Tuberculosis Epidemiology

Curry International Tuberculosis Center
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Outline

TB epidemiology

• Global burden

• United States ➔ California
  • Summary of surveillance data
  • Demographic characteristics
  • Clinical characteristics

• Summary
## Estimated Global TB Burden, 2017

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incident TB cases</strong></td>
<td>10 million (133 per 100,000)</td>
<td>Persons with HIV: 920,000 (9%)</td>
</tr>
<tr>
<td><strong>Deaths</strong></td>
<td>1.6 million</td>
<td>Persons with HIV: 300,000 (19%)</td>
</tr>
<tr>
<td><strong>MDR-TB</strong></td>
<td>460,000</td>
<td></td>
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</tbody>
</table>

8 countries accounted for two-thirds of new cases:
- India (27%), China (9%), Indonesia (8%), the Philippines (6%), Pakistan (5%), Nigeria (4%), Bangladesh (4%) and South Africa (3%)

WHO, Global Tuberculosis Report 2018
TB Epidemiology
United States

Reported Tuberculosis Cases:
United States, 1982–2017

Division of Tuberculosis Elimination, CDC
Reported Tuberculosis Cases: United States, 1993–2017

TB Case Rates*: United States, 2017

*Cases per 100,000
DC, District of Columbia; NYC, New York City (excluded from New York State)

≤2.8 (2017 national average) vs. >2.8
Which populations in the U.S. developed TB?

Reported TB Cases by Age Group:
United States, 2017
TB Case Rates by Age Group and Sex:
United States, 2017

Reported TB Cases by Race/Ethnicity*:
United States, 2017

* 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.

Countries of Birth of Non-U.S.-born Persons Reported with TB: United States, 2017
Percentage of Non-U.S.–Born Persons with TB, by Time of Residence in U.S. Before Diagnosis:
United States, 2017

What is the prevalence of TB drug resistance in the U.S.?
Primary Anti-TB Drug Resistance:
United States, 1993 – 2016

Note: Based on initial isolates from persons with no prior history of TB; multidrug-resistant TB (MDR-TB) is defined as resistance to at least isoniazid and rifampin.

Primary MDR TB:
United States, 1993 – 2017

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TB Epidemiology California
Number of Tuberculosis Cases: California, 1930-2018

Number of Tuberculosis Cases and Case Rates: California, 2009-2018

*National Case Rate (2.8 per 100,000)
Tuberculosis in California, 2018

CA Epidemiology Reflects Global Epidemiology
Tuberculosis Cases by Country of Origin:
California, 2018*

- U.S.-born: 17%
- Born Outside the U.S.: 83%
- Mexico: 450 (26.9%)
- Philippines: 355 (21.3%)
- Vietnam: 205 (12.3%)
- China: 160 (9.6%)
- India: 96 (5.7%)
- All Others: 404 (24.2%)

Tuberculosis Cases by Race/Ethnicity:
California, 2018

- Asian/Pacific Islander: 1,081 (50.3%)
- Hispanic: 776 (36.1%)
- Black: 118 (5.5%)
- American Indian/Alaska Native: 4 (0.2%)
- White, Non-Hispanic: 165 (7.7%)
- Black, Non-Hispanic: 7 (0.3%)
- Native Hawaiian/Pacific Islander: 5 (0.2%)
- Multi-race: 6 (0.3%)
- Asian: 355 (16.3%)
- Hispanic: 278 (13.0%)
- White, Non-Hispanic: 166 (7.7%)
- Black, Non-Hispanic: 7 (0.3%)
- Native Hawaiian/Pacific Islander: 5 (0.2%)
- Multi-race: 6 (0.3%)

California Department of Public Health, Tuberculosis Control Branch
Tuberculosis Case Rates by Race/Ethnicity:
California, 2008 - 2018

Tuberculosis Cases by HIV/AIDS Diagnosis:
California, 2009-2018
Other Medical Comorbidities and Special Populations: California, 2018

<table>
<thead>
<tr>
<th>Medical Comorbidities</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes Mellitus</td>
<td>552</td>
<td>27.2</td>
</tr>
<tr>
<td>TNF-alpha Antagonist Therapy</td>
<td>19</td>
<td>0.9</td>
</tr>
<tr>
<td>End-Stage Renal Disease</td>
<td>86</td>
<td>4.2</td>
</tr>
<tr>
<td>Other Immunosuppressive Condition</td>
<td>98</td>
<td>4.8</td>
</tr>
<tr>
<td>Post-Organ Transplant</td>
<td>20</td>
<td>1.0</td>
</tr>
</tbody>
</table>

36% of adult TB cases had a medical comorbidity that can increase the risk of progression from latent to active TB disease.

<table>
<thead>
<tr>
<th>Special populations</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correctional facility resident</td>
<td>67</td>
<td>3.2</td>
</tr>
<tr>
<td>Homeless in year prior to TB diagnosis</td>
<td>90</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Tuberculosis Cases Identified with *Mycobacterium Bovis*: California, 2014-2018

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Genotyped Cases</th>
<th>Number of M. bovis</th>
<th>% M. bovis</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>1663</td>
<td>53</td>
<td>3.2</td>
</tr>
<tr>
<td>2015</td>
<td>1702</td>
<td>54</td>
<td>3.2</td>
</tr>
<tr>
<td>2016</td>
<td>1632</td>
<td>48</td>
<td>2.9</td>
</tr>
<tr>
<td>2017</td>
<td>1664</td>
<td>41</td>
<td>2.5</td>
</tr>
<tr>
<td>2018</td>
<td>1611</td>
<td>54</td>
<td>3.4</td>
</tr>
</tbody>
</table>
Cases with resistance to at least isoniazid and rifampin reported on the Initial Drug Susceptibility Report (Follow-up 1) or on the Case Completion Report (Follow-up 2).

