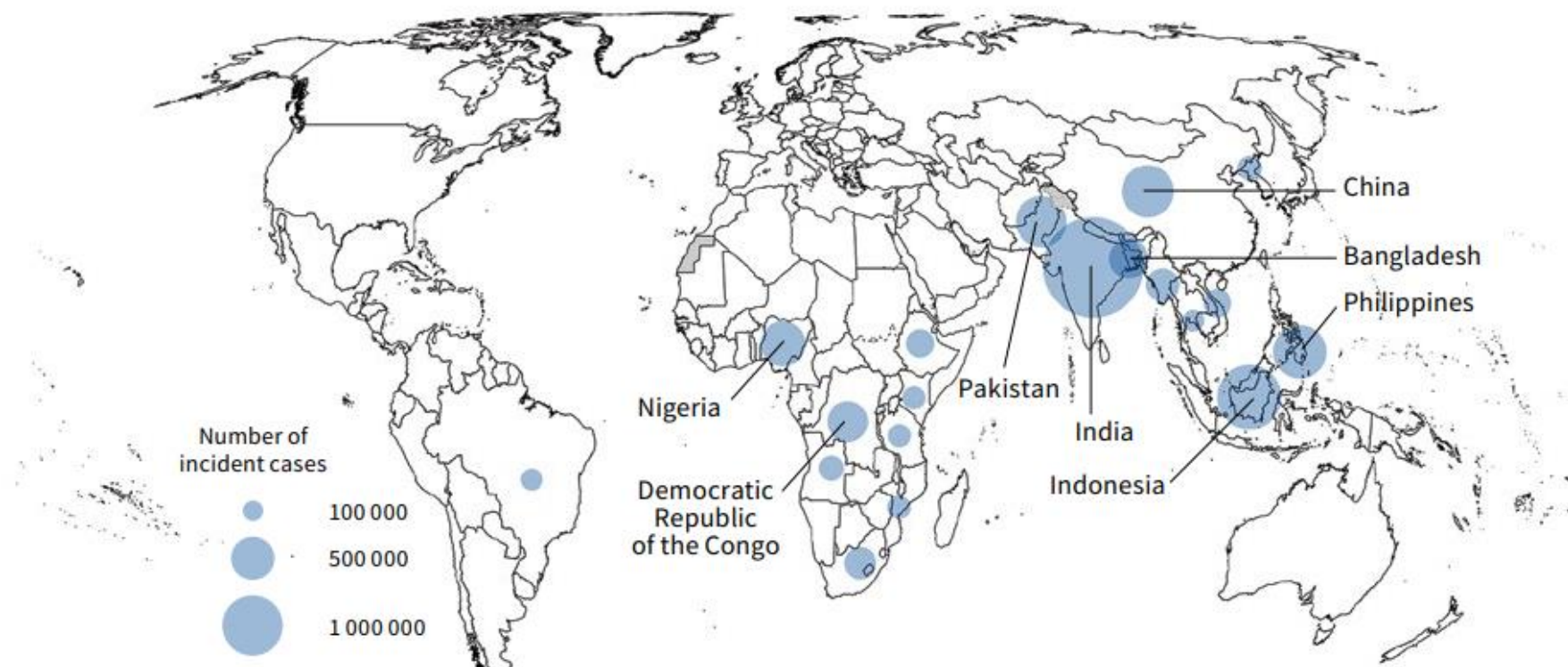
**TB Incidence Rates and Percentages by Origin of Birth,*
United States, 2023 (N=9,633)**



Wide Range of Risk of Exposure - Depends on Country of Origin

FIG. 3

Estimated number of incident TB cases for countries with at least 100 000 incident cases, 2024^a



