TB EPIDEMIOLOGY

TB Clinical Intensive Course
Curry International Tuberculosis Center
September 30, 2015

Varsha Nimbal, MPH
Tuberculosis Control Branch
California Department of Public Health

Outline
• TB epidemiology
  ➢ Global burden
  ➢ United States → California
    – Summary of surveillance data
    – Demographic characteristics
    – Clinical characteristics
  ➢ Summary

Estimated Global TB Burden, 2013
• 9 million incident cases; 1.1 million HIV positive
• 126 cases per 100,000 population
• 1.5 million deaths
  ➢ 360,000 HIV Positive
• 480,000 developed MDR

WHO, Global Tuberculosis Control 2014
TB Epidemiology
United States

Reported TB Cases
United States, 1982–2013

No. of Cases

0
5,000
10,000
15,000
20,000
25,000
30,000
### TB Morbidity
**United States, 2008–2013**

<table>
<thead>
<tr>
<th>Year</th>
<th>No.</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>12,893</td>
<td>4.2</td>
</tr>
<tr>
<td>2009</td>
<td>11,519</td>
<td>3.8</td>
</tr>
<tr>
<td>2010</td>
<td>11,164</td>
<td>3.6</td>
</tr>
<tr>
<td>2011</td>
<td>10,509</td>
<td>3.4</td>
</tr>
<tr>
<td>2012</td>
<td>9,940</td>
<td>3.2</td>
</tr>
<tr>
<td>2013</td>
<td>9,582</td>
<td>3.0</td>
</tr>
<tr>
<td>2014*</td>
<td>9,412</td>
<td>3.0</td>
</tr>
</tbody>
</table>

*Provisional Results from CDC MMWR 2015; 64(10); 265-269*

### TB Case Rates,* United States, 2013

![Map showing TB case rates](image)

### Reported TB Cases by Age Group, United States, 2013

- <15 yrs (5%)
- 15-24 yrs (10%)
- 25-44 yrs (31%)
- 45-64 yrs (31%)
- ≥65 yrs (23%)
TB Case Rates by Age Group and Sex, United States, 2013

Reported TB Cases by Race/Ethnicity, United States, 2013

*All races are non-Hispanic. Persons reporting two or more races accounted for less than 1% of all cases.

TB Case Rates by Race/Ethnicity, United States, 2003–2013
Primary Anti-TB Drug Resistance, United States, 1993 – 2013

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.


Note: Based on initial isolates from persons with no prior history of TB.


Note: Based on initial isolates from persons with no prior history of TB. MDR TB defined as resistance to at least isoniazid and rifampin.
TB Epidemiology
California

Number of Tuberculosis Cases:
California, 1988-2014

Number of Tuberculosis Cases and Case Rates:
California, 2005-2014
Tuberculosis in California, 2014

Tuberculosis Case Rates per 100,000 Population: California, 2014

Note: The map illustrates TB case rates by reporting jurisdiction in 2014. Thirteen jurisdictions (including Long Beach, not represented) had TB case rates equal to or above the state average of 3.6 cases per 100,000 population. Eight jurisdictions had tuberculosis case rates below the 2014 national rate of 3.2 per 100,000 population. Eleven jurisdictions (including Pasadena and Berkeley, not represented) had rates greater than the national rate of 3.2 but below the state average. Case rates were not calculated for 29 jurisdictions because there were fewer than five cases in these areas.

CA Epidemiology Reflects Global Epidemiology

Tuberculosis Cases by Country of Origin:
California, 2014

California Department of Public Health, Tuberculosis Control Branch
Tuberculosis Cases in Foreign-born and U.S.-born Persons: California, 2005-2014

How do TB Cases Occur in California?

Importation
- TB within 1 year of US arrival
  - 835 of 11,149 cases (2010-2014) occurred within 1 year of arrival in US
  - 7.9%

Recent Transmission
- 26% genotype clustering within county (3 year window)
- 8% with indication of transmission within 2 years on RIVCT
- Midpoint = 17%

Reactivation of remote infection
- Cases not from importation or recent transmission
  - 75.5%
Figure 12. HIV/AIDS-associated Tuberculosis* by Race/Ethnicity: California, 2004-2013

Figure 13. Tuberculosis Cases with Multidrug Resistance (MDR) on Initial or Final Drug Susceptibility Testing*: California, 2003-2012

*Match found in HIV/AIDS Registry, California Office of AIDS
California Department of Public Health, Tuberculosis Control Branch
Deaths in Persons with Tuberculosis: California, 2003-2012

What are the implications for public health practice?

