Ethiopian National TB Prevalence survey 2010-2011 Preliminary Result

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Outline of presentation

• Introduction
• Objectives
• Result
• Strength and Limitation of the study
• Major findings
• Implication to the program
• Strength and limitation
1. Introduction

- Projected Pop for 2010 = 79,731,054
  (76% - rural Pop, 16% - Urban and 8% - Pastoralist)
  ≥ 15 years = 55%
- Administratively divided into: 9 Regions and 2 City Administrations, 810 Districts and 15,022 Kebeles
Introduction

• Prevalence of TB all forms = 585/100000 (WHO 2009 report)
• Prevalence of smear positive TB = 284/100000 (2008 WHO estimate)
• Incidence Rate SS+ = 163/100000 (WHO 2009 estimate)
• 7th high TB burden country in the world
• 3rd high TB burden country in Africa
Introduction...

TB control Program performance of Ethiopia

Program achievement  Global target

• Current SS+ CDR=36%  70%
• TSR =84%  85%
• SS+ NR  = 57/100,000
• NR all forms  = 183/100,000
Rationale of TB prevalence survey for Ethiopia

• No study is available at population level
• Between 2007&2008, WHO estimate of SS+ TB increased from 152 to 168/100,000.
• The case detection rate remain steady between 32-34 % against the expected 70% global target.
• Evidence based approach is essential for plan and decision making.
• TB prevalence survey is one of the most effective tools to monitor the impact of the program.
Countries where surveys are recommended (Approved by Task Force Meeting, Dec 2007)

21 global focus countries
36 additional countries that met basic criteria

Note: Ethiopia was added to the global focus countries in 2009
2. Objective

1. To determine the prevalence of smear positive TB
2. To determine the prevalence of culture positive TB
3. To determine the prevalence of symptoms suggestive of TB
3. Method

- Cross-sectional survey
- Multistage cluster sampling
- Stratified: Urban, rural & pastoral populations
- Sample size: 46,514 (aged ≥ 15)
- Clusters: 85 (Urban: 14; Rural: 63; Pastoral: 8)
  
  cluster size: 548 subjects
List of selected districts
Sampling Stage

1. PPS
   - 85 (63 R, 14 U & 8 P)

2. PPS
   - 1 in each district, total 85

3. Random selection
   - n blocks, 550 individuals
Screening

Symptom screening
Chest X-ray screening

No symptoms
Normal chest X-ray

No smear microscopy
No culture

Symptoms or
Abnormal chest X-ray

Smear microscopy
Culture
Bacteriologic examination

• Two sputum (morning and spot) requested from survey TB suspects: smear done for both spot and morning and culture done for morning and rarely spot processed in case of morning not submitted.

• Smear microscopy using LED FM

• Culture using solid media
4. Result

- Survey operation started on October 2, 2010 and completed on June 25, 2011
- A total of 19,267 house hold members has been included in the study
- Census done for 95092 individuals (46186(49.6) male and 47906(50.4) Female.
- Total eligible invited to the study = 51667
Population pyramid of Ethiopia and survey participants
## Participation rate by sex

<table>
<thead>
<tr>
<th>Sex</th>
<th>Participation</th>
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<th>Total Eligible</th>
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<tbody>
<tr>
<td></td>
<td>participated(%)</td>
<td>Refused(%)</td>
<td>Absent(%)</td>
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<tr>
<td>Male</td>
<td>21819(88.6)</td>
<td>1(0)</td>
<td>2803(11.4)</td>
<td>24623</td>
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<tr>
<td>Female</td>
<td>24878(92)</td>
<td>2(0)</td>
<td>2164(8)</td>
<td>27044</td>
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<td>Total</td>
<td>46697(90.4)</td>
<td>3(0)</td>
<td>4967(9.6)</td>
<td>51667</td>
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</table>
## Participation rate by strata

<table>
<thead>
<tr>
<th>Strata</th>
<th>Participated(%)</th>
<th>Refused</th>
<th>Absent(%)</th>
<th>Total eligible invited</th>
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</thead>
<tbody>
<tr>
<td>Urban</td>
<td>7490(86.5)</td>
<td>0</td>
<td>1164(13.5)</td>
<td>8654</td>
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<tr>
<td>Rural</td>
<td>34952(91.5)</td>
<td>3(0)</td>
<td>3226(9.5)</td>
<td>381829</td>
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<tr>
<td>Pastoral</td>
<td>4255(88.1)</td>
<td>0</td>
<td>577(11.9)</td>
<td>4832</td>
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<tr>
<td>Total</td>
<td>46697(90.4)</td>
<td>3(0)</td>
<td>4967(9.6)</td>
<td>51667</td>
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Eligible study population: 51,667 (54%)

