TB Epidemiology and Global Elimination Strategy

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Objectives

- Describe the global epidemiology of tuberculosis (TB)
- Understand global TB elimination strategies
  - Millennium Development Goals
  - Stop TB Strategy
  - DOTS
- Identify remaining challenges for progress towards global TB elimination targets
- Understand how local TB efforts impact global TB epidemiology and progress towards TB elimination
10 Facts about TB

1. In 2011, 8.7 million people fell ill with TB
   - Only ~5.8 million newly diagnosed were reported to National TB Programs
   - Incidence rate of 125/100,000 population
   - Disease of poverty that thrives where social and economic determinants of ill health prevail
   - Affects mostly young adults in their most productive years

10 Facts about TB

2. About 80% of reported TB cases occurred in 22 countries in 2011
   - Nearly 60% of new TB cases occurred in Asia
   - Sub-Saharan Africa has highest rate of new cases per capita (26% of cases)

• The largest estimated numbers of incident cases
  - India (uncertainty range 2.0 million to 2.5 million) and
  - China (0.9 million to 1.1 million).

Estimated tuberculosis (TB) incidence rates, 2011

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10 Facts about TB

3. A total of 1.4 million people died from TB in 2011
   - TB remains one of world's top infectious killers.
   - About 95% of TB deaths occur in low- and middle-income countries
   - TB is among the top three causes of death among women aged 15 to 44.

One person dies of TB every 20 seconds. TB is preventable and curable.
10 Facts about TB

4. Up to 70,000 children died due to TB globally in 2011
   - Childhood TB often overlooked by health providers and can be difficult to diagnosis and treat.
   - There are about 10 million orphan children as a result of adult TB deaths.

10 Facts about TB

5. TB is leading killer of people living with HIV
   - 1.1 million TB cases reported in people with HIV, 2011
   - ~1 in 4 deaths among people with HIV due to TB (including 430 000 in 2011)

10 Facts about TB

6. Multidrug-resistant TB (MDR-TB) does not respond to standard treatments, difficult and costly to treat
   – Estimated 630,000 people with MDR-TB in 2011
   – Present in virtually all countries surveyed by WHO
   – The primary cause of multi-drug resistance is the inappropriate or incorrect use of anti-TB drugs

Percentage of previously treated tuberculosis cases with MDR-TB*

* MDR-TB: multidrug-resistant tuberculosis (resistance to, at least, isoniazid and rifampicin)
Note: Figures are based on the most recent year for which data have been reported, which varies among countries.

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Percentage of new tuberculosis cases with MDR-TB*

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10 Facts about TB

7. Extensively drug-resistant TB (XDR-TB) reported in 84 countries
   - XDR-TB is an even more severe form of multi-drug resistant TB that responds to even fewer available medicines.

Countries that had notified at least one case of XDR-TB by the end of 2011

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10 Facts about TB

8. About 51 million TB patients have been **successfully treated** since 1995 worldwide.
   - Up to 20 million lives have been saved since 1995 through DOTS and the Stop TB Strategy.

10 Facts about TB

9. Although one-third of the world (2M) is infected with M. tuberculosis, **TB can be prevented:**
   - Prevent transmission with early detection by active TB screening in high risk populations
   - Conduct effective contact investigations to detect new cases, identify persons at risk of future TB
   - Treat latent TB infection (LTBI) if detected
     - INH preventive therapy for HIV+ persons without active TB
10. The world is on track to achieve two global TB targets set for 2015:

- The Millennium Development Goal, which aims to **halt and reverse the TB epidemic by 2015** has already been achieved.
- The Stop TB Partnership target of halving deaths from TB (in comparison with 1990).
  - **41% since 1990**; World is on track to achieve the global target of a 50% reduction by 2015.
  - **Europe and Africa are not on track**.

Global trends in estimated rates of TB incidence, prevalence and mortality

Source: Global Tuberculosis Report 2012, WHO
Global TB Elimination Strategies
The United Nations Millennium Development Goals (MDGs)

- Eight goals that all 191 UN Member States have agreed to try to achieve by the year 2015.
- United Nations Millennium Declaration signed in September 2000
- Commits world leaders to combat poverty, hunger, disease, illiteracy, environmental degradation, and discrimination against women.
- The MDGs are derived from this Declaration, and all have specific targets and indicators.
- The MDGs are inter-dependent; all the MDG influence health, and health influences all the MDGs.
  - For example, better health enables children to learn and adults to earn. Gender equality is essential to the achievement of better health. Reducing poverty, hunger and environmental degradation positively influences, but also depends on, better health.
The Eight Millennium Development Goals (MDGs) are:

