Tuberculosis: a persistent global health challenge

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What is TB?

Tuberculosis is an infectious disease caused by *Mycobacterium tuberculosis*

- Active TB: sick and contagious

Most infected people do not develop the disease

- These people are *not* contagious
- We call this ‘latent infection’
Clinical manifestations of TB

General
- Fever, weight loss, weakness
- “Consumption”, “Phthisis”

Organ specific
- Lungs: cough, spitting up blood
- Others:
  - Scrofula: swollen lymph nodes
  - Spine: ‘hump-back’
  - Etc.
“Youth grows pale and spectre thin and dies”

TB killed Keats at the age of 25.
TB was nearly always fatal before the advent of anti-TB drugs
Nelson Mandela
John Keats
Bronte sisters
Jane Austen
Franz Kafka
Anton Chekhov
George Orwell
Frederic Chopin
DH Lawrence...
Tuberculosis, Man, and Society
René and Jean Dubos
The White Plague
With a new Foreword by David Mechanic and a new Introductory Essay by Barbara Gutmann Rosenkrantz

The Forgotten Plague
How the Battle Against Tuberculosis Was Won — And Lost
Frank Ryan, M.D.

THOMAS MANN
THE MAGIC MOUNTAIN
TB is still a huge problem globally!

**In 2017**
- **1.6 million people** died from TB, including 300,000 people with HIV.
- **3.6 million global gap**
  - 6.4 million were detected and notified.
  - 3.6 million people with TB were undiagnosed or detected and not reported.

**Access to MDR-TB treatment**
- Only one in four people had access to MDR-TB treatment.

**Treatment outcomes**
- Of those treated, only 55% were cured.

**Preventive treatment**
- Only 36% of people newly enrolled in HIV care were started on TB preventive treatment.
- Only 23% of children under 5 years, estimated to be eligible for TB preventive treatment were started on it.

WHO strongly recommends preventive treatment for people living with HIV, and children under 5 years living in households with TB.
Drug-resistant TB

558000 people developed disease resistant to at least rifampicin—the most effective first-line TB drug.
What is the strategy for TB control?

In the absence of a good vaccine, “test and treat” is the key strategy for control.

Detect TB cases (once patients become sick) and put them on 6 month, short-course, multidrug therapy, and ensure adherence.
- Thereby reduce transmission to others.

Packaged as the “DOTS” strategy:
- 70/85 targets:
  - Detect 70% of smear-positive cases
  - Cure 85% of the cases identified
DOTS has saved lives, and cured many.

**TARGETS ON TRACK**

- Reduction in TB mortality rate of 45% since 1990
- 37 million lives saved since 2000
- 86% cure rate and 61 million patients cured, 1995-2013

**BUT....**

Ref: Global TB Control Report 2014
TB cases and deaths in **slow decline**, 1990-2016
Full implementation of Global Plan: 2015 MDG target reached but TB not eliminated by 2050

Current rate of decline:
-1.5%/yr

W Europe 1950-60s:
-10%/yr

China, Cambodia:
-4%/yr

Elimination target:<1 / million/yr
-20%/yr
MDR-TB is a crisis in some areas

India, China, Russia, Pakistan and Ukraine have 60% of all MDR-TB cases

Percentage of new TB cases with MDR-TB

Highest % in the former USSR countries

Ref: Global TB Control Report 2014
TB/HIV is a huge problem in Africa

Estimated HIV prevalence in new TB cases, 2013

78% of TB/HIV cases in Africa

Other co-morbidities emerging in other regions
FUNDING GAPS IMPEDE EFFORTS TO END TB

FUNDING GAP

TB CARE AND PREVENTION:

FUNDING GAP OF US$ 2.3 BILLION IN 2017

RESEARCH & DEVELOPMENT:

FUNDING GAP OF US$ 1.2 BILLION PER YEAR REQUIRED FOR THE DEVELOPMENT OF NEW TOOLS

World Health Organization
### Vision
- A world free of tuberculosis
- Zero deaths, disease and suffering due to tuberculosis

### Goal
End the global tuberculosis epidemic

### Milestones for 2025
- 75% reduction in tuberculosis deaths (compared with 2015);
- 50% reduction in tuberculosis incidence rate (compared with 2015)
  (less than 55 tuberculosis cases per 100,000 population)
- No affected families facing catastrophic costs due to tuberculosis

