Multidrug-resistant Tuberculosis Epidemiology

Pennan Barry, MD, MPH
California MDR TB Consult Service
Surveillance and Epidemiology Section
Curry International Tuberculosis Center
December 2019
Objectives

• Describe the national and global epidemiology of MDR TB

• Recognize who is at higher risk for MDR TB
Terminology

- Mono-resistant: resistant to only one drug
- Multidrug-resistant (MDR): resistant to at least INH and RIF
- Pre-extensively drug-resistant (Pre-XDR): MDR plus resistance to fluoroquinolone (FQ) or a second-line injectable (Amikacin, Kanamycin, or Capreomycin)
- Extensively drug-resistant (XDR): MDR-TB plus resistance to a FQ and at least one second line injectable
Global MDR Burden

• 2018 Estimate: 484,000 incident cases
  – 50% from India, China, and Russia

• Surveillance by country and region
  – 2018: Data from 85% (164/194) of countries since 1994
  – Continuous surveillance (105) vs epidemiological surveys (59)
Percentage of New Cases with MDR TB
Overall: 3.4%

WHO, Global Tuberculosis Report, 2019
Percent of Previously Treated Cases with MDR-TB
Overall: 18%

WHO, Global Tuberculosis Report, 2019
Primary Anti-TB Drug Resistance, United States, 1993–2018*

*As of June 6, 2019

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.
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.
Who is at higher risk for MDR-TB?

• History of previous TB treatment, particularly if recent
• Known exposure to MDR-TB case
• HIV (+)
  ▪ Higher incidence of Rifampin mono resistance
• Poor response to standard 4-drug treatment
  ▪ Culture remains (+) after 2 months treatment
Proportion MDR varies by birthplace
California, 2011-2018

Credit: Julian Boyce
Proportion MDR varies by birthplace
California, 2011-2018

Credit: Julian Boyce
## Number and Proportion MDR TB by Country/Region of Origin, CA 2014-2018

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>No.</th>
<th>%</th>
<th>PPV (99% spec)</th>
<th>PPV (98% spec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Former Soviet Republics</td>
<td>6</td>
<td>14.0</td>
<td>94%</td>
<td>89%</td>
</tr>
<tr>
<td>Philippines</td>
<td>32</td>
<td>2.0</td>
<td>66%</td>
<td>50%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>16</td>
<td>1.8</td>
<td>64%</td>
<td>47%</td>
</tr>
<tr>
<td>United States</td>
<td>13</td>
<td>0.9</td>
<td>46%</td>
<td>30%</td>
</tr>
<tr>
<td>Mexico</td>
<td>8</td>
<td>0.4</td>
<td>28%</td>
<td>16%</td>
</tr>
</tbody>
</table>
MDR more common <4 years after US arrival
California, 2011-2018

Credit: Julian Boyce
<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Total MDR TB cases</th>
<th>≤ 4 years in US No. (%)</th>
<th>&gt;4 years in US No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Countries (excl U.S.)</td>
<td>106</td>
<td>48 (3.6)</td>
<td>56 (1.1)</td>
</tr>
</tbody>
</table>
Who is at higher risk for MDR-TB?

• NonUS-born arrived in U.S. within last 4 years
• Immigration from or recent extended travel to country with > 2% MDR among cases from that country diagnosed in California/U.S.
• These countries* are:
  - India
  - Peru
  - Ethiopia, Eritrea
  - Former Soviet states
  - Korea
  - Ecuador
  - Nigeria
  - Mongolia
  - Burma
  - Guatemala
  - Nepal
  - Dominican Republic
  - Laos

• Other state or locally identified risk groups, including:
  – Hmong refugees
  – Persons of Tibetan origin

† Current U.S. data are available from the CDC, Division of TB Elimination (DTBE) (www.cdc.gov/tb)
Order rapid molecular test for resistance for patients with MDR risk!

Among 42 smear positive MDR cases with MDR risk, 20 did not get Xpert or pyrosequencing on sputum (California, 2012-2016)

Lowenthal, Clin Inf Dis 2019 DOI: 10.1093/cid/ciy937
Acknowledgments

- Lisa True
- Lisa Chen
- Neha Shah
- Grace Lin
- Gisela Schecter
- Janice Westenhouse
- Marya Husary
- Julian Boyce
- Adam Readhead

pennan.barry@cdph.ca.gov

Not pictured: Chris Keh, MD