Who is at Risk of TB?

Lisa Armitige, MD, PhD

April 16, 2026

Screening and Treating Tuberculosis Infection • April 16, 2026 • Midland, Texas

Speaker Name, Credentials

Has the following disclosures to make:

- No conflict of interests
- Dr. Armitige is a consultant for Oak Therapeutic, Inc.'s NIH SBIR grant

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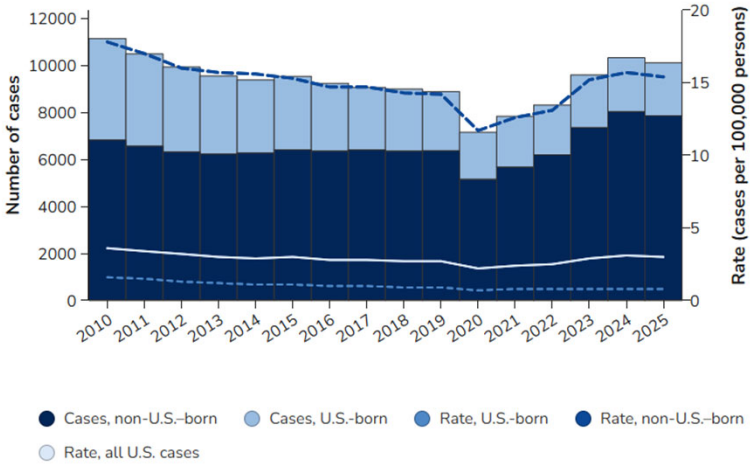
Objectives

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*
3. List risk factors for progression to TB disease if infected with *M. tuberculosis*

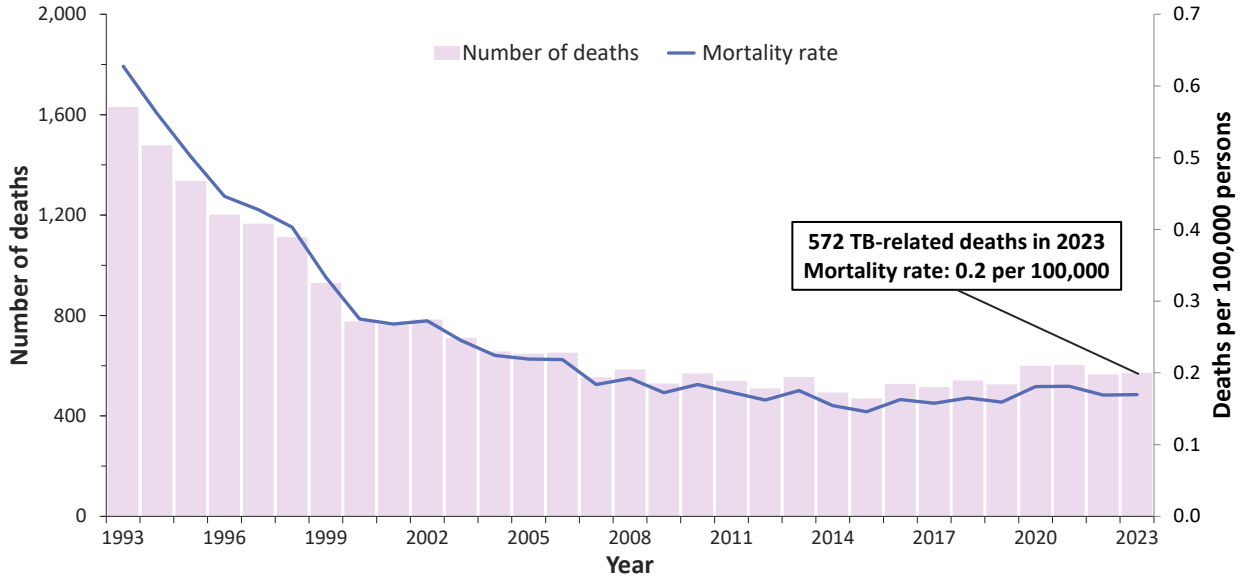
What is the Current Epidemiology of TB in the US?



In 2025, 10,260 TB cases were provisionally reported with a corresponding rate of 3.0 cases per 100,000 population.
This represented a decrease of 1% in cases and 2% in rates from 2024 to 2025.
Twenty-six states and the District of Columbia reported decreases in TB case counts and rates from 2024 to 2025.

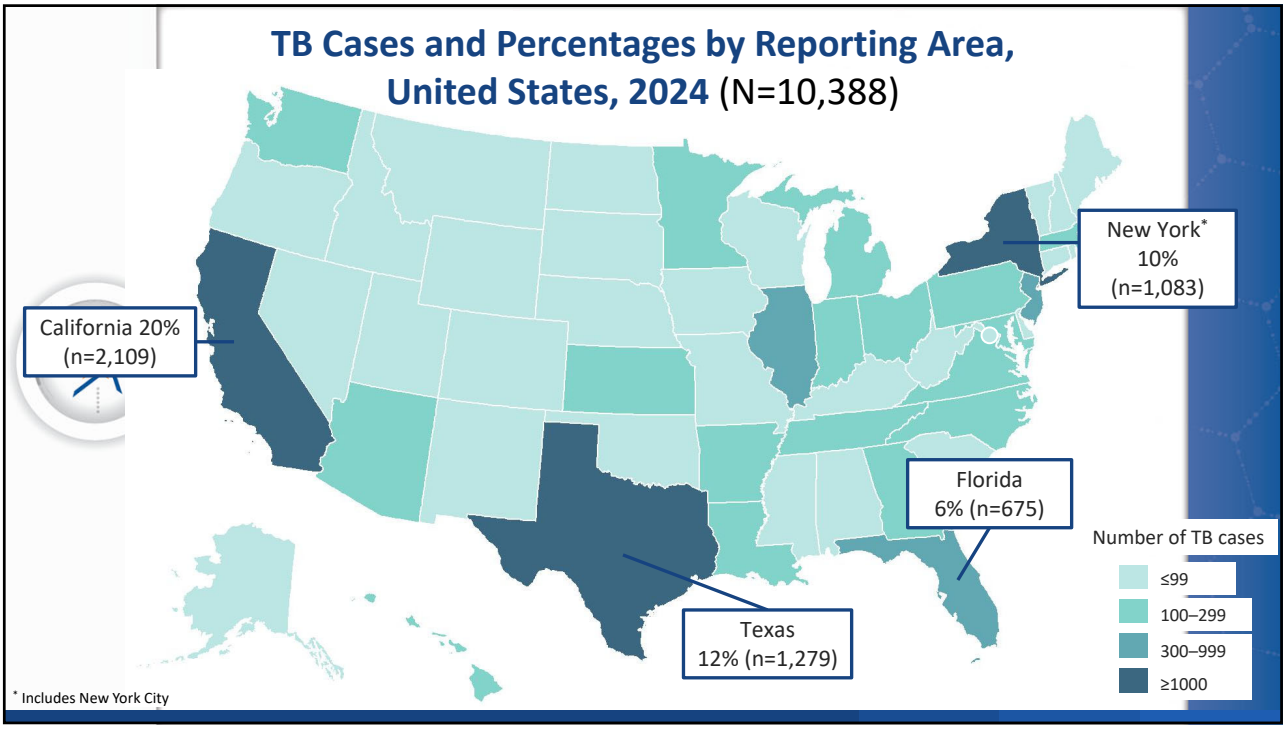
Texas was not one of them!