### Targets for 2035
- 95% reduction in tuberculosis deaths (compared with 2015)
- 90% reduction in tuberculosis incidence rate (compared with 2015)
  (less than 10 tuberculosis cases per 100,000 population)
- No affected families facing catastrophic costs due to tuberculosis

### Principles
1. Government stewardship and accountability, with monitoring and evaluation
2. Strong coalition with civil society organizations and communities
3. Protection and promotion of human rights, ethics and equity
4. Adaptation of the strategy and targets at country level, with global collaboration
The End TB Strategy: 3 pillars and 4 Principles

1. Integrated, patient-centered TB care and prevention
2. Bold policies and supportive systems
3. Intensified research and innovation

4 Principles:

- Government stewardship and accountability, with monitoring and evaluation
- Building a strong coalition with civil society and communities
- Protecting and promoting human rights, ethics and equity
- Adaptation of the strategy and targets at country level, with global collaboration
Mathematical modeling suggests that multiple interventions are necessary for impact.

To eliminate TB:
A quick PoC test for disease and infection

And:
1. Very short potent regimen for all forms, and
2. Simple regimen for mass chemoprophylaxis

Synergy of interventions!
Action on both transmission and reactivation pathways

or:
Mass pre- and post-exposure vaccine

Adds Effects = effects also on latency and infectiousness of cases in vaccinated
TB in Canada

Tuberculosis in Nunavut: a century of failure

Noni MacDonald MD MSc, Paul C. Hébert MD MHSc, Matthew B. Stanbrook MD PhD

Lewis said he had five points to make about the issue:

- The rate of tuberculosis in the territory is unacceptably high.
- There is a shortage of nursing staff who speak Inuktitut and specialize in treating TB.
- The lasting effects of colonialism are continuing and making the problem worse.
- Food insecurity and a lack of housing negatively affects health.
- The effects of the C.D. Howe medical ship, which took Inuit patients south for TB treatment in the 1950s and '60s, is still being felt.
TB incidence rates in Canada

Indigenous people await medical examination aboard the C.G.S. C.D. Howe at Coral Harbour, N.W.T. (now Coral Harbour/Salliq, Nunavut) in July, 1951. Throughout the 1950s and 60s, the Canadian Coast Guard ship made summer medical trips to the Eastern Arctic. If an infectious disease such as tuberculosis was found during the medicals, the infected individual was kept on board and not allowed to go ashore to collect belongings or say goodbye, before sailing south for treatment, which could take several years.

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The Enduring Plague: How Tuberculosis in Canadian Indigenous Communities is Emblematic of a Greater Failure in Healthcare Equality

Sarah Hick
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ABSTRACT

Despite global strides made in prevention and treatment, tuberculosis (TB) remains an acute problem for Indigenous people in Canada. TB affects Indigenous communities at significantly higher rates than the general Canadian population, for whom it is a disease of the past. This paper suggests how tuberculosis and its history of violence have shaped the face of TB in Canada, and thus how TB is a telling point of analysis for considering the lack of equity and equality in healthcare delivery in Canada.

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https://healthydebate.ca/2019/01/topic/tuberculosis-inuit-canada
Government aims to eliminate tuberculosis in Canada's North by 2030

The Mycobacterium tuberculosis (TB) bacteria is shown in a 2006 high magnification scanning electron micrograph (SEM) image. (CDC / Janice Carr)

Federal government aims to eliminate tuberculosis in Canada’s North by 2030

By The Canadian Press

Indigenous Services Minister Jane Philpott (left) and Health Minister Ginette Petitpas Taylor (centre) look on as Inuit Tapiriit Kanatami (ITK) President Natan Obed addresses media in the Foyer outside the House of Commons in Ottawa on Thursday, Oct.5, 2017.

THE CANADIAN PRESS/Sean Kilpatrick
Case study of India

The World Health Organization's longstanding strategy for fighting tuberculosis is showing deadly unintended consequences: By focusing on years for the easiest-to-treat patients, it helped allow TB strains to spread that are now all but untreatable by modern medicine.

By Geeta Anand in Mumbai and Betsy McKay in Atlanta

The WHO and a growing chorus of global health experts are now calling for a significant overhaul in the way nations with widespread drug-resistant TB combat the disease. It amounts to a de facto acknowledgment that the WHO's TB strategy, and the countries that use it, failed to adapt quickly enough as the disease turned more powerful, resistant strains.

