Recent developments in TB estimates

Philippe Glaziou
WHO Global Task Force on TB Impact Measurement
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Outline

• RR-TB incidence
• WHO and IHME estimates
• Subnational estimates of TB incidence
Annual RR-TB incidence

• Sum of
  • primary RR incidence
  • acquired RR incidence

• Underlying data

<table>
<thead>
<tr>
<th>Source</th>
<th>Data item</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHO</td>
<td>Overall TB incidence</td>
<td>Variable</td>
</tr>
<tr>
<td>Drug resistance surveillance</td>
<td>Risk of RR-TB by treatment history</td>
<td>High</td>
</tr>
<tr>
<td>Case notifications</td>
<td>Distribution by treatment history</td>
<td>Variable</td>
</tr>
</tbody>
</table>
Current approach

\[ I_{rr} = \frac{N \rho_n}{C} + \frac{L \rho_n \rho + R \rho_r}{C_u} \]

Double counting:
Cases here that were infected with RR strains are also counted in the first term of the RHS.
Removing the double counting

\[ I_{rr} = I[(1 - f)p_n((1 - r) + r\rho) + fp_r] \]

\[ I^P_{rr} = I\rho_n \] Incidence of primary RR

\[ I^A_{rr} = I_{rr} - I\rho_n \] Incidence of acquired RR
Outline

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• Subnational estimates of TB incidence
## Global TB Report 2017 vs. GBD2016

<table>
<thead>
<tr>
<th></th>
<th>WHO</th>
<th>IHME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TB incidence (2016)</strong></td>
<td>10.4 million (8.77 – 12.2)</td>
<td>10.4 million -</td>
</tr>
<tr>
<td><strong>TB mortality (HIV-negative, 2016)</strong></td>
<td>1.3 million (1.16 – 1.44)</td>
<td>1.21 million (1.2 – 1.3)</td>
</tr>
</tbody>
</table>

Both overlap

Both overlap
Variability between consecutive reports, TB

TB mortality in 2015 (HIV-neg)

<table>
<thead>
<tr>
<th>Year published</th>
<th>WHO*</th>
<th>IHME</th>
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</thead>
<tbody>
<tr>
<td>2017</td>
<td>1.33m</td>
<td>1.21m</td>
</tr>
<tr>
<td>2016</td>
<td>1.38m</td>
<td>1.11m</td>
</tr>
<tr>
<td><strong>Relative change</strong></td>
<td><strong>3.8%</strong></td>
<td><strong>7.8%</strong></td>
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</table>

* Changes driven by a small number of countries
Variability between the last two consecutive reports, HIV and malaria

<table>
<thead>
<tr>
<th></th>
<th>UNAIDS</th>
<th>WHO</th>
<th>IHME</th>
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<tbody>
<tr>
<td>HIV</td>
<td>4.5%</td>
<td>-</td>
<td>7%</td>
</tr>
<tr>
<td>Malaria</td>
<td>-</td>
<td>2%</td>
<td>1.5%*</td>
</tr>
</tbody>
</table>

*IHME estimate 1.6 times greater than WHO
Differences in estimates, variability

• WHO-IHME differences reflect different modelling approaches
• Better data quality leads to convergence
• IHME and WHO collaboration
• Variation in estimates (same agency) also for HIV and malaria
Outline

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• Subnational estimates of TB incidence
Hottest counties in coldest places

TB incidence rate per 100,000/year (2006-2010 average)

Hottest zip codes in Tarrant, TX (1993-2000)
Notification data, which are the hottest provinces?
Predicting prevalence

Number of clusters

Number of cases per cluster (Laos 2011)
Predicting prevalence from altitude and HDI
Characteristics of a large latent tuberculous infection screening programme using QuantIFERON®-TB Gold in Korea

Center for Laboratory Medicine, Korean Institute of Tuberculosis, Cheongju, Republic of Korea
## What for?

<table>
<thead>
<tr>
<th>Goals</th>
<th>Actions</th>
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<tbody>
<tr>
<td>1. Adapt NTP planning and budgeting to coverage gaps</td>
<td>Investigation of reporting performance triggered by unexpected patterns in data</td>
</tr>
<tr>
<td>2. Detect and confirm events, contain local epidemics</td>
<td>Monitor case counts in space-time and investigate clusters</td>
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</table>
Conclusion, subnational estimates

• **Notifications reflect burden**: no under-diagnosis, no under-reporting, data on residence recorded

• **Prevalence surveys**: explore small area estimation methods

• **Infection surveys** based on IGRA or future tuberculin test