TB-Related Deaths* and Mortality Rates, United States, 1993–2023



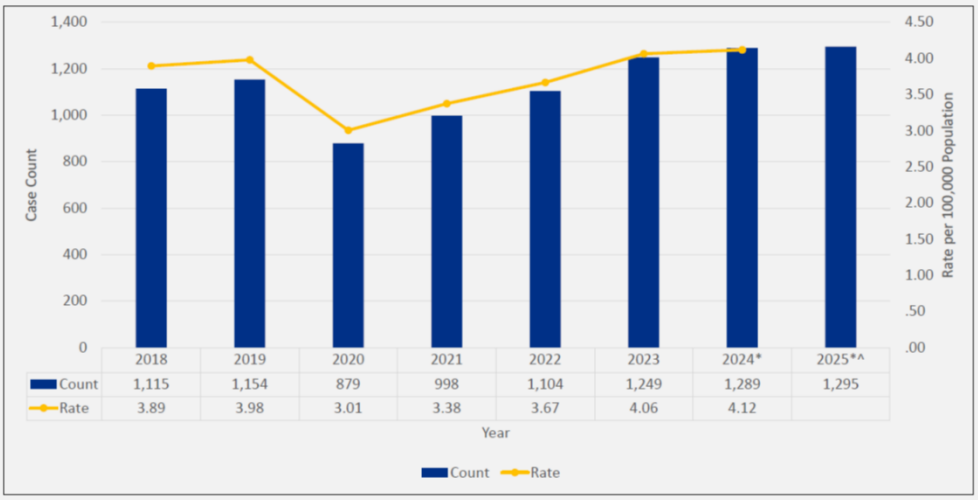
*National Vital Statistics System Underlying Cause of Death (based on deaths reported through 2023)

TB Cases and Percentages by Reporting Area, United States, 2024 (N=10,388)



* Includes New York City

TB Case Counts and TB Case Rates, 2018–2025*



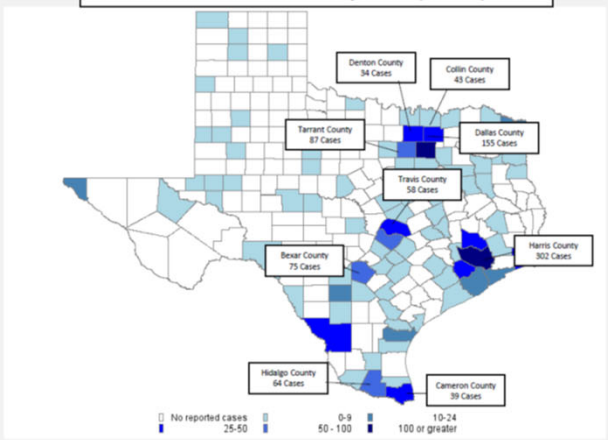
* 2024 and 2025 data are provisional

^Case Rates for 2025 data are not available at this time. Rates are calculated based on mid-year population estimates released by the U.S. Census Bureau, usually released in the second semester of the following calendar year.

Source: DSHS Tuberculosis and Hansens's Disease Section: Tuberculosis Surveillance Database

Counties with the Highest Counts of TB Cases, 2025*

Tuberculosis Case Counts by Count, Texas, 2025



Top 10 Counties With Highest Counts of TB Cases, 2025

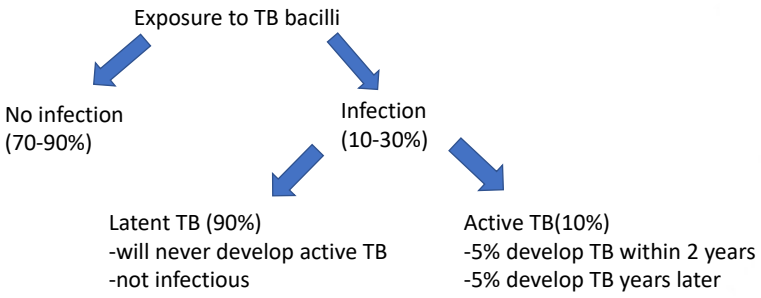
County	Reported Cases	Percent of All Texas Cases
Harris	302	22.0%
Dallas	155	15.1%
Tarrant	87	6.7%
Bexar	75	5.7%
Hidalgo	64	5.2%
Travis	58	4.7%
Walker	50	3.7%
Collin	43	3.3%
Cameron	39	3.3%
Denton	34	2.6%
Total	**912**	**72.3%**

* 2024 and 2025 data are provisional

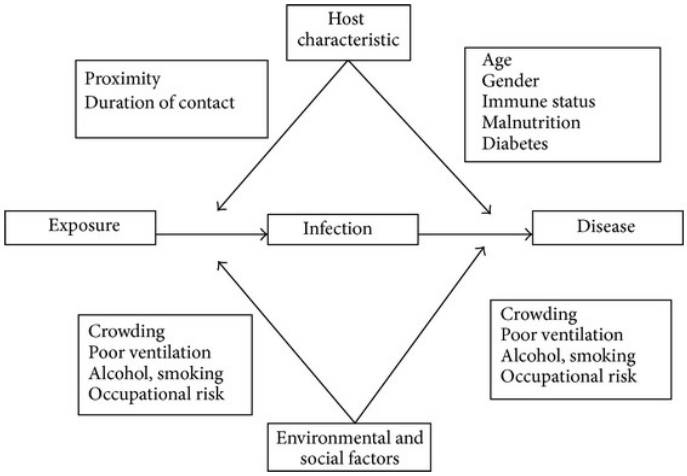
Source: DSHS Tuberculosis and Hansens's Disease Section: Tuberculosis Surveillance Database

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*?