Many patients are diagnosed with TB >10 years after arrival in the US

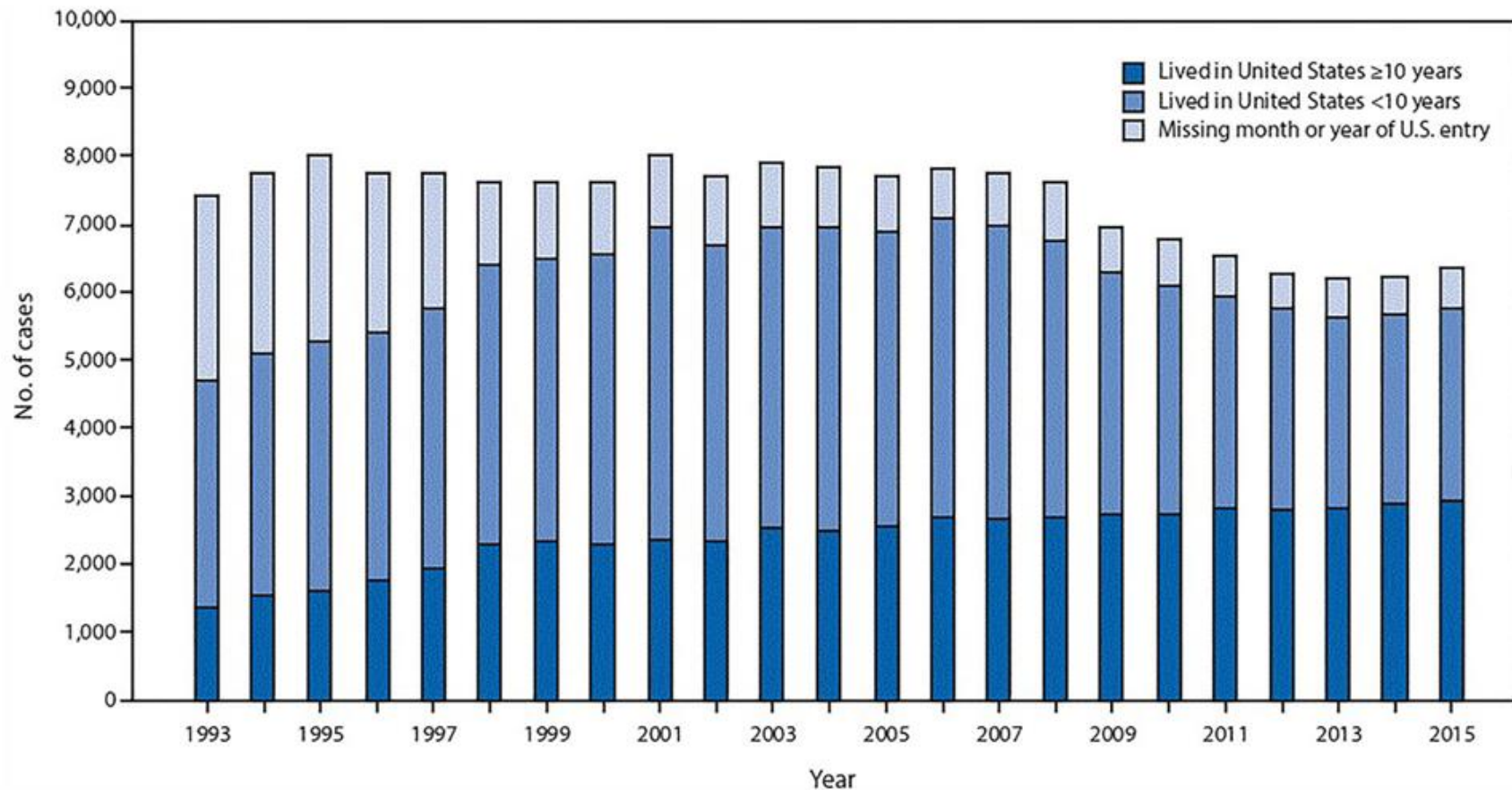
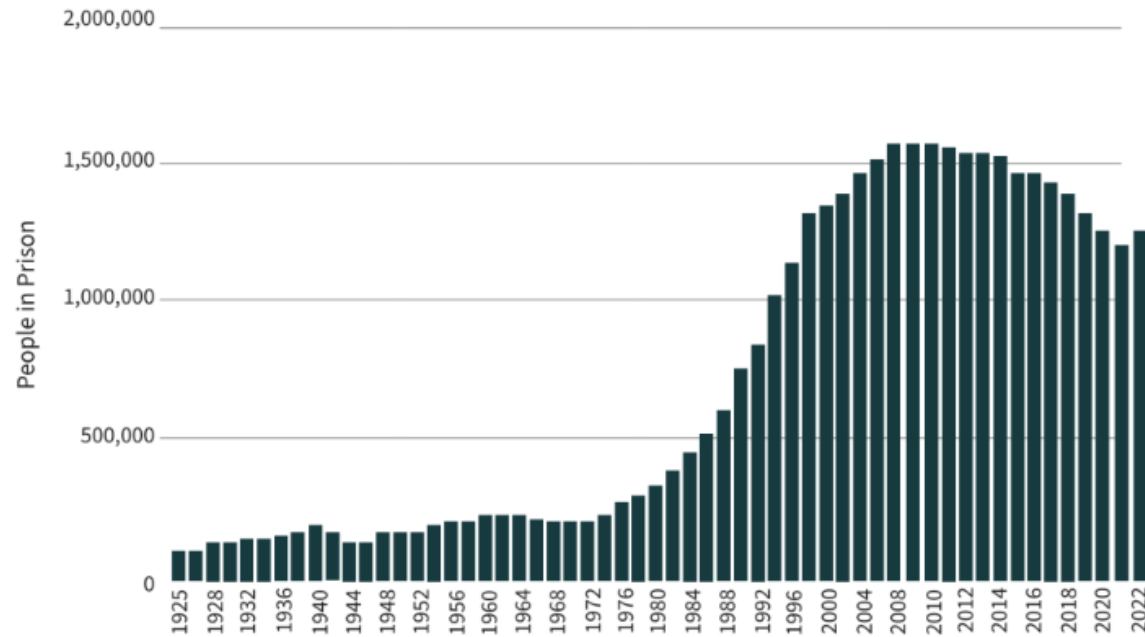


Figure 1: Number of tuberculosis cases diagnosed among foreign-born persons <10 years and ≥10 years after arrival in the United States, 1993–2015. The figure above is a histogram showing the number of tuberculosis cases diagnosed among foreign-born persons <10 years and ≥10 years after arrival in the United States, during 1993–2015.

