Tuberculosis Epidemiology
Global and the U.S.
Annie Kizilbash, MD, MPH
November 17, 2015

Tuberculosis Intensive
November 17-20, 2015
San Antonio, TX

Annie Kizilbash, MD, MPH has the following disclosures to make:

- No conflict of interests
- No relevant financial relationships with any commercial companies pertaining to this educational activity
Tuberculosis Epidemiology
Global and the U.S.

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Diseases

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Objectives

- Epidemiology of tuberculosis – global and U.S.
- Epidemiology of TB and HIV co infection
- MDR and XDR TB - how it is created and steps to address this
- TB in the U.S. – Who is at risk and how we can decrease cases

TB IN THE WORLD*

*We don’t know the epidemiology of TB in most of the world with certainty. In most of the world TB is diagnosed on the basis of AFB smears without cultures, and treated without in vitro drug susceptibility results
### Reporting of data in the 2015 round of global TB data collection

<table>
<thead>
<tr>
<th>Region</th>
<th>Countries</th>
<th>Reporting</th>
<th>Countries</th>
<th>Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>African Region</td>
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<tr>
<td>Eastern Mediterranean Region</td>
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<td>European Region*</td>
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<td>Region of the Americas</td>
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<td>South-East Asia Region</td>
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<td>Western Pacific Region</td>
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<td>High-burden countries</td>
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<td>22</td>
<td>22</td>
<td>22</td>
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<tr>
<td>World</td>
<td>216</td>
<td>205</td>
<td>194</td>
<td>185</td>
</tr>
</tbody>
</table>

* Countries that did not report by the deadline were mostly low-incidence countries in Western Europe.

Global Tuberculosis Report
WHO Report 2015
Global Tuberculosis Report
WHO Report 2015

- The global burden of TB remains enormous
- TB infection – 1/3 of the world’s population
- In 2014
  - TB disease - 9.6 million estimated cases
  - Mortality - TB: 1.5 million
    » 0.4 million- HIV positive

Time to wake up to shocking toll of TB
By Eric Goosby
CNN: Wed October 28, 2015
Top 10 Countries with the highest NEW TB CASES – WHO Data from 2014

WHO Global Tuberculosis Report 2015

Top 10 Countries with the highest NEW TB CASES per 100,000 – WHO Data from 2014

WHO Global Tuberculosis Report 2015
Timor-Leste

TB and HIV Coinfection

• 12% of the 9.6 million new TB cases were HIV +

• 3 out of 4 of all TB – HIV co infected patients worldwide reside in Africa.

• The proportion of TB patients known to be HIV + ranged from 6% in Eritrea to 73% in Swaziland
Epidemiology of Drug Resistant TB
Definitions of Drug Resistant Tuberculosis

• MDR TB: Resistant to INH and Rifampin
• MDR TB is the precursor of XDR TB
• XDR TB: MDR TB
  – PLUS
  – Resistance to a fluoroquinolone
  – Resistance to at least one of the following injectables:
    • Amikacin, Kanamycin, Capreomycin

Drug Resistant Tuberculosis
Creation of MDR & XDR TB

• The development of drug resistant TB results from suboptimal TB control and treatment practices
• Case identification and treatment response are based on AFB smears without confirmatory cultures or susceptibility testing
• Retreatment for treatment failure not based on in vitro susceptibility studies, rather, on fixed retreatment regimens
• MDR TB can spread like susceptible TB from index patient to contacts

- Estimated 480,000 MDR TB cases in 2014
  — > 50% cases in India, China and Russian Federation
- 111,000 started on MDR TB treatment
- 50% of patients were successfully treated
- 190,000 deaths from MDR TB
WHO Global Tuberculosis Report 2015
XDR TB
WHO Report 2015

• Extensively drug-resistant TB (XDR-TB) has been reported by 105 countries
• On average, an estimated 9.7% of people with MDR-TB have XDR-TB.
• Of 2,685 XDR-TB patients in 2012
  – 682 (26%) completed their treatment successfully
  – 510 (19%) treatment failed
  – 809 (30%) patients died
  – 684 (25%) were lost to followup

Global Tuberculosis Control
WHO Report 2015

• Conventional lab tests are sputum smear microscopy and culture and drug susceptibility testing – decades
• Rapid molecular tests recommended by WHO 2008
• Xpert MTB/RIF recommended by WHO in 2010
  – Guidelines for use expanded in 10/2013
Global Tuberculosis Control – WHO Report 2015
Cost per Patient, 2014

- Drug-susceptible TB
  - US$ 100-1,000
- MDR-TB
  - US$ 6,826 in low-income countries to US$ 21,265 in upper middle-income countries.

