National TB prevalence surveys 2009-2015

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TB Monitoring & Evaluation
Global TB Programme
WHO
WHO Global Task Force on TB Impact Measurement

Mandate

To produce a robust, rigorous and widely-endorsed assessment of whether
2015 global targets for reductions in TB incidence, prevalence and mortality
are achieved at global, regional and country levels

Three strategic areas of work

1. Strengthening surveillance of TB cases and deaths, all countries

2. National TB prevalence surveys in 22 global focus countries

3. Periodic review of methods to produce disease burden estimates
22 Global Focus Countries

Africa: Ethiopia, Ghana, Kenya, Malawi, Mali, Mozambique, Nigeria, Rwanda, Sierra Leone, South Africa, Tanzania, Uganda, Zambia

Asia: Bangladesh, Cambodia, China, Indonesia, Myanmar, Pakistan, Philippines, Thailand, Viet Nam
Surveys since 2009

- GFC survey done/ongoing (17)
- Non-GFC survey done (6)
- GFC survey planned (3)
- GFC no current plans (2)
Prevalence surveys since 1990
Prevalence surveys since 1990

WHO Global Task Force on TB Impact Measurement subgroup is active
Surveys: 2009-2017

- Asia: Myanmar, China, Lao PDR, Pakistan, Cambodia, Thailand, Gambia, Nigeria, Malawi, Zambia, Zimbabwe, Bangladesh, DPRK, Mongolia, Philippines, Viet Nam, Nepal, India, Myanmar
- Africa: Tanzania, Sudan, Ghana, Indonesia, Uganda, Rwanda, Kenya, Mozambique, South Africa, Uganda, Gambia, Thailand, Nigeria, Zimbabwe, Madagascar, Malawi, Indonesia, Bangladesh, Nepal, India, Myanmar
Reports
Publications

Tuberculosis prevalence in China, 1990–2010; a longitudinal analysis of national survey data

The first national tuberculosis prevalence survey of Lao PDR (2010–2011)

National tuberculosis prevalence surveys in Africa, 2010-2015: An overview of results and lessons learned

The first population-based national tuberculosis prevalence survey in Ethiopia, 2010-2011

Significant decline in the tuberculosis burden in the Philippines ten years after initiating DOTS

National tuberculosis prevalence surveys in Asia, 1990–2012: an overview of results and lessons learned
WHO data and document repository

- Aggregated level data
- Individual level data
- Documents
  - SOPs
  - Forms

https://extranet.who.int/tb-prevalence-surveys/index.php/catalog/central

- 23 country profiles
- Cross-cutting chapters
- Cluster level data
- Input from survey teams, KNCV, US-CDC, RIT, independent consultants
- Due end of 2016
Methods
Consistent screening and diagnostic methods since 2009

Symptom identification and/or Sputum collection and/or Smear microscopy

Chest X-ray + Xpert MTB/RIF + Culture
What is measured in a national TB prevalence survey?

Prevalent survey TB cases

- TB patients currently on treatment
- TB patients who are in the early phase of treatment, some serious cases without conversion, MDR-TB, treatment interruption
- Converted to negative or with uncertainty of initial status
Technical support

INDEPENDENT CONSULTANTS

Bangladesh
Kenya
Malawi
Nigeria
Uganda

Mozambique
Pakistan
Rwanda
Tanzania
Viet Nam
Zambia

Gambia
Malawi
Philippines

Cambodia
Mongolia
Myanmar
Nepal

Philippines
Sudan
Thailand
Zimbabwe

Cambodia
Ethiopia
Gambia
Ghana
Indonesia

Kenya
Mongolia
Mozambique
Uganda
Zimbabwe

Bangladesh
Cambodia
Ethiopia
Ghana
Indonesia
Kenya
Lao PDR

Malawi
Myanmar
Nigeria
Philippines
South Africa
Sudan
Thailand
Uganda
Support & Collaboration

★ Multi-country workshops
   Cambodia
   Ghana
   Indonesia
   Ethiopia

★ Study trips
   Bangladesh
   Malawi
   Mongolia
   Thailand
   Uganda

▲ SRLs
   Adelaide
   Antwerp
   Milan
   Tokyo
Country-Country Collaboration

- **Cambodia** → Ethiopia, Kenya, Lao PDR, Uganda
- **Ethiopia** → Ghana, Sudan, Zimbabwe
- **Ghana** → Kenya
- **Indonesia** → Mongolia
- **Pakistan** → Sudan
10 key results
Surveys 2009-2016
### 1. TB prevalence

<table>
<thead>
<tr>
<th>Africa</th>
<th>S+ prevalence</th>
<th>Total bact-confirmed prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zambia</td>
<td></td>
<td>800</td>
</tr>
<tr>
<td>Nigeria</td>
<td></td>
<td>500</td>
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<tr>
<td>Tanzania*</td>
<td></td>
<td>400</td>
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<td>Malawi</td>
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<td>400</td>
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<td>Uganda</td>
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<tr>
<td>Ghana</td>
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<td>300</td>
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<tr>
<td>Zimbabwe</td>
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<tr>
<td>Ethiopia</td>
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<td>Gambia</td>
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<td>Myanmar</td>
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<td>Pakistan</td>
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<td>Thailand</td>
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<td>200</td>
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<tr>
<td>China</td>
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<td>200</td>
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</tbody>
</table>

- Considerable variation among countries, highest in Asia
- High proportion of cases that are bact-confirmed but smear-negative

*Tanzania: bacteriologically confirmed cases could not be verified*
2. Estimates pre- and post-survey

All forms, all ages

Prevalence per 1000 population (log scale)

Pre-survey prevalence (range of uncertainty)
Post-survey prevalence (range of uncertainty)
3. Repeat surveys show TB prevalence can be halved in a decade

[Graph showing trends in TB prevalence for different countries over time.]
4. TB prevalence systematically higher in men
5a. Ageing epidemic in Asia, mixed picture in Africa
5b. Absolute number of cases also highest in older age groups in some countries.