Correctional Facilities and Risk for TB

Figure 1. U.S. State and Federal Prison Population, 1925-2022

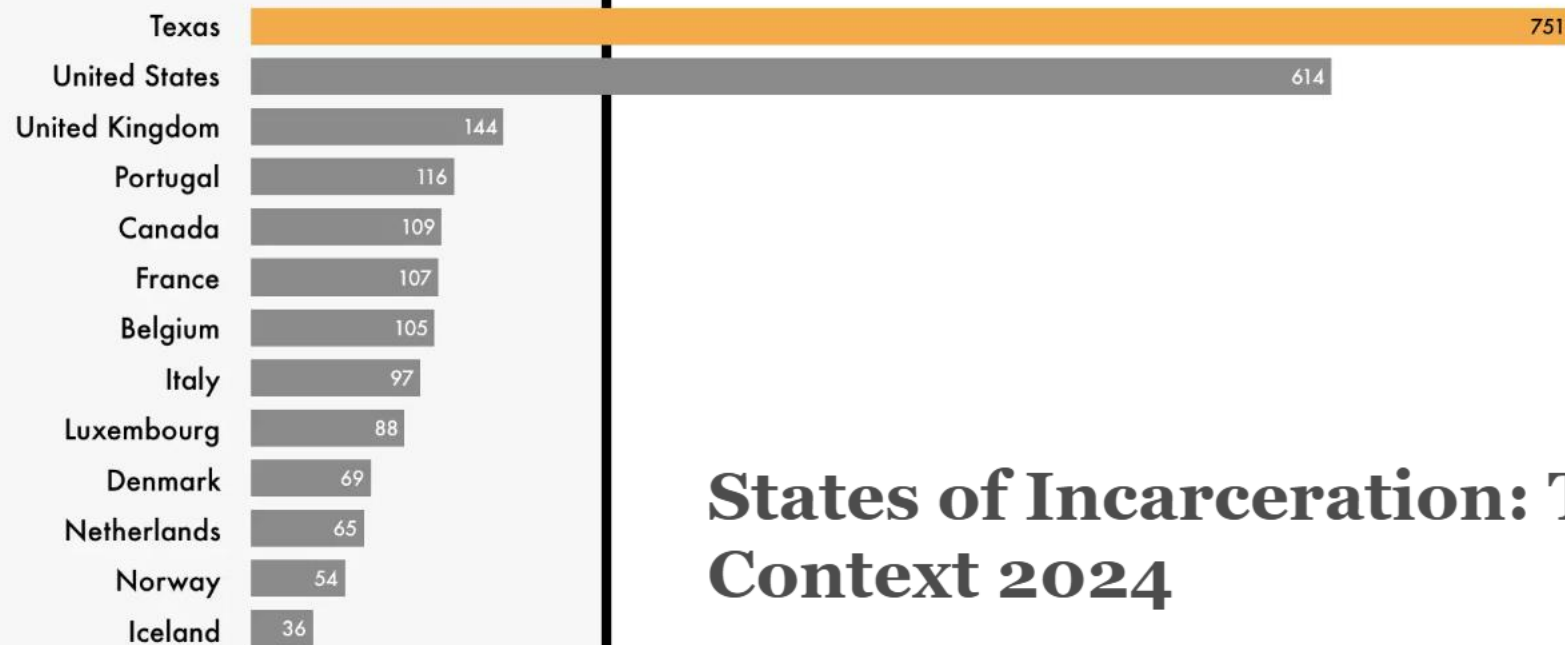


Sources: Cahalan, M. W. (1986). [*Historical corrections statistics in the United States, 1850-1984*](#). Bureau of Justice Statistics; Carson, E. A. (2023). [*Prisoners in 2022-Statistical tables*](#). Bureau of Justice Statistics.



INCARCERATION RATES

COMPARING TEXAS
AND FOUNDING NATO COUNTRIES



Incarceration rates per 100,000 population

States of Incarceration: The Global Context 2024

Correctional facilities and Risk for TB

- Prevalence of LTBI among inmates high
 - 49 correctional facilities in 12 states, 198102 inmates, 17% TST positive
 - Treatment for latent TB in correctional facilities: a challenge for TB elimination; Loboto MN; Am J Prev Med. 2003; 24:249-53
- Correlation between length of incarceration and positive TST
 - 8% LTBI newly incarcerated, 5% increase with each year
 - Active and latent tuberculosis in Brazilian correctional facilities: cross sectional study; Carbone; BMC Infectious Diseases 2015
- Substantially higher TB disease cases rates in correctional populations
 - E.g. New Jersey (1994) - 91.2 cases per 100,000 (11 cases per 100,000 among all residents)



📷 In El Salvador, 44% of tuberculosis cases occurred in prisons, the worst scenario. The country has the highest incarceration rate of the six Latin American nations studied. Photograph: Alex Peña/Getty Images

AT-A-GLANCE: CDC RECOMMENDATIONS FOR CORRECTIONAL AND DETENTION SETTINGS

Testing, Vaccination, and Treatment for
HIV, Viral Hepatitis, TB, and STIs

Recommendations current as of August 10, 2022

Why ?

- At least three factors:

- Those incarcerated are at higher risk for TB
- Physical structure of the facility – inadequate ventilation, overcrowding, close living quarters
- Movement of inmates into and out of facilities



In 2024, 342 people (4% of total U.S. cases) were actively incarcerated at the time of their diagnosis, and 824 people (9%) reported a broader history of past incarceration



Tuberculosis among the Homeless

- TB outbreaks frequently originate in homeless shelters – high risk of recurrence
- Homeless – person without a fixed, regular adequate nighttime residence within 12 months preceding the diagnosis of TB



NATIONAL

Homelessness in the U.S. hit a record high last year as pandemic aid ran out

UPDATED DECEMBER 15, 2023 · 4:25 PM ET ⓘ

HEARD ON ALL THINGS CONSIDERED



Jennifer Ludden



4-Minute Listen

+ PLAYLIST



In 2024, 698 people (7% of cases with TB among persons aged 15 or older) experienced homelessness at the time of their tuberculosis diagnostic evaluation

While 866 people (9% of patients with TB) reported a history of ever experiencing homelessness.