TB Funding – WHO 2015

[Graph showing Funding for TB prevention, diagnosis and treatment by intervention area, 2006–2015 (constant 2015 US$ billions)]
Global Tuberculosis Report
WHO Report 2015

• 43 millions lives estimated to have been saved since 2000
• Progress towards global targets for reductions in TB cases and deaths continues ‘slowly’
• TB incidence rates fall
  – by 1.5% per year
• The prevalence of active TB has fallen by
  – by 42% globally since 1990.
• Mortality rates have continued to fall in most countries
  – by 45% since 1990

Lancet – How to Eliminate Tuberculosis Series; Nov 2015

Strategies include
– Active identification of TB cases and initiation of correct therapy
– Treatment of TB infection in close contacts and those at risk for disease progression
– Addressing some of the mechanisms that fuel tuberculosis – social, economic and environmental
TB IN THE UNITED STATES

2014 United States TB Cases

– 9,412 TB cases reported

– 3.0 cases per 100,000 population

– This is the 22nd consecutive year of declining rates
  – an all time low since national reporting of TB began in 1953 when rate was 53 per 100,000 population

MMWR March 20,2015
California, Texas, New York and Florida accounted
• More than 500 cases each
• Approximately half the TB cases (4,795) in 2014
Reported TB Cases by Race/Ethnicity,*
United States, 2014

![Pie chart showing race/ethnicity distribution of reported TB cases in 2014.]

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>2013 No.</th>
<th>Rate</th>
<th>2014 No.</th>
<th>Rate</th>
<th>% Change from 2013 to 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hispanic</td>
<td>2,697</td>
<td>5.0</td>
<td>2,760</td>
<td>5.0</td>
<td>(2.3)</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>2,588</td>
<td>5.3</td>
<td>1,996</td>
<td>5.1</td>
<td>(-6.3)</td>
</tr>
<tr>
<td>Black</td>
<td>2,296</td>
<td>10.6</td>
<td>2,951</td>
<td>17.6</td>
<td>(-26.5)</td>
</tr>
<tr>
<td>Asian</td>
<td>1,434</td>
<td>8.7</td>
<td>1,247</td>
<td>0.8</td>
<td>(-12.4)</td>
</tr>
<tr>
<td>Unknown</td>
<td>141</td>
<td>0.8</td>
<td>481</td>
<td>8.3</td>
<td>(17.5)</td>
</tr>
<tr>
<td>Total</td>
<td>8,812</td>
<td>3.0</td>
<td>8,412</td>
<td>3.0</td>
<td>(-4.6)</td>
</tr>
</tbody>
</table>

* For 165,998 populations.
1 Data for 2014 are provisional.
2 Includes persons reported as American Indian/Alaska Native (2014: 115 cases; rate = 4.6; 2013: 127 cases; rate = 5.0); Native Hawaiian or other Pacific Islander (2014: 94 cases; rate = 11.4; 2013: 103 cases; rate = 13.5); and of multiple races (2014: 192 cases; rate = 5.0; 2013: 174 cases; rate = 2.5).
Number of TB Cases in U.S.-born vs. Foreign-born Persons, United States, 2000 - 2014

<table>
<thead>
<tr>
<th>Country</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>1,268</td>
</tr>
<tr>
<td>Philippines</td>
<td>745</td>
</tr>
<tr>
<td>Vietnam</td>
<td>498</td>
</tr>
<tr>
<td>India</td>
<td>472</td>
</tr>
<tr>
<td>China</td>
<td>420</td>
</tr>
</tbody>
</table>


MMWR March 21, 2014
Estimated HIV Coinfection in Persons Reported with TB, United States, 1993 – 2014*

Primary MDR TB, United States, 1993 – 2014*
Primary MDR TB in U.S.-born vs. Foreign-born Persons, United States, 1993 – 2014*

Primary Isoniazid Resistance in U.S.-born vs. Foreign-born Persons, United States, 1993 – 2014*
Case Count

Year of Diagnosis

XDR TB Case Count Defined on Initial DST* by Year, 1993 – 2014**

Worldwide TB and the United States

- Foreign born persons account for the majority of TB cases in the U.S.

- Foreign born persons account for the great majority of drug resistant and multi-drug resistant TB cases in the U.S.

- How can we further decrease the number of TB cases in the U.S.?
Moving toward TB elimination: implementation of statewide targeted tuberculin testing in TN
(Cain et al, AJRCCM 2012)

- 2002-2006: 102,709 TST placed and read
- 9,090 + TST: 53% started treatment of whom 54% completed treatment (25% of total)
- Estimated 195 TB cases prevented over the 5 year study period
- The # of TST placed to prevent one TB case:
  - 150 for foreign born persons
  - 9,834 for persons without TB risk
- “Yield and cost-effectiveness are maximized by prioritizing foreign-born persons; a large population with high TB risk.”
TB Epidemiology in the US:

- TB is increasingly a disease of persons born outside the U.S.
- TB disproportionately affects African-American, Hispanic and Asian/Pacific Island populations.
- In an era of diminishing resources, we need to focus our TB control efforts on high risk groups

Thank you!