- 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

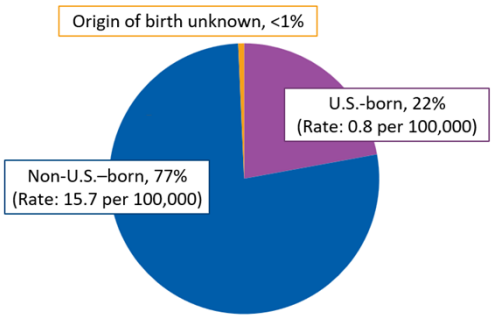
- Globally: In 2024
  - 10.7 million estimated cases of TB disease
  - 133 per 100,000 population

Global Tuberculosis Report WHO Report 2025

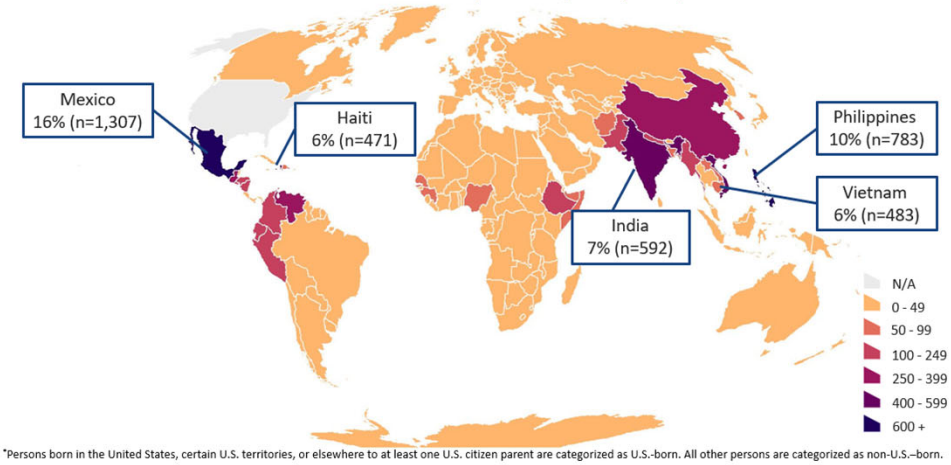
- USA: In 2024
  - 10,388 TB disease cases reported
  - 3.1 cases per 100,000 population

MMWR March 2025

TB Incidence Rates and Percentages by Origin of Birth,* United States, 2024 (N=10,388)



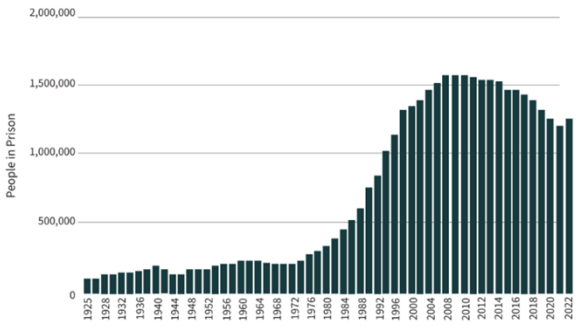
TB Cases by Countries of Birth Among Non-U.S.–Born* Persons, United States, 2024 (N=8,016)



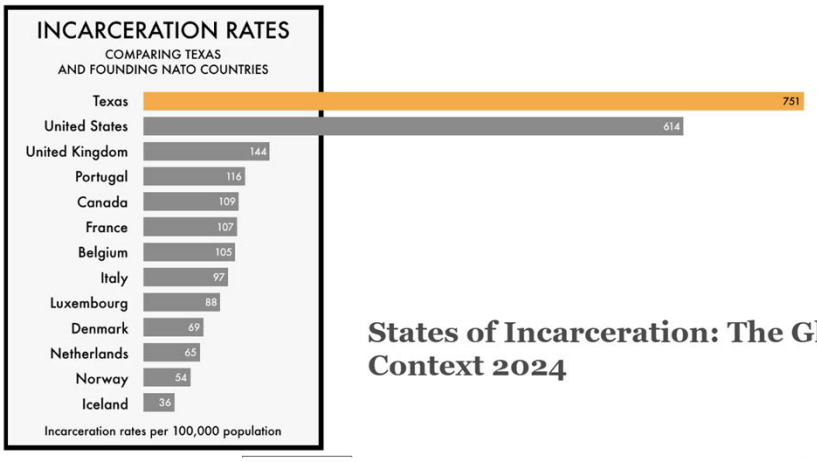
*Persons born in the United States, certain U.S. territories, or elsewhere to at least one U.S. citizen parent are categorized as U.S.-born. All other persons are categorized as non-U.S.–born.

Correctional Facilities and Risk for TB

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



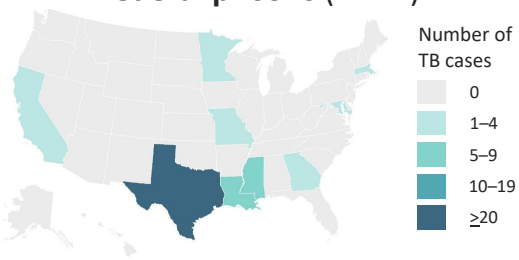
Sources: Cahalan, M. W. (1986). *Historical corrections statistics in the United States, 1850-1984.* Bureau of Justice Statistics; Carson, E. A. (2023). *Prisoners in 2022–Statistical tables.* Bureau of Justice Statistics.



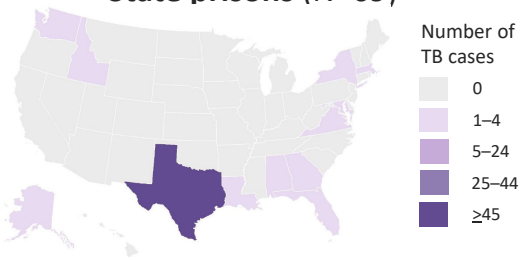
States of Incarceration: The Global Context 2024

TB Cases Among Incarcerated Persons Aged ≥15 Years by Type of Facility, United States, 2024

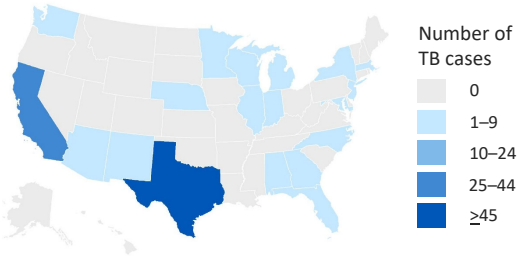
Federal prisons (N=47)



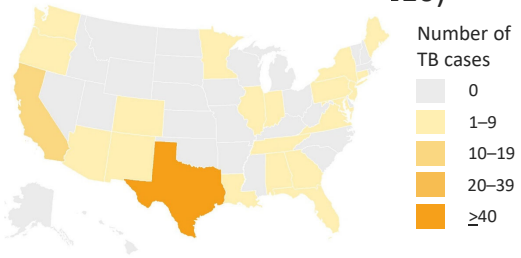
State prisons (N=69)



Local jails (N=110)



Other facilities (N=110)



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 2023, 324 (3.6%) persons 15 years of age or older with TB disease were residents of a correctional facility at the time of TB diagnosis.