1. Eradicate extreme poverty and hunger;
2. Achieve universal primary education;
3. Promote gender equality and empower women;
4. Reduce child mortality;
5. Improve maternal health;
6. Combat HIV/AIDS, malaria, and other diseases;
7. Ensure environmental sustainability; and
8. Develop a global partnership for development.
MDG Targets for Tuberculosis

- **MDG 6**: Combat HIV/AIDS, malaria and other diseases
  - **Target 6.C**: Halt and begin to reverse the incidence of malaria and other major diseases (including TB)
  - **Indicator 6.9**: Incidence, prevalence and death rates associated with TB
  - **Indicator 6.10**: Proportion of TB cases detected and cured under DOTS
MDG Targets for Tuberculosis

Related 2015 targets under MDGs 4 and 5

- **Goal 4:** Reduce child mortality
  - Target 4.A: Reduce the under-five mortality rate by two thirds between 1990 and 2005

- **Goal 5:** Improve maternal health
  - Target 5.A: Reduce the maternal mortality ratio by three quarters between 1990 and 2005
Stop TB Partnership

- The **Stop TB Partnership** is a global coalition of stakeholders established to coordinate international efforts (housed at WHO).

- **The Stop TB Strategy** (2006) comprises best practices in the diagnosis and treatment of patients with active TB, approaches to address major epidemiological and system challenges of today, and the promotion of research for innovations.

- It underpins the **Global Plan 2011–2015**, a comprehensive and budgeted plan to reach the global targets.
# THE STOP TB STRATEGY

## VISION
A TB-FREE WORLD

## GOAL
To dramatically reduce the global burden of TB by 2015 in line with the Millennium Development Goals and the Stop TB Partnership targets

## OBJECTIVES
- Achieve universal access to high-quality care for all people with TB
- Reduce the human suffering and socioeconomic burden associated with TB
- Protect vulnerable populations from TB, TB/HIV and multidrug-resistant TB
- Support development of new tools and enable their timely and effective use
- Protect and promote human rights in TB prevention, care and control

## TARGETS
- MDG 6, Target 8: Halt and begin to reverse the incidence of TB by 2015
- Targets linked to the MDGs and endorsed by Stop TB Partnership:
  - 2015: reduce prevalence of and deaths due to TB by 50%
  - 2050: eliminate TB as a public health problem
THE 6 COMPONENTS

1. PURSUE HIGH-QUALITY DOTS EXPANSION AND ENHANCEMENT
   a. Secure political commitment, with adequate and sustained financing
   b. Ensure early case detection, and diagnosis through quality-assured bacteriology
   c. Provide standardised treatment with supervision, and patient support
   d. Ensure effective drug supply and management
   e. Monitor and evaluate performance and impact

2. ADDRESS TB-HIV, MDR-TB, AND THE NEEDS OF POOR AND VULNERABLE POPULATIONS
   a. Scale-up collaborative TB/HIV activities
   b. Scale-up prevention and management of multidrug-resistant TB (MDR-TB)
   c. Address the needs of TB contacts, and poor and vulnerable populations

3. CONTRIBUTE TO HEALTH SYSTEM STRENGTHENING BASED ON PRIMARY HEALTH CARE
   a. Help improve health policies, human resource development, financing, supplies, service delivery and information
   b. Strengthen infection control in health services, other congregate settings and households
   c. Upgrade laboratory networks, and implement the Practical Approach to Lung Health (PAL)
   d. Adapt successful approaches from other fields and sectors, and foster action on the social determinants of health

4. ENGAGE ALL CARE PROVIDERS
   a. Involve all public, voluntary, corporate and private providers through Public-Private Mix (PPM) approaches
   b. Promote use of the International Standards for Tuberculosis Care (ISTC)

5. EMPOWER PEOPLE WITH TB, AND COMMUNITIES THROUGH PARTNERSHIP
   a. Pursue advocacy, communication and social mobilization
   b. Foster community participation in TB care, prevention and health promotion
   c. Promote use of the Patients' Charter for Tuberculosis Care

6. ENABLE AND PROMOTE RESEARCH
   a. Conduct programme-based operational research
   b. Advocate for and participate in research to develop new diagnostics, drugs and vaccines