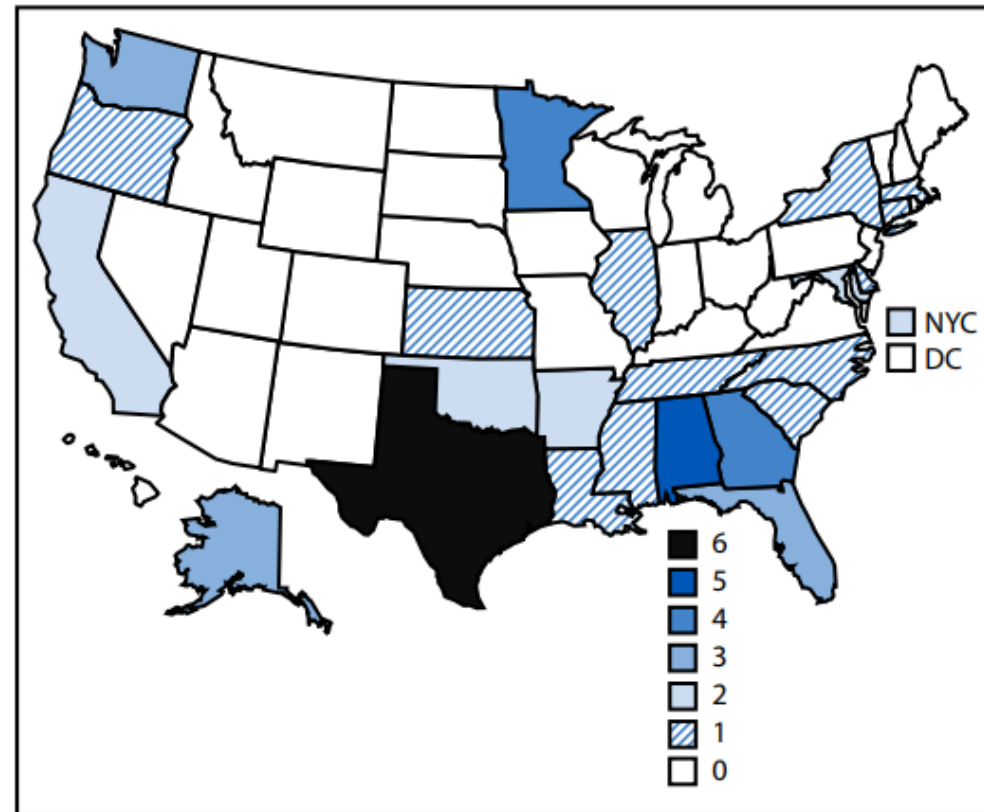


Large TB Outbreaks in the USA

- 25% of large TB outbreaks were associated with congregate settings
- Administrative infection control measures in overnight congregate settings are proven strategies for preventing the spread of TB.
- Large outbreaks in these settings underscore the continued need for infection control measures in congregate settings, despite low overall U.S. TB incidence

MMWR April 30th, 2026. Large Tuberculosis Outbreaks — United States, 2017–2023

FIGURE. Large tuberculosis outbreaks,* by jurisdiction† — United States, 2017–2023



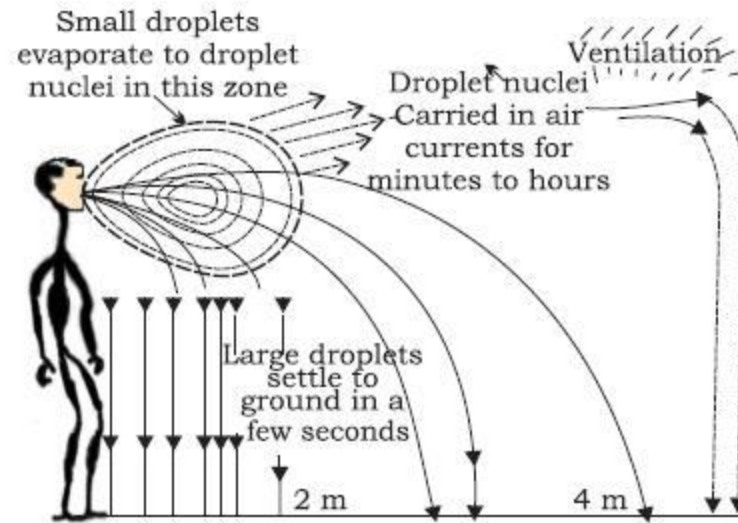
Abbreviations: DC = District of Columbia; NYC = New York City.

* N = 50. Ten or more cases of tuberculosis related by transmission within a 3-year period (*Mycobacterium tuberculosis* isolates differ by five or fewer single nucleotide polymorphisms or, when sequencing data are unavailable [e.g., for cases diagnosed without culture confirmation], an epidemiologic link to another outbreak-related case is present).

† Outbreaks are attributed to the jurisdiction where >50% of outbreak-related cases were reported. NYC is a distinct reporting area from the state of New York.

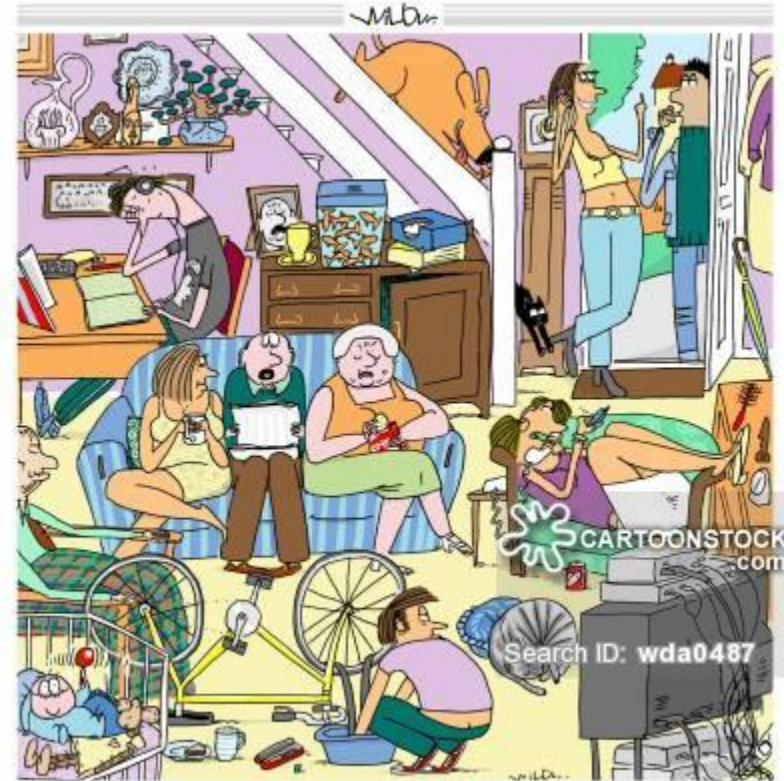
What are environmental factors which increase likelihood of TB transmission?