Note: Number of MDR cases may increase as additional drug susceptibility test results are received for 2018.

Tuberculosis Cases with Multidrug Resistance (MDR)*: California, 2009-2018

Deaths in Persons with Tuberculosis: California, 2007-2016
What are the implications for public health practice?

The current decline in TB incidence is insufficient to eliminate TB in the United States in the 21st century. TB elimination will require enhanced surveillance, detection, and treatment. Focusing on populations that are at increased risk for latent TB infection will be important in achieving TB elimination.

- CDC MMWR 2019; 68(11); 257-262

To reach TB elimination in California, we need to accelerate the decline.

* Average annual decline in case rate 2005-2014; decline from 2012-2018 is -1.2%
How do TB cases occur in California?

- 6% importation
- 12% recent transmission
- 82% LTBI progression
- ~2,000 TB cases

The Challenges and Opportunities of Latent TB Infection

- Preventing TB disease by detecting and treating those with latent TB infection (LTBI) is a cornerstone of the U.S. strategy for TB elimination.
- TB infection is not currently reportable.
- It is estimated that more than 2 million Californians have latent TB infection (~13 million people in the U.S.).
- If not treated, persons with TB infection have a 5-10% lifetime risk of developing TB disease.
- New diagnostics and shorter course treatment regimens for LTBI are now available.
Estimated latent TB infection prevalence, awareness and treatment*: California, 2018


Plan to Eliminate TB

California TB Elimination Plan 2016-2020

California TB Risk Assessment

U.S. Preventive Services Task Force recommendation

Recommendation Summary

Population | Recommendation
---|---
Asymptomatic adults at increased risk for infection | The USPSTF recommends screening for latent tuberculosis infection (LTBI) in populations at increased risk.

- Birth, travel, or residence in a country with an elevated TB rate for at least 1 month
- HIV infection, organ transplant recipient, treated with TNF-alpha antagonist, steroids or other immunosuppressive medication
- Close contact to someone with infectious TB disease during lifetime
TB Free California

HIGHLIGHTS FROM 2018

- **COUNTY PARTNERSHIPS**: 12 counties across California received support, including TB prevention consultation, protocol development, analytic support, clinical training and patient/digital resources to scale up latent TB testing and treatment.
- **PROVIDERS Trained**: 575 providers serving high-risk non-U.S. born patients received training reflecting current latent TB testing and treatment recommendations, including use of blood tests and short treatment regimens.
- **MATERIALS DISTRIBUTED**: 2,000 latent TB educational videos and print documents developed in English, Chinese, Spanish, and Vietnamese were disseminated to providers and community clinics throughout California and nationally.
- **WEBSITE VIEWS**: 2,120 since its launch in September 2018, community members and providers throughout the country accessed the website to learn about latent TB and obtain TB prevention materials.
- **INCREASE IN TESTING**: >180% across select partner clinics, testing for TB infection using the recommended blood test among at-risk patients increased with support from TB Free California.
Summary

Case count
- Over 9,000 new cases of TB per year in the U.S.
- Nearly ¼ of cases in the U.S. occur in California

Disease incidence rate
- Declining, but the pace of decline has slowed
- California’s TB incidence rate nearly twice that of the U.S.

Certain groups remain disproportionately affected
- Persons born outside the U.S.
- Race/ethnicity disparities

TB deaths
- 10% of TB case patients die in California

HIV and other medical comorbidities
- 3-4% of cases in California are among persons with HIV
- More than one-third of adult cases in California have a condition that can increase the risk of progress from latent to active TB

Drug Resistance
- Multidrug resistance in 1-2% of TB cases, higher among non-U.S.-born compared to U.S.-born

LTBI
- An estimated 13 million people in the U.S. and 2 million in California have LTBI
- Prioritizing TB testing and treatment for groups with elevated LTBI prevalence and medical risk of progression from LTBI to TB will help prevent future TB cases
References


Acknowledgments

Pennan Barry
Varsha Hampole
TBCB Registry
Tuberculosis Cases by Country of Origin: California, 2018*

- **U.S.-born** (21.6%)
- **Foreign-born** (77.8%)
- **Unknown** (0.7%)

**Countries:**
- Philippines: 355 (21.3%)
- Mexico: 450 (26.9%)
- All Others: 404 (24.2%)
- Vietnam: 205 (12.3%)
- China: 160 (9.6%)
- India: 96 (5.7%)

*Tuberculosis Case Rates by Race/Ethnicity: California, 2008 - 2018*
Tuberculosis Rates by Place of Birth and Race/Ethnicity: California, 2018

Incidence Rate per 100,000 Persons

- **Asian**: 2.0 Non-U.S.-born, 2.8 U.S.-born
- **Black**: 20.0 Non-U.S.-born, 2.8 U.S.-born
- **Hispanic**: 10.6 Non-U.S.-born, 1.8 U.S.-born
- **White**: 4.1 Non-U.S.-born, 0.5 U.S.-born