© WHO 2010
The Global Plan to Stop TB, 2011-2015

<table>
<thead>
<tr>
<th>PLAN COMPONENT AND INDICATORS</th>
<th>BASELINE 2009</th>
<th>TARGET 2015</th>
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<tbody>
<tr>
<td><strong>DOTS/Laboratory strengthening</strong></td>
<td></td>
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<tr>
<td>Number of cases diagnosed, notified and treated according to the DOTS approach (per year)</td>
<td>5.8 million</td>
<td>6.9 million</td>
</tr>
<tr>
<td>Treatment success rate (in annual cohort)</td>
<td>86%</td>
<td>90%</td>
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<tr>
<td>Number of countries with ≥1 laboratory with sputum smear microscopy services per 100 000 population</td>
<td>≥75</td>
<td>149</td>
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<tr>
<td>Percentage of laboratories providing sputum smear microscopy services that are using LED microscopes for diagnosis of smear-positive TB</td>
<td>&lt;1%</td>
<td>20%</td>
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<tr>
<td><strong>Drug-resistant TB/Laboratory strengthening</strong></td>
<td></td>
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<tr>
<td>Percentage of previously treated TB patients tested for MDR-TB</td>
<td>7%</td>
<td>100%</td>
</tr>
<tr>
<td>Percentage of new TB patients tested for MDR-TB</td>
<td>7%</td>
<td>20%</td>
</tr>
<tr>
<td>Number of countries among the 22 high burden countries (HBCs) and 27 high MDR-TB burden countries with ≥1 culture laboratory per 5 million population</td>
<td>18–21</td>
<td>36</td>
</tr>
<tr>
<td>Percentage of confirmed cases of MDR-TB enrolled on treatment according to international guidelines</td>
<td>36%</td>
<td>100%</td>
</tr>
<tr>
<td>Number of confirmed cases of MDR-TB enrolled on treatment according to international guidelines</td>
<td>11 000</td>
<td>~270 000</td>
</tr>
<tr>
<td>Treatment success rate among confirmed cases of MDR-TB</td>
<td>60%</td>
<td>≥75%</td>
</tr>
<tr>
<td><strong>TB/HIV/Laboratory strengthening</strong></td>
<td></td>
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<tr>
<td>Percentage of acid-fast bacilli (AFB) smear-negative, newly notified TB cases screened using culture and/or molecular-based test</td>
<td>&lt;1%</td>
<td>≥50%</td>
</tr>
<tr>
<td>Percentage of TB patients tested for HIV</td>
<td>26%</td>
<td>100%</td>
</tr>
<tr>
<td>Percentage of HIV-positive TB patients treated with co-trimoxazole therapy (CPT)</td>
<td>75%</td>
<td>100%</td>
</tr>
<tr>
<td>Percentage of HIV-positive TB patients treated with antiretroviral therapy (ART)</td>
<td>37%</td>
<td>100%</td>
</tr>
<tr>
<td>Percentage of people living with HIV attending HIV care services who were screened for TB at their last visit</td>
<td>-25%</td>
<td>100%</td>
</tr>
<tr>
<td>Percentage of people living with HIV attending HIV care services who were enrolled on isoniazid preventive treatment (IPT), among those eligible</td>
<td>&lt;1%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Laboratory strengthening (additional to those above)</strong></td>
<td></td>
<td></td>
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<tr>
<td>Percentage of national reference laboratories implementing a quality management system according to international standards</td>
<td>&lt;5%</td>
<td>≥50%</td>
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Progress Towards Global Targets

• Access to TB care has expanded substantially since the mid-1990s (when WHO launched a new global TB strategy and began systematically monitoring progress)

• Between 1995 and 2011:
  – 51 million people were successfully treated for TB in countries that had adopted the WHO strategy
  – Resulting in 20 million lives saved

• Since collaborative TB/HIV activities were first recommended by WHO in 2004:
  – An estimated 1.3 million lives were saved between 2005 and 2011.

• At the country level, Cambodia demonstrates what can be achieved in a low income and high-burden country:
  – 45% decrease in TB prevalence since 2002.
Progress Towards Global Targets

- Innovations in diagnostics are being implemented.
  - Impressive roll-out of Xpert MTB/RIF, a rapid molecular test that can diagnose TB and rifampin resistance within 100 min
  - Between its endorsement by WHO in December 2010 and the end of June 2012, 1.1 million tests had been purchased by 67 low- and middle-income countries
  - A 41% price reduction (from US$ 16.86 to US$ 9.98) in August 2012 should accelerate uptake
Progress Towards Global Targets

• Development of new drugs and new vaccines also progressing
  – New or re-purposed TB drugs and novel TB regimens to treat drug-sensitive or drug resistant TB are advancing in clinical trials and regulatory review
  – 11 vaccines to prevent TB moving through development
Remaining Challenges for TB Elimination in 2013
New Diagnostics Needed to “Mind the Gap” in TB Case Detection

![Graph showing TB cases and estimated incidence](image)