Participants (screened by at least one method): 46,697 (90%)

Participants symptoms screening: 46,697 (100%)
Participants chest X-ray screening: 46,548 (99.7%)

Participants screened by both methods: 46,548 (99.7%)

Total number of individuals eligible for sputum examination: 6,078 (13%)
- 806 (13%) eligible by both screening methods
- 2,219 (36%) eligible by symptoms screening only
- 3,012 (50%) eligible by chest X-ray screening only
- 41 (1%) exempted/refused CXR & symptomatic

At least 1 sputum specimen collected: 5,864 (96%)
Both sputum specimens collected: 5,606 (92%)

At least 1 specimen examined with smear: 5,863 (~100%)
Specimen examined with culture: 5,809 (99%)
Both specimens examined with smear: 5,598 (99%)

At least 1 smear result available: 5.770 (99%)
Culture result available: Both smear results available
Smear Positive Study Cases = 47

- 61 showed at least one slide AFB smear positive screened by LED Fluorescent MS.
  - **33 Definite Cases:** Isolation of Mycobacterium Tuberculosis by culture = study case
  - **14 Probable Cases:** 8 subjects with 2 smear positive slides, 6 subjects with 1 smear positive slide with CXR consistent with TB by a panel reading = study case
  - 13 Possible Cases: Non-study case: One slide positive without any other evidence to suggest TB
  - 1 NTM: Isolation of Mycobacterium other than TB without co-isolation of Mycobacterium tuberculosis
Smear Negative Culture Positive Study Cases = 63

63 Smear Negative MTB Culture Positive Subjects

– **59 Definite Case** with CXR consistent with TB

– **4 Probable Case**: "MTB isolates 10 colonies or more" without CXR consistent with TB
  : Isolations of MTB from two tubes

– 0 Possible Case: MTB isolates less than 10 colonies without CXR consistent with TB = Non Study Case
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<td>4 2</td>
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<td>82</td>
<td>21</td>
<td>3 12</td>
<td>63</td>
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<td></td>
<td></td>
<td>92</td>
<td>18</td>
<td>18 13</td>
<td>123</td>
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</tbody>
</table>

*BE: Bronchial Echtasis
Smear and culture TB cases

Smear-positive: 47
- 25 identified by both screening methods
- 2 identified by symptoms screening only
- 20 identified by chest X-ray screening only
(Note: All smear positive culture conformed cases were identified by CXR screening)

Smear-negative, culture-positive: 63
- 21 identified by both screening methods
- 9 identified by symptoms screening only
- 33 identified by chest X-ray screening only

Positive bacteriological result: 110
- 46 identified by both screening methods
- 11 identified by symptoms screening only
- 53 identified by chest X-ray screening only
Prevalence of smear positive TB and bacteriologically confirmed TB by sex among participants

<table>
<thead>
<tr>
<th></th>
<th>$P$ of $S^+$ TB per 100000 (95% CI)</th>
<th>$P$ of $S^+$ and/or $C^+$ TB per 100000 (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>123 (75–171)</td>
<td>287 (201–374)</td>
</tr>
<tr>
<td>Female</td>
<td>83 (44–122)</td>
<td>232 (163–301)</td>
</tr>
<tr>
<td>Total</td>
<td>105 (72,138)</td>
<td>259 (205,314)</td>
</tr>
</tbody>
</table>
## Point Prevalence of smear positive TB by strata among participants

<table>
<thead>
<tr>
<th>Strata</th>
<th>Smear Positive</th>
<th>Total Participants</th>
<th>P of Smear positive TB/100000 (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>5</td>
<td>7490</td>
<td>77 (0,159)</td>
</tr>
<tr>
<td>Rural</td>
<td>35</td>
<td>34952</td>
<td>103 (62,143)</td>
</tr>
<tr>
<td>Pastoralist</td>
<td>7</td>
<td>4255</td>
<td>167 (64,269)</td>
</tr>
</tbody>
</table>
Prevalence of Smear positive and bactiriologically confirmed TB by age group among participants