![Graph showing percentage of cases by age group for Asia and Africa.]

- **Asia**
  - China
  - Thailand
  - Cambodia
  - Lao PDR
  - Pakistan
  - Myanmar

- **Africa**
  - Tanzania
  - Ghana
  - Malawi
  - The Gambia
  - Zimbabwe
  - Rwanda
  - Nigeria
  - Sudan
  - Zambia
  - Ethiopia
  - Uganda

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**Weighted average**
6a. Prevalence:Notification ratio (S+)
Illustrates detection and/or reporting gaps

- P:N ratio highly variable
  - from 0.6-5

- Two examples
  - Nigeria: Detection and (to lesser extent) under-reporting
  - Indonesia: Considerable under-reporting of detected cases

*Following the publication of WHO’s Definitions and Reporting Framework for Tuberculosis (2013 revision), data on smear-positive notifications disaggregated by sex have not been systematically collected at the global level since 2013. For this reason, the P:N ratio could not be calculated for Sudan, Uganda, Zambia and Zimbabwe.
6b. Detection and reporting gaps systematically higher for men.
6c. Prevalence:Notification ratio by age

Selected examples
6d. Better detection of TB among people living with HIV

HIV prevalence much higher in notified cases compared with prevalent survey cases.
7. Many cases don’t report symptoms meeting criteria for presumptive TB

Typically 30–50% for both S+ and bact-confirmed; up to 70–80%

<table>
<thead>
<tr>
<th></th>
<th>Smear-positive</th>
<th>Bacteriologically confirmed</th>
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<tbody>
<tr>
<td>Zimbabwe</td>
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Proportion symptom screening negative and CXR positive

- Africa
- Asia

Graph showing the proportion of symptom screening negative and CXR positive for different countries.
8. Many symptomatic TB cases had sought care prior to detection by survey.
9. High proportion of TB patients being treated in private/NGO sector in several countries*

*Those currently on TB treatment at the time of the survey (excluding unknown location)
10. High proportion of S+ participants unlikely to have TB*

Proportion of smear-positive results

- **S+ not MTB** (culture not TB and NAA test-negative)
- **S+ MTB** (culture MTB and/or NAA test-positive)

*Surveys with systematic use of rapid molecular tests

*provisional results
Implications

• **Surveys can demonstrate**
  – the **true burden** (accurate) of TB disease
  – **reductions in disease burden** with repeat surveys, and in turn provide evidence about **intervention impact** and **service access**
  – that some countries can do better with **available interventions**
  – **transmission dynamics** (age and sex)

• **Survey results provide a platform to revisit policy**
  – **Reliance on smear microscopy** in the context of active case finding has to be reassessed
  – **Re-visit screening and diagnostic algorithms** used in routine clinical care and active case finding, including role of chest X-ray
Major challenges
>50% of surveys had problems with culture: Low culture confirmation among smear-positive TB cases (<85%)

Group 1: Classical definition of smear-positive TB based on culture and CXR
Group 2: Since 2013, new definition of smear-positive TB based on culture and Xpert/LPA

Difficult to standardise culture technique within and between countries indicating a transition to molecular technology as a replacement
Delays: Time taken to complete survey preparations and dissemination of results

Median preparation time: 3.0 years (range: 0.7-6.6)
• Procurement of X-ray equipment
• Strengthen laboratory capacity
• Time taken to identify a suitable implementing agency
• Funding availability

Median time to disseminate report/paper: 1.3 years (range: 0.5-2.2+)
• Finalising dataset/data cleaning
• No one assigned to write final report
Data management practices must be strengthened

Non-relational datasets not matching

<table>
<thead>
<tr>
<th>Result</th>
<th># of obs.</th>
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<tr>
<td>not matched</td>
<td>16,169</td>
</tr>
<tr>
<td>from master</td>
<td>15,940 (_merge==1)</td>
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<tr>
<td>from using</td>
<td>229 (_merge==2)</td>
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<tr>
<td>matched</td>
<td>2,204 (_merge==3)</td>
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</tbody>
</table>

Poor archiving of documents and CXRs

Manual transcription error
Substantial progress, but more to consider and improve upon

“It’s time we face reality, my friends. ... We’re not exactly rocket scientists.”
Acknowledgements

National TB Programmes

The Global Fund
To Fight AIDS, Tuberculosis and Malaria

USAID
From the American People

KNCV
To eliminate TB

INDEPENDENT CONSULTANTS

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End
Participation rate <80% in a few countries

- Urban areas more challenging than rural areas
- Males and/or young people less likely to participate
- Over-sampling of the cluster size to compensate (bias)

But better access to health service may be a good reason to start/repeat a survey
Other challenges

- Delays in case management
- Recruitment of appropriate staff
- Sampling errors – restricted sampling frames
- Data management problems
- Delay in disbursement of funds
- Insecurity/weather
- Delays in reading of central chest X-rays
- Inadequate correct action following TA visits