Global TB estimates

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outline

• Why did we update methods
• Summary of major changes
• Methods
• Global Burden of disease
• Next steps
• Questions
Why did we update methods?

Country programme managers and partners were increasingly often challenging "WHO estimates of case detection rate"
Summary of major changes

1. Documentation of *uncertainty*
2. Model simplified
3. Data sources updated, vital registration measurements incorporated
4. Consultations with countries
5. Incidence trajectories based on notifications and time changes in case finding effort
Task Force sub-group on estimates

- June 2008, the Hague
  - Commissioned literature reviews
- October 2009, Geneva
  - Uncertainty framework
  - Simplified model
  - Global TB Report Update 2009
- Regional epi workshops
  - EUR, SEAR, AMR, EMR in 2009
  - WPR, AFR this year
AFTER

All incident cases

- HIV+ve
  - Notified
  - Not Notified

- HIV-ve
  - Notified
  - Not Notified
## Sources of data

<table>
<thead>
<tr>
<th>Source of data</th>
<th>Number of countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case notifications</td>
<td>212</td>
</tr>
<tr>
<td>Mortality (vital registration)</td>
<td>89</td>
</tr>
<tr>
<td>Prevalence surveys of disease</td>
<td>6</td>
</tr>
<tr>
<td>Inventory / capture re-capture</td>
<td>3</td>
</tr>
<tr>
<td>Tuberculin surveys</td>
<td>19</td>
</tr>
</tbody>
</table>
**Onion model**: size of the non-notified TB population

<table>
<thead>
<tr>
<th>Category</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not have access to health care</td>
<td>DHS</td>
</tr>
<tr>
<td>Have access but do not seek care</td>
<td>Survey</td>
</tr>
<tr>
<td>Seek care but not diagnosed</td>
<td>Survey</td>
</tr>
<tr>
<td>Diagnosed but not reported</td>
<td>Inventory study</td>
</tr>
</tbody>
</table>

Capture-recapture
Can we measure TB incidence?
Sources of data on incidence

- Incidence surveys
- PPD surveys
- Notifications
- Capture-recapture?
- Indirect estimation
incidence = \frac{prevalence}{duration}
incidence = \frac{\text{mortality}}{\text{case fatality rate}}
incidence = \frac{\text{notifications}}{\text{case detection rate}}

http://www.flickr.com/photos/teenytinyturkey/313457260/
Most incidence estimates are derived from expert opinion
How about prevalence?

- Measurable through cross-sectional surveys
- Indirect estimates uncertain

\[ P = l^* d \]
Mortality

- Measurements from VR in 89 countries
  - Coverage > 80%
  - Ill-defined causes < 20%
- Use prior estimates of CFR ($f$) from literature review (Masja Straetemans)
- Generate mortality estimates: $M = l \times f$
- Update CFRs to maximize the number of trajectories crossing VR data points
Model fit to VR measurements
More deaths (VR) per notified case in FSU compared with high income
Trends in TB incidence and mortality in Latvia

From Vital Registrations
Incidence estimated from mortality measurements in Brazil

Incidence: yellow - notified: blue

CFR = probability of death at 4 years of follow-up among linked records
probability of linkage of TB death records
Problematic VR data in SA

From Vital Registrations
Global trends in mortality

(a) Excluding HIV-infected
(b) Including HIV-infected
Disaggregation of estimates

• By smear status
  – Based on %smear pos in groups of countries

• By age group and sex
  – Based on distribution of smear pos TB by age and sex in groups of countries

• By HIV-status

• MDR-TB
  – MDR among incident TB
  – acquired MDR
  – MDR-TB deaths
Incident episodes of MDR-TB
Problems

TB in children

% smear pos among newly notified cases varies widely (min 42%, max 84%)* between 34 countries with surveillance data on culture results—what does such variation mean?

Global Burden of Disease 2005

- New Global Burden of Diseases, Injuries, and Risk Factors Study
  - Harvard University
  - University of Washington
  - Johns Hopkins University
  - University of Queensland
  - World Health Organization

- Study current levels and recent trends in all major diseases, injuries, and risk factors
Requested output

TB incidence and mortality estimates in

• 21 regions
• 28 age + sex groups

For 1990 and 2005
Work done

- Review of the methods
- Definitions, sequelae
- (Systematic) reviews:
  - Duration of treated and untreated TB
  - HIV +/- TB incidence Rate Ratio
  - ART on/off TB incidence rate ratio
  - TB as risk factor for death in HIV
  - Smear-positive cases by age and sex
  - % Smear-positive
  - Case fatality
Sequelae definitions

**TB disease (not HIV infected):** Individuals with clinical pulmonary or extrapulmonary tuberculosis

**TB disease (HIV infected):** Individuals with clinical pulmonary or extrapulmonary tuberculosis in combination with HIV infection.
Does the task force agree to send the latest 1990 and 2005 estimates to GBD?
Next steps

- Analyze VR mortality data
- Explore improvements to mortality model
- Averted deaths analysis
- Advocate for more VR, including at GF
- De-emphasize use of CDR globally
Acknowledgements

• Marieke van der Werf
• Katherine Floyd
• Ana Bierrenbach
• Babis Sismanidis
• the Estimates sub-group of the Task Force
Questions to the Task Force

- What are your comments on the methods detailed in the background document sent to you?

- What next steps to improve estimations of TB burden would you recommend?

- Do you agree to send the current 1990 and 2005 estimates to GBD?