- Poorly ventilated settings
- Crowding



Crowding and Risk of TB Transmission

- 'Persons per room' is widely used an indicator of crowding
- Increases the likelihood of contact between an infectious TB case and a susceptible person and increases intimacy of exposure



Shocking, the overcrowding in our prisons.

Poor Ventilation and Risk of TB Transmission

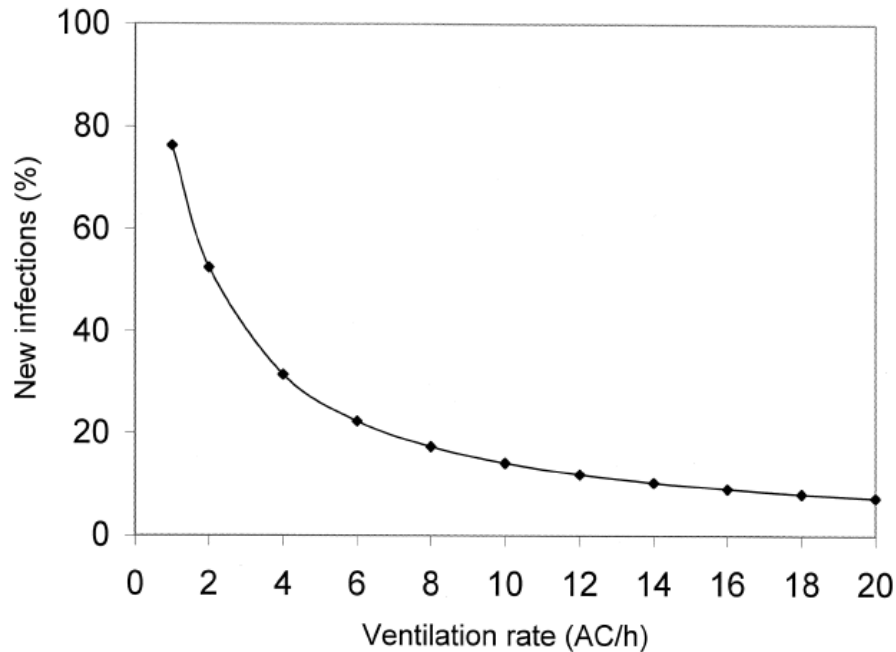
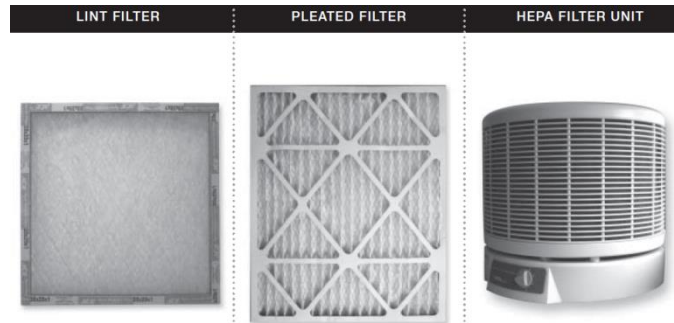
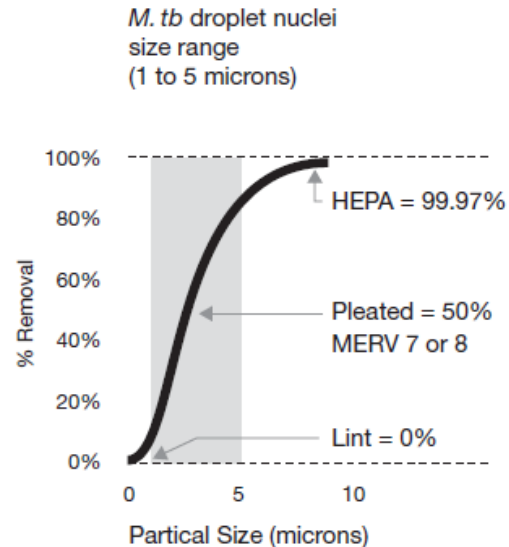


Figure 5 Effect of ventilation rate on new infections for base condition parameters with a total quanta production rate of 12 quanta/h and an exposure time of 16 h.

- Simplistic parametric model
- Depends on other factors such as room volume, occupancy density, infectious dose and susceptibility of host

Guidelines for Preventing the Transmission of *M.tuberculosis* in Health-Care Settings 2005; CDC



• Airborne infection isolation room

- Minimum ventilation rate of 12 air changes per hour
- Negative pressure rooms created by exhausting air
- HEPA filters recommended ± UV germicidal irradiation

Why are Healthcare Workers Sick of TB?