- Estimated incidence: 7.6 in 1990, 8.8 in 2010
- Cases detected and notified: 3.7 in 1990, 5.8 in 2010
Gap in TB Case Detection

- Many TB cases are treated but not reported
  - Cases are treated in the private sector or in general hospitals that are not part of services linked to national programs

- Many TB cases go undiagnosed
  - People with no health insurance and no social protection lack access to health care
  - Laboratory network is underperforming
Slow Progress Responding to MDR-TB

- One in five (19%) of notified MDR-TB patients treated (2011)
- 48% of those who started were *successfully* treated

*Treatment outcomes for MDR-TB patients started on treatment in 2009, by WHO Region and Global*

The number of countries reporting outcomes for at least one MDR-TB case, followed by the total cases with outcome results, shown beside each bar.
Insufficient Progress Implementing Collaborative TB/HIV Activities

- Only 40% of TB patients (2.5M) tested for HIV (2011)
- Of TB patients with known HIV, 48% were started on antiretroviral therapy (ART)
  - Coverage needs to double to meet WHO recommendation that all HIV+ TB patients are promptly started on ART
- 79% of HIV+ TB patients treated with co-trimoxazole (CPT)
- The Three I’s for HIV/TB
  - Intensified case finding for TB in HIV+ persons
  - Isoniazid preventive therapy (IPT) for HIV+ (*if TB ruled out*)
  - Infection control
Percentage of tuberculosis (TB) patients with known HIV status by country, 2011*

* Data for the Russian Federation are for new TB patients only.

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Percentage of HIV-positive tuberculosis (TB) patients enrolled on antiretroviral therapy (ART), 2011

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Remaining Challenges: Funding

- Critical funding gaps for TB care and control remain
  - Between 2013 and 2015 up to US$ 8 billion per year is needed in low- and middle-income countries
  - Funding gap of up to US$ 3 billion per year

- International donor funding is especially critical to sustain recent gains and make further progress in 35 low-income countries (25 in Africa)
  - Donors provide more than 60% of current funding.

- Also critical funding gaps for research and development
  - US$ 2 billion per year is needed
  - Funding gap was US$ 1.4 billion in 2010
## TB Epidemiology Profile

<table>
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<tr>
<th></th>
<th>GLOBAL</th>
<th>HAITI</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>10 Million</td>
<td>10 Million</td>
<td>313 Million</td>
</tr>
<tr>
<td>Infected with M. tuberculosis</td>
<td>1.7 billion (33% pop.)</td>
<td>Not reported</td>
<td>10 million (4% pop.)</td>
</tr>
<tr>
<td>Incidence rate</td>
<td>125 (222 (183-265)</td>
<td>4.7 (1.9-8.8)</td>
<td></td>
</tr>
<tr>
<td>Prevalence rate</td>
<td>170</td>
<td>307 (152-516)</td>
<td>3.9 (3.4-4.40)</td>
</tr>
<tr>
<td>Death rate</td>
<td>20</td>
<td>30 (15-53)</td>
<td>0.13 (0.13-0.14)</td>
</tr>
<tr>
<td>% with MDR (new)</td>
<td>3.7%</td>
<td>2.1% (0.7-3.4)</td>
<td>1.4% (1.1–1.7)</td>
</tr>
<tr>
<td>% with MDR (retreatment)</td>
<td>20%</td>
<td>11% (4.3-18)</td>
<td>7.6% (4.9–11)</td>
</tr>
<tr>
<td>% HIV+ TB</td>
<td>13%</td>
<td>19%</td>
<td>8%</td>
</tr>
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## Comparison of TB indicators, 2011

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<th>USA</th>
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</thead>
<tbody>
<tr>
<td>TB case notification</td>
<td>67%</td>
<td>64%</td>
<td>NR by CDC</td>
</tr>
<tr>
<td>Treatment success rate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sm+ or cx+</td>
<td>87%</td>
<td>82%</td>
<td>92-93%*</td>
</tr>
<tr>
<td>Sm- or EPTB</td>
<td>85%</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>Retreatment</td>
<td>69%</td>
<td>75%</td>
<td>NR</td>
</tr>
<tr>
<td>Cases with known HIV status</td>
<td>40%</td>
<td>73%</td>
<td>82%*</td>
</tr>
<tr>
<td>HIV+ on CPT</td>
<td>79%</td>
<td>12%</td>
<td>NR</td>
</tr>
<tr>
<td>HIV+ on ART</td>
<td>48%</td>
<td>17%</td>
<td>NR</td>
</tr>
<tr>
<td>Available funding (2012)</td>
<td>NR</td>
<td>7M</td>
<td>140M</td>
</tr>
<tr>
<td>% of budget funded (2012)</td>
<td>Gap=$0.4–0.7 billion/y</td>
<td>31%</td>
<td>NR</td>
</tr>
</tbody>
</table>