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

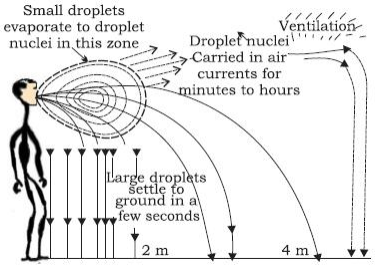
In 2023, among persons 15 years of age or older with TB disease:

695 (8.3%) persons reported ever experiencing homelessness during their lifetime, and

536 (5.9%) persons reported experiencing homelessness within 12 months prior to TB diagnosis.

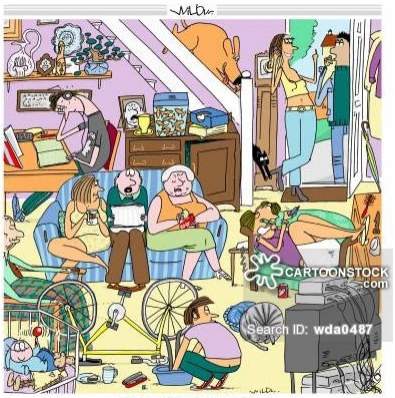
What are environmental factors which increase likelihood of TB transmission?

- Poorly ventilated settings
- Crowding



Crowding and Risk of TB Transmission

- 'Persons per room' is widely used an indicator of crowding
  - Definition is problematic, varies between countries and temporally
- Increases the likelihood of contact between an infectious TB case and a susceptible person and increases intimacy of exposure
  - PPD conversion in children living in houses of TB cases is associated with the number of cubic ft/person in house
    - Chapman JS. Social and other factors in intrafamilial transmission of tuberculosis. Am Rev Respir Dis 1964
  - The number of new TB cases was highly correlated with overcrowding.
    - Stein L. Glasgow tuberculosis and housing. Tubercle 1954:35; 195-203



Shocking, the overcrowding in our prisons.

Poor Ventilation and Risk of TB Transmission

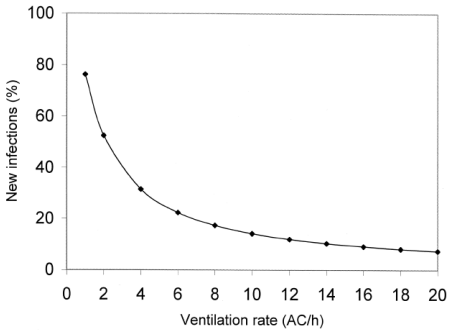
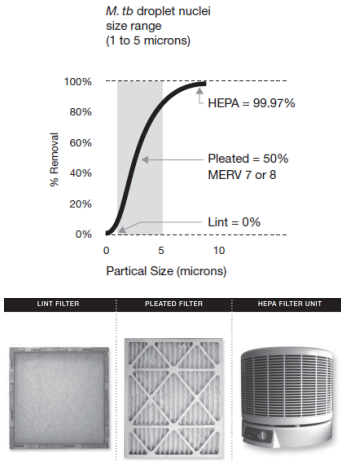


Figure 5 Effect of ventilation rate on new infections for base condition parameters with a total quanta production rate of 12 quanta/h and an exposure time of 16 h.

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

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, 2003

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?

- In low- and middle-income countries annual risk of TB infection in HCWs 3.9% to 14.3% (between 2.6% and 11.3% attributable to occupational exposure).

  Joshi R, Reingold AL, Menzies D, Pai M. Tuberculosis among health-care workers in low- and middle-income countries: a systematic review. PLoS Med 2006;3(12):e494.

- Annual risk of developing TB disease was three times higher (95% CI:2.43–3.51) for HCWs compared to the general population.

  Baussano I, Nunn P, Williams B, Pivetta E, Bugiani M, Scano F. Tuberculosis among health care workers. Emerg Infect Dis 2011;17(3):488–94.

Four occupational drug-resistant TB survivors unite behind ZERO TB and ZERO STIGMA on South African National Women's Day.

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

- 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

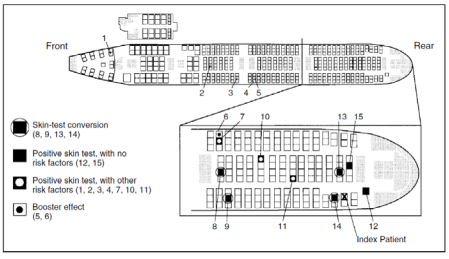


Figure 2. Diagram of the Boeing 747-100, with Seat Assignments of the Passengers and Flight Crew on Flight 4 Who Had Positive Tuberculin Skin Tests.
Numbers refer to the contacts listed in Table 2. Contact 12 was a member of the flight crew.

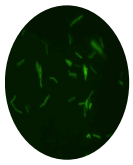
Table 3. Seat Locations in Aircraft and Results of Tuberculin Skin Tests of Passengers and Crew Members on Flight 4 Who Had No Risk Factors.*

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
	2+	moderately positive	~100,000	probably infectious
1-10 per field	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

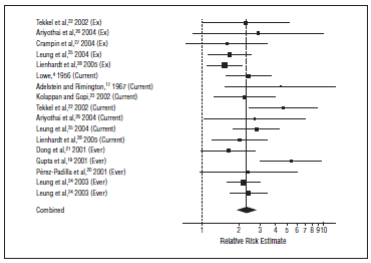


Figure 3. Forest plot of results for men only and for men and women combined in studies that examined smoking and tuberculosis disease. The smoking type (ex-smokers [Ex], current smokers [Current], and ever smokers [Ever]) of the study population is shown on the y-axis.