- Twenty-one studies were included and provided data on 30,961 HCWs across 16 countries.
- Prevalence of LTBI among HCWs was 37%, and mean incidence rate of TB disease was 97/100 000 per year.
- Compared with the general population, the risk of LTBI was greater for HCWs (OR 2.27) and the incidence rate ratio for TB disease was 2.94.



Open Forum Infectious Diseases

MAJOR ARTICLE

IDSA
Infectious Diseases Society of America

hivma
hiv medicine association

OXFORD

Risk of Tuberculosis Infection and Disease for Health Care Workers: An Updated Meta-Analysis

Lydia Uden,¹ Ella Barber,^{1,2} Nathan Ford,³ and Graham S. Cooke¹

¹Division of Infectious Diseases, Imperial College London, ²Manson Unit, Médecins Sans Frontières, London, UK; and ³Centre for Infectious Disease Epidemiology and Research, University of Cape Town, South Africa

Received 10 May 2017; editorial decision 23 June 2017; accepted 24 June 2017.

Healthcare Associated Outbreaks

Table Quanta production rate data for TB and measles outbreaks, as reported by various sources

Disease	Description	Reported quanta per hour	Reported by	Original source
TB	Average TB patient	1.25	Nardell et al. ¹³	Riley et al. ¹⁵
TB	Outbreak in office building	12.7	Nardell et al. ¹³	Nardell et al. ¹³
TB	Laryngeal case of TB	60	Nardell et al. ¹³	Riley et al. ¹⁵
TB	Bronchoscopy-related outbreak	250	Nardell et al. ¹³	Catanzaro ¹⁴
TB	Bronchoscopy-related outbreak	360	Gammaitoni & Nucci ¹¹	Catanzaro ¹⁴
TB	Outbreak related to jet irrigation of abscess	2 280	Gammaitoni & Nucci ¹¹	Hutton et al. ¹⁶
TB	Autopsy outbreak	5 400	Gammaitoni & Nucci ¹¹	Kantor et al. ¹⁷
TB	Intubation-related outbreak	30 840	Gammaitoni & Nucci ¹¹	Haley et al. ¹⁸
Measles	Outbreak in a school (index case)	5 580	Riley et al. ⁹	Riley et al. ⁹

- Extraordinarily high rate of production of droplet nuclei containing *M. tuberculosis* in ‘artificial’ clinically-induced outbreaks compared to ‘normal’ pulmonary TB patients

The transmission of tuberculosis in confined spaces: an analytical review of alternative epidemiological models,
Beggs C.B., Int J Tuberc Ling Dis 7(11): 1015-1026



TB Screening and Testing of Healthcare Personnel, U.S., 2018

Rectangular Snip

- Few (3%–5%) U.S. HCP test positive for *M. tb* at baseline
- Low rate of conversion of test to positive (<1%) among U.S. HCP during serial testing (*little transmission?*)
- Almost half of U.S. HCP reverted from positive to negative test result during serial testing (*false positive?*)
- No cases of TB disease reported among the ~64,000 U.S. HCP included in studies reviewed (*low incidence*)

Sosa et al. Tuberculosis Screening, Testing, and Treatment of U.S. Health Care Personnel: Recommendations from the NTCA and CDC, 2019. MMWR Morb Mortal Wkly Rep 2019;68:439–43.
https://www.cdc.gov/mmwr/volumes/68/wr/mm6819a3.htm?s_cid=mm6819a3_w



Contacts to persons with infectious TB disease

- Factors include:
 - Infectiousness of TB patient
 - Susceptibility of contact
 - Duration of contact
 - No safe exposure time has been established
 - Proximity of contact
 - Difficult to determine

Contact Investigation for Tuberculosis: a systematic review
and meta-analysis; Fox G, Eur Respir J. 2013



Proximity and Duration of MTB Exposure

- 32 years old Korean lady MDR pulmonary TB
- Flight from Chicago to Honolulu
- Flight duration 8.75 hours
- 15 positive TST
 - 6 without TB risk factors

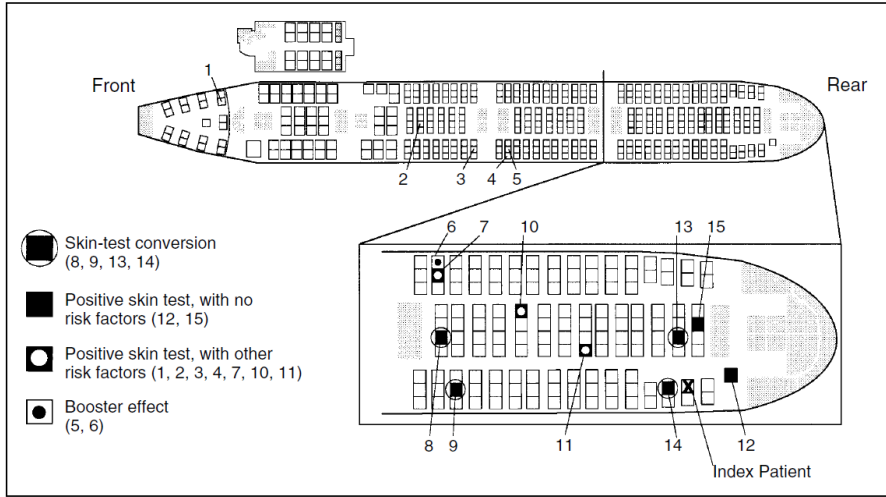


Figure 2. Diagram of the Boeing 747-100, with Seat Assignments of the Passengers and Flight Crew on Flight 4 Who Had Positive Tuberculin Skin Tests.
Numbers refer to the contacts listed in Table 2. Contact 12 was a member of the flight crew.