<table>
<thead>
<tr>
<th>Age</th>
<th>P of S+ per 100000 (95%CI)</th>
<th>P of S+ and/or C+ per 100000 (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-34</td>
<td>81 (28–134)</td>
<td>218 (129–307)</td>
</tr>
<tr>
<td>35-44</td>
<td>111 (41–181)</td>
<td>237 (122–353)</td>
</tr>
<tr>
<td>45-54</td>
<td>136 (22–249)</td>
<td>321 (152–490)</td>
</tr>
<tr>
<td>55-64</td>
<td>158 (19–297)</td>
<td>369 (146–592)</td>
</tr>
<tr>
<td>65+</td>
<td>39 (0–118)</td>
<td>215 (22–408)</td>
</tr>
</tbody>
</table>
Survey detected cases

55% (60/110) are younger than 35
Smear + < Smear negative culture positive

42.7% of Confirmed cases are smear positive
Survey detected cases and case notification in 2010

Survey

Notification data 2010
TB history of Prevalent Cases
98% of C+ (94/96) are undetected cases

• **33 S+C+**

  **32 Not on treatment (97%)**
  – 27 New Cases (No TB Treatment History at least in 5 years)
  – 5 Previously Treated
  – 1 On treatment

• **63 S-C-**

  **62 Not on treatment (99%)**
  – **59 New**
  – 3 Previously treated
  – 1 Previously treated and On treatment

• **14 S+C-**

  **13 Not on treatment (93%)**
  – 10 New
  – 3 Previously treated
  – 1 Previously treated and On treatment
Extrapolating nationwide prevalence

• Adjusting for children (0-14)
  – Percentage of children over total population is 45%
  – S+ notification rate per 100,000 of children since 2000 has: mean=7.5, SD=1.1
  – Assuming notification is a correct estimate of prevalence rate
  – Prevalence among total population
    \[ p_{total} = p_{child} \times c + p_{adult} \times (1-c) \]
    where \( p_{child} \) is the prevalence among children, \( p_{adult} \) the prevalence among adults drawn from the survey and \( c \) the percentage of children in the country

• Adjusting for extra-pulmonary TB
  – Assuming EP prevalence rate constant across all ages
  – Percentage of EP over total notifications since 2000 has: mean=34.8%, SD=1.2%
Prevalence of TB in Ethiopia (extrapolation using survey result and program routine report)

<table>
<thead>
<tr>
<th>Forms of TB</th>
<th>P per 100000</th>
<th>95%CI</th>
<th>Notification rate of the country for/100000</th>
<th>WHO estimate,</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smear positive TB</td>
<td>61</td>
<td>44-81</td>
<td>57</td>
<td>284(2008 estimate)</td>
</tr>
<tr>
<td>Bacteriologically confirmed TB</td>
<td>146</td>
<td>118-176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All forms of TB</td>
<td>224</td>
<td>181-271</td>
<td>183</td>
<td>585(2010 report)</td>
</tr>
</tbody>
</table>
5. Strengths/Limitations

- Strong commitment and leadership of government
- Committed survey team
- Open process: contribution to other African countries
- Good community involvement and their contributions
- High participation rate
- High sputum collection rate
- International standard screening practice
- Strong supports by partners especially by WHO CO and HQ
- Country – country collaboration
Strength....

• Using the national TB laboratory for both smear and culture examination
• Strict supervision of lab by senior microbiologists
Limitations

- Age <15 not studied
- Only one culture per "suspect"
6. Major Findings

- Observed TB prevalence is much lower than WHO estimation.
- Most patients (55%) were young (15 to 34).
- Male: Female ratio is almost 1:1.
- Smear Positive Cases account only 43% of bacteriologically positive cases.
7. Implication to the Program

• Incidence rate of smear positive TB could be $<70/100000?$ (WHO estimate 163/100000)
• Ethiopia could achieve MDG targets for TB
• From 47 smear positive TB cases only two were on treatment and 27 individuals were symptomatic: this is an indication that TB is circulating in the community and there is a need to strengthen TB screening in the community.
Implication to the Program...

• The survey result shows x-ray picks up most bacteriologically confirmed TB cases.
  – Chest x-ray could be a good tool to screen or diagnose pulmonary TB

• More than 50% of cases are smear negative and culture positives
Acknowledgement

• WHO (HQ, CO)
• Italian cooperation
• TBCARE, Ethiopia
• USAID
• GLRA
THANK YOU!