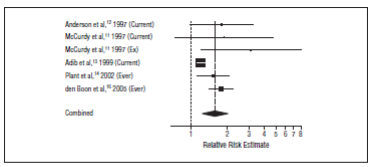
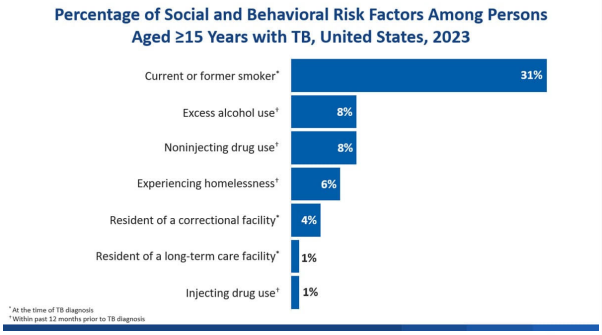


Figure 1. Forest plot of results of 5 studies that examined smoking and tuberculosis infection. The smoking type (current smokers [Current], ex-smokers [Ex], and ever smokers [Ever]) of the study population is shown on the y-axis.

Smoking

- 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.



Who is likely to progress to TB disease after infection with *M. tuberculosis?*

Risk Factors for Progression to TB disease after infection with *M.tuberculosis*

- Infants and children aged ≤5 years

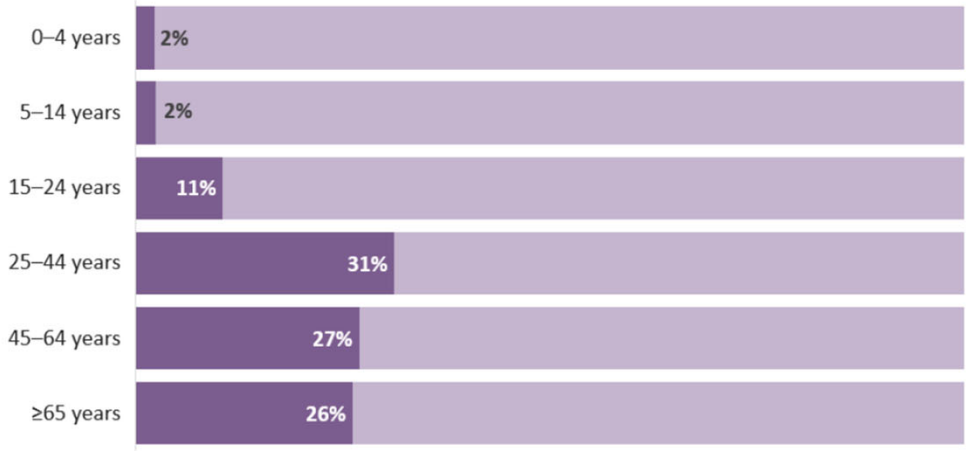
Percent Risk of Disease by Age

Age at Infection	Risk of Active TB
Birth – 1 year*	43%
1 – 5 years*	24%
6 – 10 years*	2%
11 – 15 years*	16%
Healthy Adults	5-10% lifetime risk
HIV Infected Adults+	30-50% lifetime

*Miller, Tuberculosis in Children Little Brown, Boston, 1963

+WHO, 2004

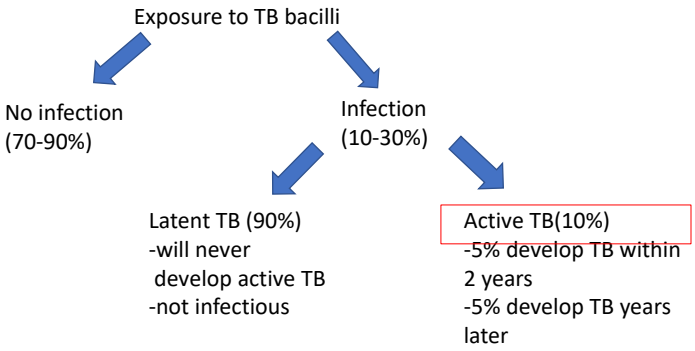
Percentage of TB Cases by Age Group, United States, 2023 (N=9,633*)



Risk Factors for Progression to TB disease after infection with *M.tuberculosis*

- Infants and children aged ≤5 years
- Infected with *M. tuberculosis* within the prior 2 years

Pathogenesis of Tuberculosis



Risk Factors for Progression to TB disease after infection with *M.tuberculosis*

- Infants and children aged ≤ 5 years
- Infected with *M.tuberculosis* within the prior 2 years
- HIV infection and other medical risk factors

Table 2. Common Risk Factors for Increased Likelihood of Progression from Latent Tuberculosis Infection to Active Disease.*

Risk Factor and Study	Relative Risk (95% CI)
	%
Advanced, untreated HIV infection	
Moss et al.[10]	9.9 (8.7–11)
Pablos-Méndez et al.[16]	9.5 (3.6–25)
Close contact with a person with infectious tuberculosis†	
Ferebee[17]	6.1 (5.5–6.8)
Radiographic evidence of old, healed tuberculosis that was not treated	
Ferebee[17]	5.2 (3.4–8.0)
Treatment with ≥15 mg of prednisone per day‡	
Jick et al.[18]	2.8 (1.7–4.6)
Chronic renal failure	
Pablos-Méndez et al.[16]	2.4 (2.1–2.8)
Treatment with TNF-α inhibitor	
Askling et al.[19]	2.0 (1.1–3.5)
Poorly controlled diabetes	
Pablos-Méndez et al.[16]	1.7 (1.5–2.2)
Weight ≥10% below normal	
Palmer et al.[20]	1.6 (1.1–2.2)
Smoking	
Bates et al.[21]	1.5 (1.1–2.2)

* Relative risk was calculated as described in Horsburgh.[5] CI denotes confidence interval, HIV human immunodeficiency virus, and TNF tumor necrosis factor.
† Relative risk was calculated for the first 3 years after exposure.
‡ The drug was taken for 2 weeks or more.