Table 3. Seat Locations in Aircraft and Results of Tuberculin Skin Tests of Passengers and Crew Members on Flight 4 Who Had No Risk Factors.*

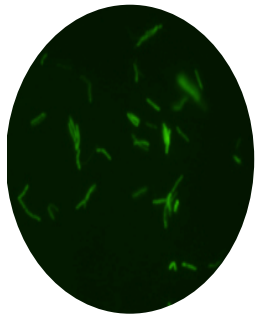
SEAT LOCATION	NO. WITH POSITIVE SKIN TESTS/NO. TESTED (%)	RATE RATIO (95% CI)†	P VALUE
Not same cabin section as index patient	0/136	Reference value	—
Same cabin section as index patient	6/68 (8.8)	Undefined	0.001
Within 2 rows	4/13 (30.8)	8.5 (1.7–41.3)	0.01
Elsewhere in same section	2/55 (3.6)	Reference value	

Transmission of Multidrug Resistant Mycobacterium tuberculosis during a long airplane flight, NEJM 4/11/96

Chest X-ray of Index Patient 8 days after Flight



Sputum Bacteriology – AFB smear positive



one microscopic
field

CAP	ATS	Interpretation	AFB/ml sputum	Infectiousness of patient
negative	negative	negative	<5,000	probably not infectious
1 or 2 per smear	1 or 2 per smear	weakly positive	~5,000	probably infectious
<1 per field	1+	moderately positive	~10,000	probably infectious
1-10 per field	2+	moderately positive	~100,000	probably infectious
	3+	strongly positive	~1,000,000	probably very infectious
>10 per field	4+	strongly positive	>1,000,000	probably very infectious

Illicit Drug Use and TB

- IDU often share risk factors which confer additional risk for exposure

Tuberculosis and Illicit Drug Use: Review and Update;
Deiss R.G.; CID 2009; 48 Jan 1

- During 2023, reported types of substance use among persons 15 years of age or older with TB disease were:
 - Excess alcohol use (7.9%)
 - Noninjecting drug use (7.8%)
 - Injecting drug use (1.1%)
- ‘Shotgunning’ – inhaling and exhaling smoke into another’s mouth – Kansas TB outbreak



A network informed approach to investigating a tuberculosis outbreak: implications for enhancing contact investigations. McElroy RD; Int J Tuberc Lung Dis 2003; 7 S486-93



The Effects of Smoking



- Smoking associated with RR 1.7 for TB Infection and RR 2.3-2.7 for TB disease
- Estimated RR for development. of TB disease in a TB infected population of 1.4-1.6

Risk of Tuberculosis From Exposure to Tobacco Smoke;
Bates M.N.; Arch. Int. Med, Feb 2007

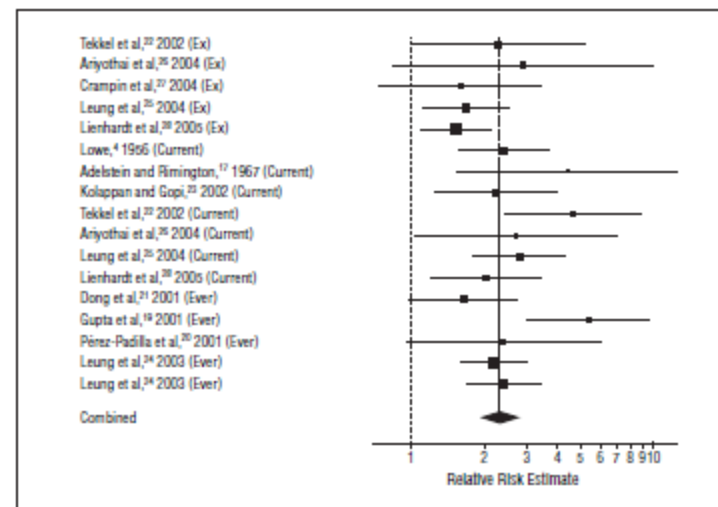


Figure 3. Forest plot of results for men only and for men and women combined in studies^{6,17,19-28} that examined smoking and tuberculosis disease. The smoking type (ex-smokers [Ex], current smokers [Current], and ever smokers [Ever]) of the study population is shown on the y-axis.

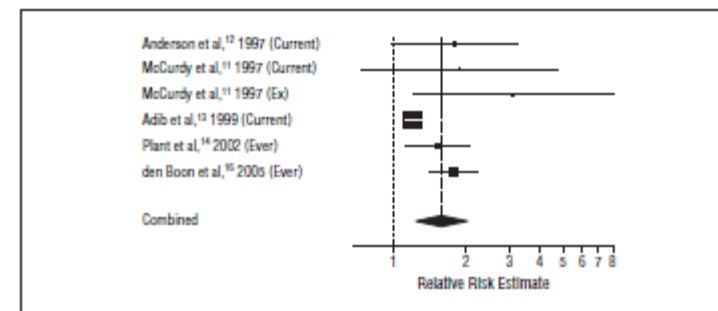
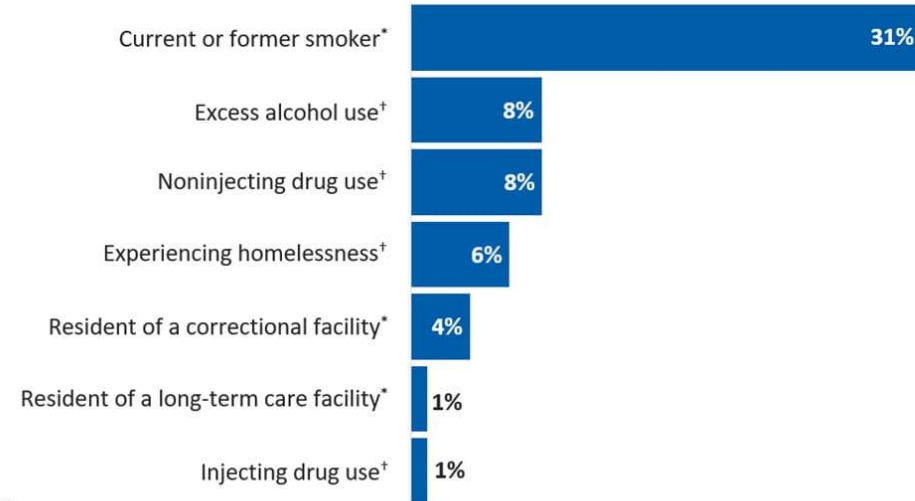