“The TB community has been too conservative on a global scale, said Banerjee, until recently a senior officer in the WHO's India TB program. “We should have pushed sooner for a more aggressive, comprehensive approach toward drug resistance,” he said this month in an interview. “There was a cost in failing to do that. We're paying that cost today.”

The WHO played a particularly sizable role in designing the tuberculosis program in India, which has seen a steep decline in regular TB, but India and other poor countries are now in the midst of an epidemic of drug-resistant strains—deadlier and harder-to-treat varieties of one of the world's top infectious-disease killers.

G.R. Khatri, who headed India's TB program more than a decade ago, called the epidemic of resistant TB in Mumbai "a recipe for disaster." The WHO should have known it was so bad and bear responsibility, he said: "What has the WHO been doing?"

In pilot testing across India this year of a new diagnostic method, some 66% of untreated TB patients were drug-resistant—suggesting far higher rates than the 2% to 3% levels India and the WHO have cited for years. The test was a collaboration of international aid groups and India's government. At one clinic in Mumbai, research showed more than one-quarter of 566 TB patients tested in recent months were resistant to the most powerful treatment, according to data obtained by The Wall Street Journal through India's Right to Information Act. The results are preliminary, but in the absence of any nationwide survey they offer a sense of what India's drug-resistance rates might be.
Indian TB Programme: DOTS coverage is high (quantity is good!)

Population in India covered under DOTS and Total Tuberculosis Patients put on treatment each quarter

Annualized New Smear-Positive Case Detection Rate and Treatment Success Rate in DOTS areas, 2001 – 2011

Source: RNTCP
And yet...

In 2017, an estimated 2.7 million people developed TB disease, and over 400000 people died. So, India accounts for 27% of the global estimated cases, and 25% of the estimated deaths.

TB is one of the top 5 causes of death at ages 30-69 in India, whereas in China, TB is no longer one of the top 10 causes.
Reducing global tuberculosis deaths—time for India to step up

As another World Tuberculosis Day passes by, the outlook for tuberculosis control is far from optimistic, especially for India, the ground zero for the global epidemic. Last year, WHO declared that the tuberculosis epidemic was worse than previously thought, with an estimated 10.4 million new tuberculosis cases worldwide in 2015. WHO estimated that globally 1.8 million people died from tuberculosis in 2015, of whom 0.4 million were also infected with HIV. Although global tuberculosis deaths declined by 22% between 2000 and 2015, it is remarkable that tuberculosis today is responsible for more deaths than HIV and malaria combined, and continues to rank among the top ten causes of deaths worldwide.

WHO estimates that India accounts for 2.8 million (27%) of the 10.4 million new cases, and 29% of the 1.8 million deaths. According to the Registrar General of India’s Million Death Study, which documented causes of death in 1.4 million households, tuberculosis remained one of the top five causes of death among people aged 30-69 years. By contrast, in China tuberculosis is no longer one of the top ten reasons for dying. Importantly, the declines in the age-standardised tuberculosis death rates in India mostly occurred between 2001 and 2007, with a slowing of the decline from 2008 to 2013. Most tuberculosis deaths in India continue to be among young adults in the economically productive age group, with high economic and social costs.

Why are so many Indians dying of a curable infectious disease in 2017? There are several factors that contribute to India’s enormous tuberculosis death toll. First, India has not adequately tackled key determinants of tuberculosis, especially malnutrition and tobacco smoking, which have been clearly linked with excess tuberculosis mortality. Second, India continues to underinvest in health, with governmental expenditure on health being one of the lowest in the world at 1.4% of the gross domestic product. This underinvestment is reflected in India’s Revised National Tuberculosis Control Program (RNTCP) that has struggled to receive budgets commensurate with the scale of India’s epidemic.

Third, implementation failures and a weak health system have led to suboptimal cascade of care in the public system. About half a million patients with tuberculosis in...
Social determinants: poverty, malnutrition and TB in India

“The overall prevalence of undernutrition in the age group of 15–49 years was 36% among women and 34% among men. About half of all cases of active TB ... were attributable to undernutrition.”

“TB control strategies should be targeted to the poorest populations that are most at risk, and should address the most important determinants of disease—specifically low BMI and indoor air pollution.”
The Tuberculosis Cascade of Care in India’s Public Sector: A Systematic Review and Meta-analysis

An average TB patient in India is diagnosed with TB after a delay of 2 months, and is seen by 3 healthcare providers before diagnosis.
Simulated patient studies in India show that most primary care providers do not manage TB well.

