TB prevalence surveys and TB burden estimation
# International TB targets

<table>
<thead>
<tr>
<th>MDG</th>
<th>Reverse incidence by 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>STP</td>
<td>50% reduction in prevalence and mortality by 1990 – 2015</td>
</tr>
<tr>
<td></td>
<td>Eliminate TB by 2050 (less than 1 case per million)</td>
</tr>
</tbody>
</table>
Sources of data on TB burden

- Incidence
  - Case-notifications with documentation of underreporting
- Mortality
  - Vital Registration (VR) records, sample VR
  - Mortality surveys
- Prevalence
  - Population-based surveys of disease
Repeat prevalence surveys in China

Prevalence of bacteriologically confirmed TB in adults (per 100,000), 2010

$$\pi_{\text{adults}} = 119 \ [\text{Standard Deviation: 8.1}]$$

How about extra-pulmonary TB? How about TB in children?
TB in children

- **In 2000**
  \[
  \pi_{children,2000} = 12.3 \ (\pm 3.7) \text{ per } 100,000 \text{ population}
  \]
  Ratio prev adults (bact confirmed) 2010 / 2000
  \[
  r = 0.58 \ (\pm 0.059)
  \]

- **In 2010**
  \[
  \pi_{children,2010} = \pi_{children,2000} \times r
  = 7.1 \ (\pm 2.27) \text{ per } 100,000
  \]
  Proportion children out of total population, \( c_{2010} = 20\% \)
  \[
  \pi_{all} = \pi_{children,2010} \times c_{2010} + \pi_{adults,2010} \times (1 - c_{2010})
  = 99.4 \ (\pm 6.3) \text{ per } 100,000
  \]
Extra-pulmonary TB

  - $e = 6.8\% \pm 0.44$ of new + relapse, bact confirmed
  - Assume % EP similar between notified and prevalent cases
- Total prevalence rate (2010)
  $$\pi_{total,2010} = \frac{\pi_{all,2010}}{1 - e}$$
  $$= 104 \ (\pm 7.12)$$
- Total prevalence rate (2000)
  $$\pi_{total,2000} = 169 \ (\pm 12.7)$$
Reduction in prevalence in China 1990–2010

50% reduction target
Uncertainty in prevalence estimates, 2000–2010

Mortality Rate per 100,000


National mortality surveys

DSP
Can we use prevalence survey results to estimate incidence? (option 1)

\[ \lambda P^* = \lambda_t T^* = \frac{T^*}{\theta} \]

\[ d = \frac{P^* \theta}{T^*} \]

\[ I = \frac{P^*}{d} \]

- \( P^* \): prevalent cases, in steady state equilibrium
- \( T^* \): cases on treatment
- \( \lambda \): rate of detection = \( 1/d \)
- \( \lambda_t \): rate of removal by treatment
- \( \theta \): duration of treatment = 0.5 year
- \( d \): duration of disease

**E.g. Myanmar:** \( I = 364 \ (118–852) \) per 100,000
- biased: mortality
- imprecise: small numbers
Can we use prevalence survey results to estimate incidence? (option 2)

- \( I = \frac{P}{d} \)
- Disease duration difficult to measure
- Example
  - \( P = \frac{100}{100,000} \) (SD = 12.5)
  - \( d \sim U(0.5, 2) \) years
  - \( I = 92 \) (45 – 193) per 100,000
Repeat prevalence surveys provide a measureable *impact indicator*

TB prevalence estimates should be used for programme evaluation purposes *only when derived from population-based surveys*

Prevalence surveys are *not designed to estimate incidence*