Figure 1. Forest plot of results of 5 studies^{11-14,16} that examined smoking and tuberculosis infection. The smoking type (current smokers [Current], ex-smokers [Ex], and ever smokers [Ever]) of the study population is shown on the y-axis.

Smoking as a Risk Factor in the USA

- Smoking is associated with increased risk of TB disease. In the 2020 RVCT, the definition of "smoking" is consuming tobacco (or nicotine) through:
 - Combustible tobacco products (e.g., cigarettes)
 - Electronic nicotine delivery systems (e.g., vapes, e-cigarettes)
- In 2023, 2,834 (31.2%) persons 15 years of age or older with TB disease reported being a current or former smoker.

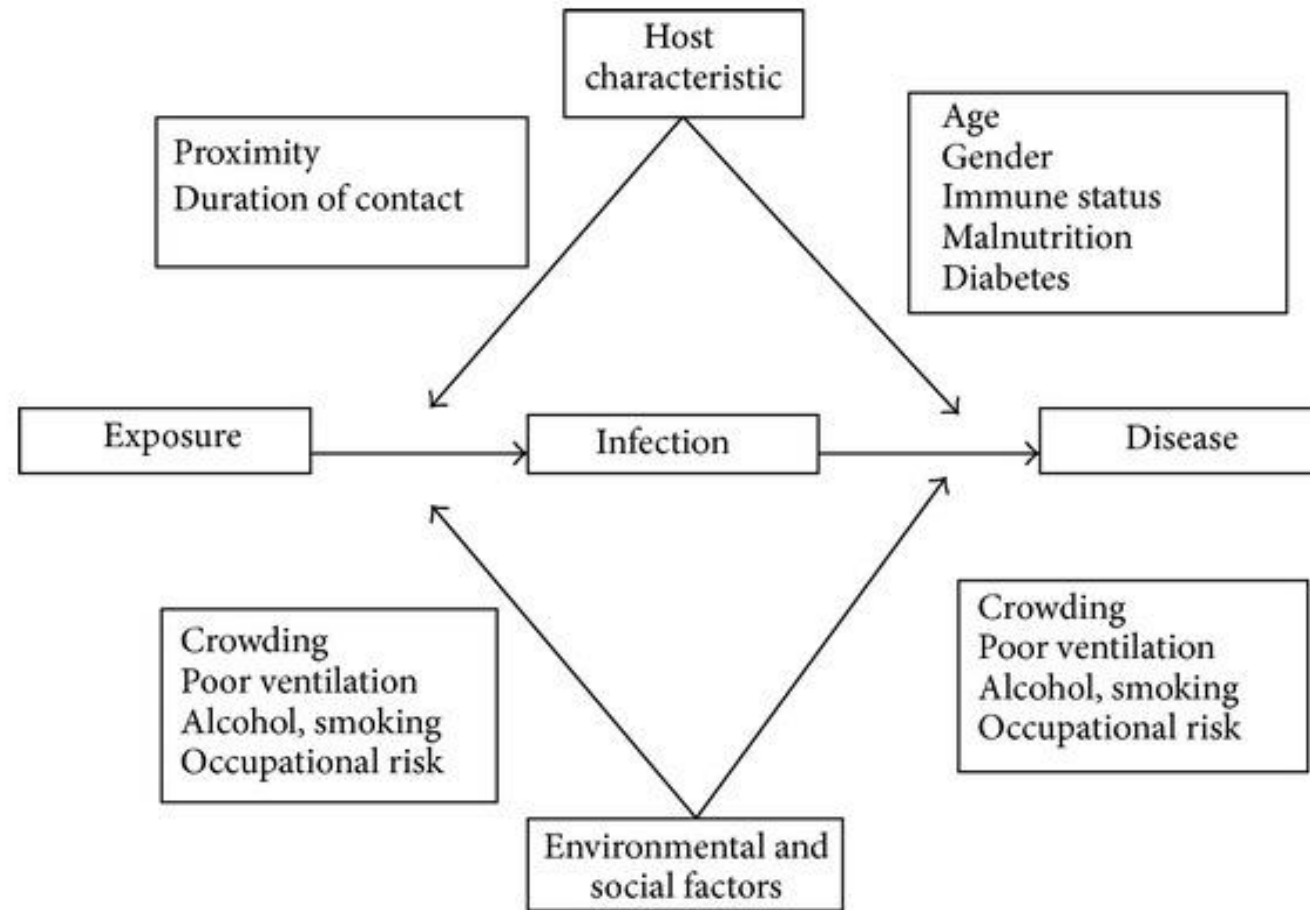
Percentage of Social and Behavioral Risk Factors Among Persons Aged ≥15 Years with TB, United States, 2023



* At the time of TB diagnosis

† Within past 12 months prior to TB diagnosis

Risk Factors for Tuberculosis



Thank you!