Latent Tuberculosis Infection in the United States, Horsburgh R., NEJM, 4/14/2011

Effect of HIV on Progression from Latent to TB Disease

Tuberculosis in the Homeless; A Prospective Study
Moss, A.; J Respir Crit Care Med Vol 162. pp 460–464, 2000

INCIDENCE OF REPORTABLE TUBERCULOSIS IN THE SAN FRANCISCO GENERAL HOSPITAL HOMELESS COHORT BY HIV AND TUBERCULIN SKIN TEST (TST) STATUS AT BASELINE

	n	Person-years	Cases	Rate per Person-Year	95% Confidence Interval
TST+, HIV+	40	134	6	4.46	(1.76–9.10)
TST+, HIV−	695	2,524	12	0.48	(0.25–0.80)
TST−, HIV+	155	559	3	0.56	(0.14–1.46)
TST−, HIV−	1,382	4,422	3	0.07	(0.02–0.18)
TST unknown, HIV+	49	185	1	0.54	(0.02–2.14)
TST unknown, HIV−	443	1,418	0	0	(0.0–0.21)
Total	2,764	9,221	25	0.27	(0.18–0.39)

HIV infected had about a 10 times higher risk of reactivation than those HIV uninfected

Effect of HIV on Latent TB Reactivation

*HIV infected with 25 times the rate of reactivation of latent TB compared to HIV uninfected

Table 5. Estimated Rate of Reactivation Tuberculosis Among HIV-infected and HIV-uninfected Tuberculosis Patients Aged 15–64 Years Not Residing in California, United States, 2006–2008

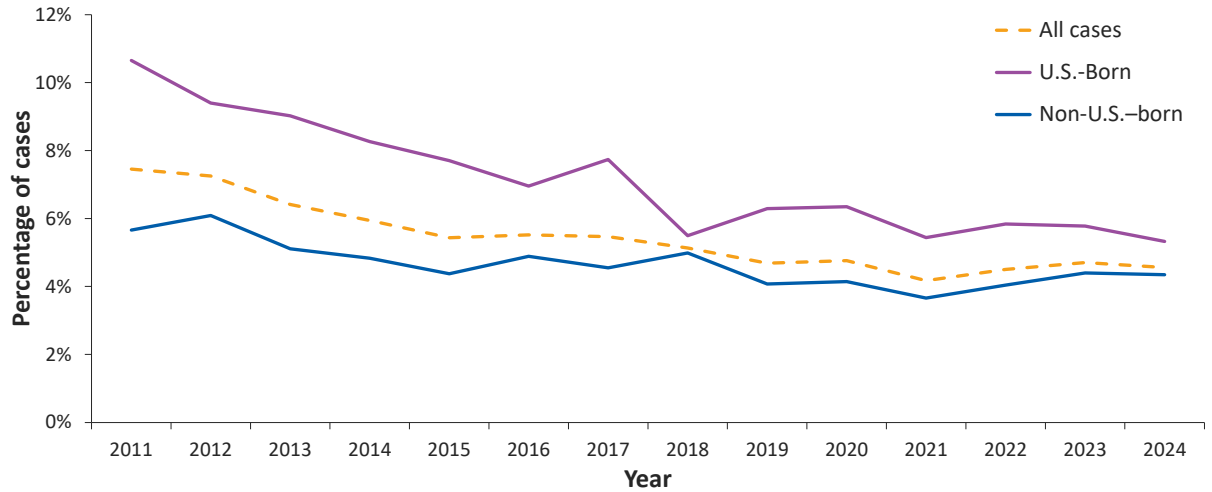
	Estimated No. of Reactivation TB Cases	Estimated % of US Population With Latent TB Infection	Estimated US Population	Estimated No. of PY at Risk for Reactivation TB	Estimated Rate of Reactivation TB per 100 PY	95% Confidence Interval
HIV-infected	2,198	4.2	961,000	121,100	1.82	1.74, 1.89
HIV-uninfected	16,568	4.2	182,243,000	22,850,000	0.073	0.070, 0.075

Abbreviations: HIV, human immunodeficiency virus; PY, person-years; TB, tuberculosis.

Estimated rate of reactivation of latent tuberculosis infection in the United States, overall and by population subgroup; Shea KM, Am J Epidemiol. 2014 Jan 15; 179(2):216-25

5.3% of TB patients with known HIV status in 2018 were coinfected with HIV, including 8.6% among persons aged 25–44 years. MMWR 2019

Percentage of HIV Coinfection* by Origin of Birth† Among Persons with TB, United States, 2011–2024



* Persons alive at diagnosis with HIV test results
† Persons born in the United States, certain U.S. territories, or elsewhere to at least one U.S. citizen parent are categorized as U.S.-born. All other persons are categorized as non-U.S.–born.

Pathogenesis of Tuberculosis

Exposure to TB bacilli

No infection (70-90%)

Infection (10-30%)

Latent TB (90%)
-will never develop active TB
-not infectious

Active TB(10%)
-5% develop TB within 2 years
-5% develop TB years later

HIV infected – 10% reactivation **per year** of latent TB

Diabetes and TB

Richard Morton (1637-98) and his Phthisiologia

Tuberculosis and diabetes mellitus: convergence of two epidemics; Dooley K; *Lancet Infect Dis*. 2009 December; 9(12): 737–746.

- A link between diabetes and TB has been recognized for centuries
- Diabetics have increased risk of progression to disease, failure of therapy, relapse and mortality from TB

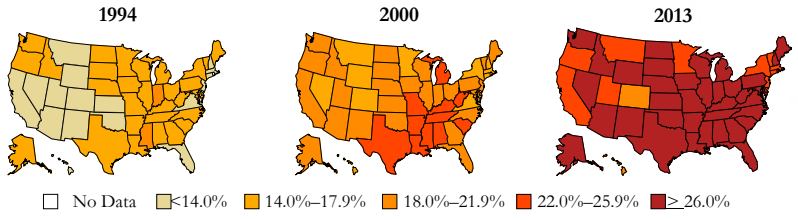
TABLE 3—Adjusted[a] Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for Tuberculosis among Patients Discharged from Civilian Hospitals in California during 1991, by Race/Ethnicity

