Gaps in tuberculosis infection testing practices: a 15-year serial cross-sectional study

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BACKGROUND

TB in the US is concentrated among persons born in TB-endemic countries

- Over the past two decades, the fraction of all new tuberculosis (TB) cases that are among people born in TB-endemic countries has been increasing
- Today, 82% of all new TB cases in California are among people born in TB-endemic countries
- Testing and treating this population for TB infection (TBI) can accelerate progress towards TB elimination in the US

Potential gaps between evidence and TB infection testing practices

- While all guidelines agree that people born in TB-endemic countries should be tested for TBI, current guidelines are vast, broad, sometimes inconsistent, and recommend TBI testing for many other indications
- This may generate potential gaps between evidence and TBI testing practices

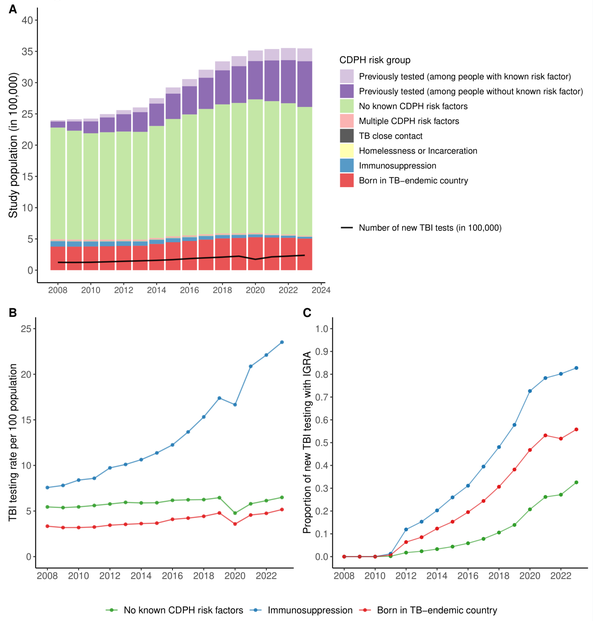
Focal research questions

- Has TBI testing become a part of routine health care for people with elevated risk for TB disease?
- Are populations with the highest risk for TB disease tested at higher rates?

METHODS

- **Serial cross-sectional study design, including all Kaiser Permanente Northern California (KPNC) members aged >18 years with at least 6 months of continuous enrollment**
- Study period: January 2008 to December 2023
- The primary outcome was TBI testing with either a tuberculin skin test (TST) or an interferon gamma release assay (IGRA).
- Multivariable modified Poisson regression was used to assess factors associated with TBI testing including TB risk factors specified by California-specific screening guidelines

Temporal trends in (A) study population composition, (B) testing rate per 100 population, and (C) IGRA uptake by TB risk group, 2008-2023



We identified a *gap between evidence and practice*: Despite that 82% of all new TB cases in California are among persons born in TB-endemic countries, (1) 16% of all testing were in this population, and (2) they were 25% less likely to receive a TB infection test compared to US-born persons.

Descriptive statistics by tuberculosis infection (TBI) test status and multivariable analysis for TBI testing prevalence

	All members	Ever tested (n [%])	Never tested (n [%])	Row % for ever tested	aPR (95% CI)
Total	6,572,233	1,405,896	5,166,337		
CDPH risk 1: Country of birth					
TB-endemic country	1,042,463 (16%)	210,559 (15%)	831,904 (16%)	20.20%	0.747 (0.744 - 0.751)
US or low TB incidence country	2,281,171 (35%)	658,313 (47%)	1,622,858 (31%)	28.90%	REF
Unknown	3,248,599 (49%)	537,024 (38%)	2,711,575 (52%)	16.50%	0.777 (0.774 - 0.779)
CDPH risk 2: Immunosuppression					
HIV infection	19,634 (0.3%)	13,034 (0.9%)	6,600 (0.1%)	66.40%	3.580 (3.534 - 3.626)
Solid organ transplantation	12,423 (0.2%)	6,140 (0.4%)	6,283 (0.1%)	49.40%	1.148 (1.125 - 1.172)
Receipt of TNF-alpha inhibitors	11,564 (0.2%)	10,885 (0.8%)	679 (<0.1%)	94.10%	2.030 (2.001 - 2.060)
High dose corticosteroids	105,214 (1.6%)	40,132 (2.9%)	65,082 (1.3%)	38.10%	1.300 (1.289 - 1.312)
Other immunosuppressant medications	71,643 (1.1%)	42,800 (3.0%)	28,843 (0.6%)	59.70%	2.017 (1.999 - 2.035)
Total immunosuppressed	175,795 (2.7%)	85,018 (6.0%)	90,777 (1.8%)	48.40%	
CDPH risk 3: TB close contact					
TB contact	11,235 (0.2%)	8,867 (0.6%)	2,368 (<0.1%)	78.90%	2.672 (2.634 - 2.711)
CDPH risk 4: Homeless/Incarceration					
Homelessness	19,180 (0.3%)	6,019 (0.4%)	13,161 (0.3%)	31.40%	1.296 (1.269 - 1.324)
Incarceration	1,645 (<0.1%)	474 (<0.1%)	1,171 (<0.1%)	28.80%	1.113 (1.032 - 1.200)
Any CDPH risk factor					
No known CDPH risk factor	5,361,205 (82%)	1,115,391 (79%)	4,245,814 (82%)	20.80%	
One or more CDPH risk factors	1,211,028 (18%)	290,505 (21%)	920,523 (18%)	24.00%	

Caption: % is column percentage in all columns except for row % columns. Adjusted prevalence ratios (aPR) were from a multivariable modified Poisson regression with all variables in table, fixed effect terms for year in study, and demographics (age, sex, race and ethnicity). TB = Tuberculosis; 95% CI = 95% Confidence Interval; CDPH = California Department of Public Health; aPR= adjusted prevalence ratio.

RESULTS

TB infection practices from 2008 to 2023

- Among 6,572,839 adults, 1,405,768 (21.4%) were tested for TBI; 79% of all testing during the study period was among people without any TB risk factors.
- The overall TBI testing rate per 100 population did not increase substantially over time (5.2 in 2008 to 6.7 in 2023)

Factors associated with TB infection testing

- Almost all California Department of Public Health (CDPH) risk groups had greater prevalence of testing including people living with HIV (aPR 3.58 [3.53-3.63]), TB contacts (2.67 [2.63-2.71]), homelessness (1.30 [1.27-1.32]), and incarceration (1.11 [1.03-1.20])
- However, people born in TB-endemic countries had 25.2% (24.8-25.5%) lower prevalence of TBI testing compared to US-born persons

Interferon-gamma release assay (IGRA) uptake

- Among the 1,405,768 individuals tested for TBI during the study period, 373,659 (26.6%) received an IGRA
- People born in TB-endemic countries had 63.1% (61.9-64.4%) higher prevalence of IGRA administration compared to US-born persons

CONCLUSIONS

- **The TBI testing rate for persons born in the US without any TB risk factors routinely outpaced the rate for persons born in TB-endemic countries**
- Opportunities for improvement: Harmonization of testing guidelines may help make clear which populations should be targeted for testing, reduce gaps in evidence and testing practices, improve collection of TB risk factor data, and place a renewed focus on people born in TB-endemic countries