Data source from CDC rather than WHO as more current
Social and Economic Determinants of Health

- Recognition that TB depends largely upon social and economic determinants of ill health crucial to achieving full control and elimination.
- Factors such as smoking, alcohol abuse, diabetes, indoor air pollution, and malnutrition, like HIV, are affecting TB epidemiology and impeding faster progress toward TB control.
- At the population level, these factors seem to contribute to considerable proportions of TB cases worldwide and to differing extents by region.
Social and Economic Determinants of Health

- Preventive strategies may result in remarkable outcomes among certain vulnerable groups, such as people with diabetes and those with HIV.
- Reductions in levels of smoking, alcohol abuse, malnutrition, and indoor air pollution will further reduce TB infection and disease.
- Broad education of people, promotion of good health, universal health care coverage, and poverty-reduction strategies will impact the TB epidemic by progressively removing individuals from the vulnerable pool.

Glaziou et al Global Epidemiology of Tuberculosis. Semin Respir Crit Care Med 2013;34:3–16.
Reaching the Goal of TB Elimination

- “To accelerate progress, wider application of existing interventions combined with development and implementation of new drugs, vaccines, and diagnostic tools is required, as set out in the Stop TB Strategy and the Global Plan to Stop TB.”

Glaziou et al Global Epidemiology of Tuberculosis. Semin Respir Crit Care Med 2013;34:3–16.
Something can be done about tuberculosis!
Resources

• www.who.int/tb/publications/global_report/
• www.who.int/topics/tuberculosis/
• www.stoptb.org
• Glaziou et al Global Epidemiology of Tuberculosis. Semin Respir Crit Care Med 2013;34:3–16.
Tuberculosis in the Americas

Pan-American Health Organization (PAHO)
### TB in the Americas

#### Region of the Americas

- 268,000 new estimated TB cases and 30,000 estimated deaths due to TB, including those co-infected with HIV in the Americas.
- New estimated TB cases represented 3% of the global burden of the disease.
- Four countries (Brazil, Peru, Mexico and Haiti) had 60% of the estimated TB cases.
- The estimated incidence rate for the region was 28 cases per 100,000 population.

Data from PAHO
**TB Laboratory in the Americas, 2011**

- 17 countries had 1 microscopy laboratory per 100,000 population.
- 14 countries had 1 culture laboratory per 5 million population.
- 8 countries had 1 drug sensitivity testing laboratory per 5 million population.
- 7 countries incorporated molecular tests.

Data from PAHO
Notifications of TB in the America Region, 2011

- The Americas notified 218,000 TB cases of which 9,800 (5.1%) were children
- The notified incidence rate was 23 cases per 100,000 population
- TB case detection represented between 81 and 84% of the estimated cases, with big differences among countries
- Treatment success rate for new smear + pulmonary TB cases was 75%, cohort 2010

Data from PAHO
Case Detection Gaps in the American Region, 2011

Data from PAHO
TB/HIV in the America Region, 2011

TB/HIV

- HIV testing was performed and the result known in 54% of the notified TB cases.
- 17% of TB cases with HIV results were positive.
- 64% of the TB/HIV cases received Antiretroviral therapy and 43% Co-trimoxazol Preventive Therapy.

Data from PAHO
MDR-TB in the America Region, 2011

MDR-TB (Multidrug Resistant TB)

- 6,000 MDR-TB cases were estimated.
- 3,500 MDR-TB cases were diagnosed and 80% started treatment.
- 11 countries reported at least 1 XDR-TB case (extensively drug-resistant TB).

Data from PAHO
Financial Gap in the America Region, 2011

Financial Data

- 15 countries that reported available resources for TB control, reported 90% of them coming from the state.
- These 15 countries reported a financial gap of USD 38 million for 2013.

Data from PAHO
The Americas and MDG 6

Target 6c: To have halted and reverse TB incidence...

- Incidence diminishes 3% annually.

Indicator 6.9: TB prevalence and death rates reduced by 50% by 2015 relative to 1990

- Mortality has diminished by 61% in 2011 with respect to 1990.
- Prevalence has diminished by 62% in 2011 with respect to 1990

Data from PAHO
Estimated Incidence, 1900-2015

Data from PAHO
Estimated Prevalence, 1990-2015

Data from PAHO
Estimated Mortality, 1990-2015

Data from PAHO