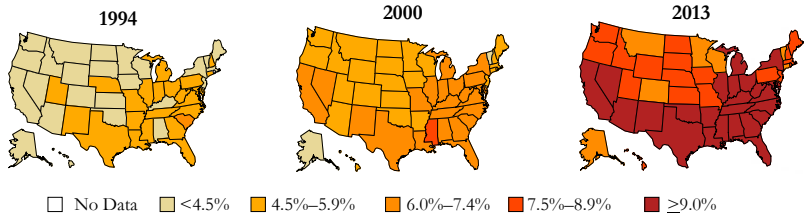
Variable	Whites		Hispanics		Blacks	
	Adjusted OR	95% CI	Adjusted OR	95% CI	Adjusted OR	95% CI
Sex (male vs female)	1.51	1.42, 1.61	1.02	0.96, 1.10	1.87	1.68, 2.08
Age, y						
<25 (reference)						
25–54	4.98	4.35, 5.70	2.87	2.66, 3.10	5.92	5.02, 6.98
>54	12.71	11.02, 14.65	9.98	8.93, 11.15	4.90	4.00, 6.01
Foreign born[b]	1.18	1.15, 1.21	1.14	1.11, 1.19	0.94	0.90, 0.99
Poor education[b]	1.40	1.31, 1.50	0.96	0.88, 1.05	2.33	2.02, 2.68
Median income[c]	0.99	0.98, 0.99	1.00	0.99, 1.01	0.97	0.95, 0.99
Health insurance						
Other (reference)[d]						
Medicare	2.22	2.04, 2.42	1.78	1.54, 2.06	2.58	2.17, 3.07
Medicaid	5.87	5.33, 6.46	3.71	3.39, 4.05	5.21	4.50, 6.02
None	2.10	1.88, 2.36	2.51	2.29, 2.76	5.39	4.61, 6.29
Diabetes mellitus	1.31	1.19, 1.45	2.95	2.61, 3.33	0.93	0.78, 1.09
Type II, uncomplicated	0.99	0.87, 1.15	1.67	1.39, 2.01	0.63	0.49, 0.82
Type I, uncomplicated	1.49	1.17, 1.88	2.22	1.66, 3.00	0.80	0.56, 1.13
Poor control/complicated	1.93	1.64, 2.28	5.73	4.78, 6.87	1.52	1.18, 1.95
HIV-related conditions	54.26	47.66, 61.77	237.81	160.81, 351.56	79.37	52.64, 119.67
Chronic renal insufficiency	4.11	3.30, 5.11	10.92	7.50, 15.89	2.23	1.61, 3.09
Alcohol-related conditions	10.19	8.87, 11.70	24.49	18.95, 31.64	9.29	6.92, 12.47
Drug use	4.63	3.26, 6.58	9.51	6.36, 14.20	9.26	6.26, 13.70

[a]Race stratified models containing all the variables listed in the table. The odds ratios for all variables, except drug use, were statistically different across race/ethnicity ($P < .01$ for each two-way interaction term).
[b]Risk associated with a 10% increase in the prevalence of foreign-born people or the proportion not completing high school in the zip code area where patients resided.
[c]Risk associated with a $1000 decrease in the mean income per capita in the zip code area where patients resided.
[d]Health insurance other than Medicare or Medicaid.

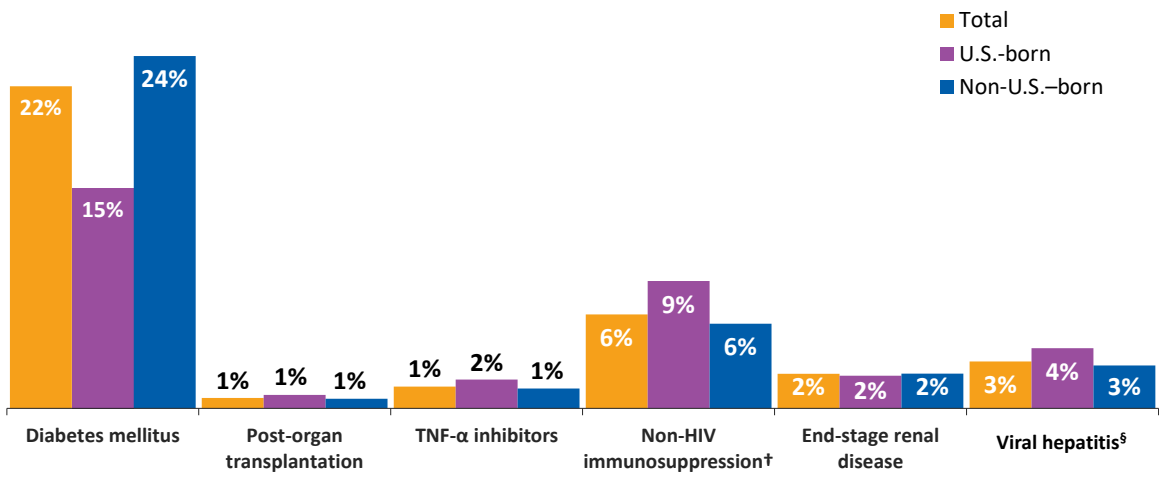
The role of diabetes mellitus in the higher prevalence of tuberculosis among Hispanics; Pablos M.A.; Am J Public Health 1997; 87:574-9

Age-adjusted Prevalence of Obesity and Diabetes



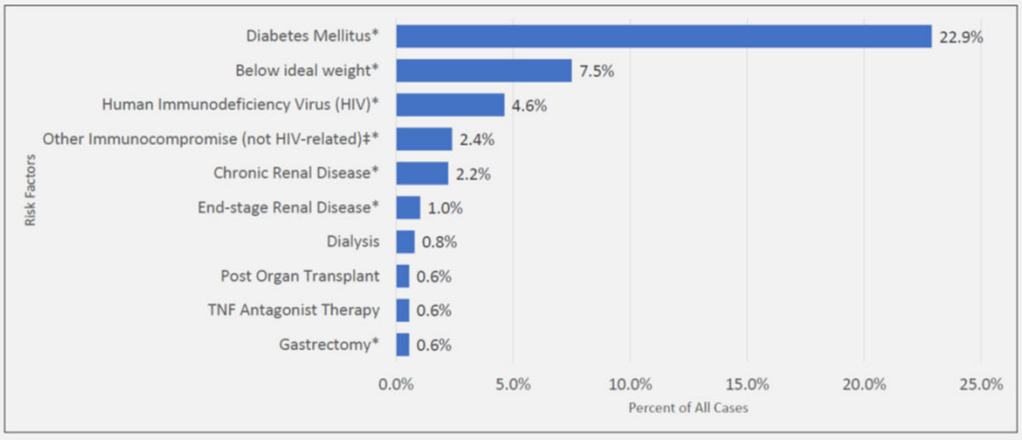


Percentage of Selected Medical Risk Factors Among Persons with TB by Origin of Birth,* United States, 2024



* Persons born in the United States, certain U.S. territories, or elsewhere to at least one U.S. citizen parent are categorized as U.S.-born. All other persons are categorized as non-U.S.–born.
† Excludes HIV and other conditions elsewhere represented in this figure.
§ Diagnosed with hepatitis B or C (acute or chronic).