Continued vigilance, surveillance, and active prevention measures are needed to reach the TB elimination. To continue making strides toward elimination, alignment of domestic TB control activities with international TB control initiatives is needed to address increasing disparities between U.S.-born and foreign-born persons. Treatment of persons at high risk with latent Mycobacterium tuberculosis infection is also needed to address this disparity.

• CDC MMWR 2015; 64(10); 265-269

The Challenges 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.
• LTBI is not reportable
• It is estimated that more than 11 million people in the U.S. (including 2.5 million in California*) have LTBI
• If not treated, about 5 to 10 percent of people with LTBI will develop TB disease. (~550,000 to 1.1 million people in the U.S.)

Source: CDC TB Epidemiologic Studies Consortium
http://www.cdc.gov/tb/topic/research/TBESC/default.htm
* California estimate derived from Census population data in 2013 and native-born and foreign-born LTBI prevalence estimates in Bennett et al., Am j Respir Crit Care Med 2008;177:548-55.
### Common Risk Factors for Progression from TB infection to active disease

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Relative Risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced, untreated HIV infection</td>
<td>9.9 (8.7 - 11)</td>
</tr>
<tr>
<td>Close contact to infectious TB</td>
<td>6.1 (5.5 - 6.8)</td>
</tr>
<tr>
<td>Radiographic evidence of old, healed, untreated TB</td>
<td>5.2 (3.4 - 8.0)</td>
</tr>
<tr>
<td>Prednisone treatment</td>
<td>2.8 (1.7 - 4.6)</td>
</tr>
<tr>
<td>Chronic renal failure</td>
<td>2.4 (2.1 - 2.8)</td>
</tr>
<tr>
<td>TNF-α antagonist treatment</td>
<td>2.0 (1.1 - 3.5)</td>
</tr>
<tr>
<td>Diabetes (poorly controlled)</td>
<td>1.7 (1.5 - 2.2)</td>
</tr>
<tr>
<td>Underweight</td>
<td>1.6 (1.1 - 2.2)</td>
</tr>
<tr>
<td>Smoking</td>
<td>1.5 (1.1 - 2.2)</td>
</tr>
</tbody>
</table>


### Medical risk factors for progression to TB disease, TB cases in CA, 2013

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>540</td>
<td>24.9</td>
</tr>
<tr>
<td>Non-HIV immunosuppressive condition</td>
<td>112</td>
<td>5.2</td>
</tr>
<tr>
<td>End stage renal disease</td>
<td>77</td>
<td>3.6</td>
</tr>
<tr>
<td>TNF-α antagonist treatment</td>
<td>20</td>
<td>0.9</td>
</tr>
<tr>
<td>Post organ transplantation</td>
<td>15</td>
<td>0.7</td>
</tr>
<tr>
<td>At least one medical risk factor</td>
<td>35%</td>
<td></td>
</tr>
</tbody>
</table>

### Summary

- **Case count**
  - ~9,500 new cases of TB per year in the U.S.
  - ~¼ of cases in the U.S. occur in California

- **Disease incident rate**
  - Declining, but the pace of decline has slowed since ~2000
  - The decline from 2013 to 2014 was the smallest in over a decade
  - California’s rate nearly twice that of the U.S. (5.6 vs. 3.0 in 2014)

- **Certain groups disproportionately affected**
  - Men (e.g., among 45+ years)
  - Foreign born
  - Race/ethnicity disparities

- **TB Deaths**
  - ~9% of TB case patients die
Summary

• HIV
  - 7% of TB cases in the U.S. and 3.5% of cases in CA are HIV positive

• Other Medical Risk Factors
  - More than 1/3 of TB cases in CA have at least one medical condition known to increase risk of progression from TB infection to disease
    - Diabetes most common (1/4 of TB cases)

• Drug Resistance
  - Isoniazid and multidrug resistance are higher among foreign born than among U.S. born

• LTBI
  - An estimated 11 million people in the U.S. (2.5 million in CA) have LTBI
  - Majority of cases of TB disease that occur in foreign born patients result from reactivation of LTBI
  - Prioritizing TB screening for groups with elevated LTBI prevalence and medical risk of progression from LTBI to TB may help prevent future TB cases

References

• CDC. Reported Tuberculosis in the United States, 2013. Atlanta, GA: U.S. Department of Health and Human Services, CDC

• Tuberculosis Control Branch. Report on Tuberculosis in California, 2014. Richmond, CA: California Department of Public Health

Acknowledgements

• Peter Oh
• Lisa Pascopella
• Saul Kanowitz
• Janice Westenhouse
• Pennan Barry