Use of standardised patients to assess quality of tuberculosis care: a pilot, cross-sectional study

Jishnu Das, Ada Kwan, Benjamin Daniels, Srinath Satyanarayana, Ramnath Subbaraman, Sofi Bergkvist, Ranendra K Das, Veena Das, MadhuKkar Pai

Use of standardised patients to assess antibiotic dispensing for tuberculosis by pharmacies in urban India: a cross-sectional study

Srinath Satyanarayana, Ada Kwan, Benjamin Daniels, Ramnath Subbaraman, Andrew McDowell, Sofi Bergkvist, Ranendra K Das, Veena Das, Jishnu Das*, MadhuKkar Pai*

Variations in the quality of tuberculosis care in urban India: A cross-sectional, standardized patient study in two cities

Ada Kwan1,2*, Benjamin Daniels1,2*, Vaibhav Saria3, Srinath Satyanarayana4, Ramnath Subbaraman5, Andrew McDowell6, Sofi Bergkvist7, Ranendra K. Das4, Veena Das4, Jishnu Das8, MadhuKkar Pai9,10,11*
Tuberculosis: treatment failure, or failure to treat? Lessons from India and South Africa

Nesri Padayatchi,1,2 Amrita Daftary,3 Naressa Naidu,1,2 Kogieleum Naidoo,1,2 Madhukar Pai3

ABSTRACT
Tuberculosis (TB) remains an enormous public health concern globally. India and South Africa rank among the top 10 high TB burden countries with the highest absolute burden of TB, and the second highest rate of TB incidence, respectively. Although the primary drivers of TB transmission vary considerably between these two countries, they do indeed share common themes. In 2017, only 64% of the global estimated incident cases of TB were reported, the remaining 36% of ‘missing’ cases were either undiagnosed, untreated or unreported. These ‘missing TB cases’ have generated much hype for the challenges they present in achieving the End TB Strategy. Although India and South Africa have indeed made significant strides in TB control, analysis of the patient cascade of care clearly suggests that these ‘missed’ patients are not really missing—most are actively engaging the health system—the system, however, is failing to appropriately manage them. In short, quality of TB care is suboptimal and must urgently be addressed, merely focusing on coverage of TB services is no longer sufficient. While the world awaits revolutionary vaccines, drugs and diagnostics, programmatic data indicate that much can be done to accelerate the

Summary box
▶ In 2017, only 64% of the global estimated incident cases of tuberculosis (TB) were reported worldwide, the remaining 36% of ‘missing’ cases were either undiagnosed, untreated or unreported.
▶ Analysis of the patient cascade of care in India and South Africa suggests that these ‘missed’ patients are not really missing; most are actively engaging the health system (public and private) but not adequately managed.
▶ National TB control programmes need to identify gaps and weaknesses along the entire patient care cascade, addressing barriers to appropriate diagnosis, linkages to treatment postdiagnosis while strengthening both public and private healthcare sectors, and bridging the gap between provider knowledge and practice.
▶ Integration of TB services within universal health coverage is critical for identifying and managing missing patients with TB.
On 1 Feb 2017, India announced TB elimination by 2025!
But Indian government is not spending enough on TB!

Health itself is not a priority for India

India ranks 127 out of 188 countries in progress towards health related SDG goals!

India spends <1.5% GDP on health, less than all other BRICS countries!

https://thewire.in/179865/punching-well-weight-india-progress-towards-health-related-sdg-goals/
This is where advocacy is critical

TB - The Ticking Time Bomb


https://www.youtube.com/watch?v=znyXf_4hQC0
Can TB patients demand better services?

http://www.survivorsagainsttb.com/

Fighting TB requires empowered patients

In this article from India, Deepi Chavan describes the differences in health outcomes when patients are able to access the information they need.

Deepi Chavan
Indian Woman Wins Right to Use Last-Resort Tuberculosis Drug

Family of 18-year-old suffering from drug-resistant TB had petitioned court

A security woman stands guard outside the Group of TB Hospitals in Mumbai, in a September 2015 photo. PHOTO: DANISH SIDDIQUI/REUTERS

Experts Speak On Patna Teen Girl’s Fight For TB Drug

Written By: Srivbha Basu January 17, 2017

The teenager who is battling tuberculosis is 18 years old and weighs 24 Kgs.

TWO COUNTRIES, TWO CHOICES

India, South Africa, and the Struggle against Multi-Drug-Resistant Tuberculosis

A film by AIDS-Free World
TB has a lot to learn from the HIV movement...


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