Medical Conditions, 2025^



*At the time of TB diagnosis
‡Includes persons immunocompromised because of either a medical condition or immunosuppressive therapy, persons on TNF-α antagonist therapy, and persons who have ever received a solid organ transplant
^2024 and 2025 data are provisional
Source: DSHS Tuberculosis and Hansens's Disease Section: Tuberculosis Surveillance Database

Chronic Kidney Disease and TB

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The role of diabetes mellitus in the higher prevalence of tuberculosis among Hispanics; Pablos M.A.; Am J Public Health 1997; 87:574-9

Malnutrition and Progression from Latent to Active TB

- Ecologic Study
  - Prisoners of War
    - British soldiers given food supplements – TB incidence 1.2%
    - Russian soliders not given food supplements – TB incidence 15-19%
      - Leyton G B. Effects of slow starvation. Lancet 1946; 2: 253–255

Steroids and TB

- CDC guidelines – Prednisone 15mg/day (or its equivalent) administered for 1 month is a risk factor for tuberculosis, primarily because this dosage has been shown to suppress tuberculin reactivity.
- However, specific thresholds of dose and duration that could increase the risk for tuberculosis were unknown

Table 4. Relationship between glucocorticoid dose and risk of tuberculosis*

Exposure†	Cases (n = 497)	Controls (n = 1,966)	Crude OR (95% CI)	Adjusted OR‡ (95% CI)
Highest daily dose				
Nonexposed§	395	1,798	1.0	1.0
<7.5 mg	7	7	4.8 (1.6–13.8)	2.3 (0.7–7.5)
≥7.5 mg	20	10	9.7 (4.4–21.6)	7.0 (2.9–16.8)
Unknown dose	24	21	3.6 (0.9–13.4)	3.4 (0.7–14.6)
Recent or past use	51	130	1.9 (1.3–2.7)	1.5 (1.0–2.2)
Most recent daily dose				
Nonexposed§	395	1,798	1.0	1.0
<7.5 mg	8	7	5.5 (1.9–16.1)	3.1 (0.9–10.3)
≥7.5 mg	19	10	9.1 (4.1–20.1)	6.0 (2.5–14.5)
Unknown dose	42	21	3.0 (0.8–10.7)	3.0 (0.7–12.3)
Recent or past use	51	130	1.9 (1.3–2.7)	1.5 (1.0–2.2)
Cumulative dose				
Nonexposed§	395	1,798	1.0	1.0
<1,000 mg	17	12	6.5 (3.0–13.9)	4.1 (1.8–9.3)
1,000–2,999 mg	8	5	9.4 (2.7–32.0)	8.3 (2.1–33.5)
≥3,000 mg	14	12	5.9 (2.6–13.2)	3.9 (1.5–9.7)
Recent or past use	51	130	1.9 (1.3–2.7)	1.5 (1.0–2.3)

* Values are the number unless otherwise indicated. OR = odds ratio; 95% CI = 95% confidence interval.
† Represents the dose equivalent of prednisone (see text for details).
‡ Adjusted for body mass index, smoking, diabetes, pulmonary diseases, and use of antirheumatic or immunosuppressive agents.
§ Referent.

Glucocorticoid Use, Other Associated Factors, and the Risk of Tuberculosis; Jick S; Arthritis & Rheumatism, Vol. 55, No. 1, February 15, 2006, pp 19–26

TNF alpha Antagonists

- TNF alpha activity is required for granuloma formation and control of MTB infection
- Used for rheumatoid arthritis, Crohn's disease, psoriasis and a variety of other immune mediated diseases

- Remicaid (inflixamab)
- Embril (entanercept)
- Humira (adalimubab)
- Cimzia (certolizumab)

Warning: Risk Of Infections Infliximab

- Tuberculosis (frequently disseminated or extrapulmonary at clinical presentation), …and other opportunistic infections have been observed in patients receiving Remicade some of these infections have been fatal.
- Patients should be evaluated for LTBI with a TST.
- Treatment of LTBI should be initiated prior to therapy with Remicade.
- SEE WARNINGS

PDR 2004

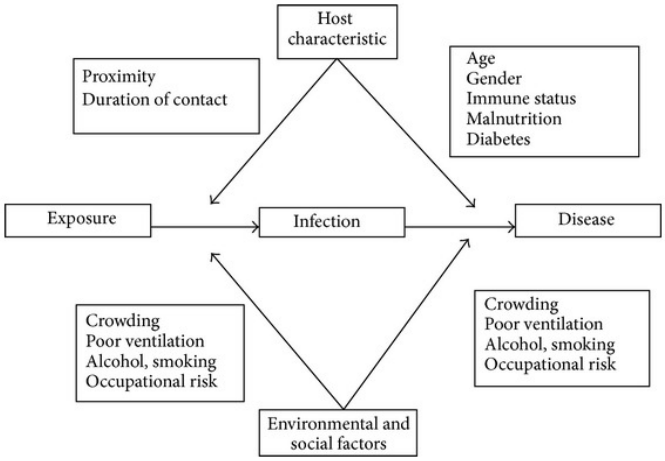
TABLE 1 Risk factors for the development of active TB among persons infected with *Mycobacterium tuberculosis* (28)[a]

Risk factor	Estimated risk for TB relative to persons with no known risk factor
High risk (testing and treatment for LTBI recommended for all ages)	
AIDS (not on anti-HIV therapy)	110–170
HIV (not on anti-HIV therapy)	50–110
Transplantation (related to immunosuppressive therapy)	20–74
Silicosis	30
Chronic renal failure requiring hemodialysis	10–25
Carcinoma of head and neck	16
Recent TB infection (<2 yrs)	15
Abnormal chest X ray—with upper lobe fibronodular disease typical of healed TB infection	6–19
TNF-α inhibitors	2–9
Moderate risk (testing and treatment for LTBI recommended if age < 65 yrs)	
Treatment with glucocorticoids	5
Diabetes mellitus (all types)	2–4
Young age when infected (0–4 yrs)	2–5
Slightly increased risk (testing and treatment for LTBI recommended if age < 50 yrs)	
Underweight (<90% ideal body weight; for most persons, this is a BMI of 20)	2–3
Cigarette smoker (1 pack/day)	2–3
Abnormal chest X ray—granuloma	2
Low risk (testing and treatment for LTBI recommended if age < 35 yrs)	
Infected person, no known risk factor, normal chest X ray ("low-risk reactor")	1
Very low risk (treatment of LTBI not usually recommended)	
Person with positive two-step ("boosting"), no other known risk factor, and normal chest X ray	0.5

[a]Modified from the work of Lobue and Menzies (140) and the CDC.

Haley, CA, Treatment of LTBI, Microbiol. Spect. 2017, April 5(2).

Risk Factors for Tuberculosis



Thank you to Dr. Annie Kizilbash for use of her slides!