TB disease burden & intervention impact
TIME dynamical model
background/rationale, country examples, next steps

Rein Houben, Marek Lalli, Debora Pedrazzoli, Matt Hamilton, Carel Pretorius, Richard White
TB Modelling Group - London School of Hygiene & Tropical Medicine
Avenir Health

TIME Impact – a new user-friendly tuberculosis (TB) model to inform TB policy decisions


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Additional file

Additional file 1: TIME Impact Technical Appendix. (PDF 783 kb)
To improve TB care and prevention in low- and middle-income countries by strengthening policies and enabling local capacity building.

Our objectives:

- To inform TB policy decision-making at the national and sub-national level by applying a comprehensive and accessible modelling framework.
- To enable local capacity building and ownership through training and support.
TIME Modules

1. Data review, quality assessment and certification
2. Estimation of current burden and past trends
3. Projection and epidemiological impact
4. Resource allocation and resource needs
TIME Modules

1. Data review, quality assessment and certification
2. Estimation of current burden and past trends
3. **Projection** and **epidemiological impact**
4. **Resource allocation** and **resource needs**
Contents

• Why TIME?
• (A brief) history of TIME
• What is TIME
• Examples of country implementation and capacity building
• Challenges and limitations
• Development plans
• Potential link to work of Task Force
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• Why TIME?
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What do we have?
What do we need?
What can we afford?
What will we get?
Tradeoffs?
In TB

• Countries need to do many things at the same time
  • More notifications
  • Lower prevalence
  • Diagnose MDR
  • No more resources

But...

What do we have?
What do we need?
What can we afford?
What will we get?
Tradeoffs?
Example – Notifications and Prevalence

• More notifications
  --> Effect of diagnosis and treatment of more prevalent patients?

• Lower prevalence
  --> Effect of lower prevalence?

• Fewer prevalent cases to notify
  • By how much, by when?

--> Need a transmission model
HIV and country-level modelling

HIV
(since 1997)
EPP/AIM + Goals
AEM + Optima HIV

UNAIDS reference group

Country workshops
HIV Investment Case
App for download
GF applications
Etc...

1997

2012  2015
TB and country-level modelling

HIV
(since 1997)

TB

Need for TB/HIV tool

TIME

1997

2012

2016
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TIME – development and use
Modelling the epidemic and interventions

- GTB Estimate
- Total notifications

Prevalence (per 100,000)

- All smear types (15+)
- Smear positive (15+)
Modelling the epidemic and interventions
Provincial-level modelling

- Slide courtesy of Piotr Hippner
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TIME - Principles

User-friendly

Start with data and epidemiology

Work with country counterpart
TIME model as campfire

Community representative
Technical agency
Funders
TIME
NTP
Modellers
TIME in TB policy cycle

Assess  
Evaluate  
Programme  
Implement  
Finance
TIME Estimates

1. Data review, quality assessment and certification
2. Estimation of current burden and past trends
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TIME Estimates

DempProj
Demographic data
(UNpop)

TB database
(GTB)

AIM
HIV data
(UNAIDS)

Using the TIME model in Spectrum to estimate tuberculosis–HIV incidence and mortality

Carel Pretorius², Philippe Glazioub,*, Peter J. Doddc,*, Richard Whited,*, and Rein Houbo

AIDS 2014, 28 (Suppl 4):S477–S487
TIME Impact

1. Data review, quality assessment and certification
2. Estimation of current burden and past trends
3. **Projection and epidemiological impact**
4. Resource allocation and resource needs
TIME Impact

Spectrum

DempProj
Demographic data (UNpop)

TB database (GTB)

AIM
HIV data (UNAIDS)

TIME
TIME Data
TIME Estimates
TIME Impact
TIME Economics

[Logos: USAID, TB Modelling Group]
TIME Economics

1. Data review, quality assessment and certification
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4. **Resource allocation and resource needs**
Resource allocation and resource needs in TIME

Spectrum

TIME
TIME Data
TIME Estimates
TIME Impact
TIME Economics

GTB Epi inputs
Impact model Epi inputs

OHT OneHealth Tool

Shared need for cost data

USAID
MODELLING GROUP

LONDON SCHOOL OF HYGIENE & TROPICAL MEDICINE
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Modelling for allocative efficiency

Bangladesh workshop at GFATM (February 2014)

• NTP preparing Concept Note submission
  – Part of Multi-Criteria Allocative efficiency workshops at GFATM (STAR)

• Multi disease meeting – limited time for TB

• Pre-workshop
  • Country provided data for TIME Impact baseline fit
  • Communication with WHO/GTB and Bangladesh NTP prioritisation in fitting process
  • Prioritised intervention: diagnosis of smear negative TB
Process and lessons learned

• Workshop
  • Intervention: explore different levels of rolling-out Xpert for SSneg diagnosis.
    • Country assumption: near 0% empiric diagnosis so big gap to fill

• Post-Workshop
  • Country Follow up with queries re MDR-TB – very short timeline
  • Concept Note writing process separated from modelling
  • No communication if/how results were used for Concept Note

• Lessons learned:
  • Timing of involvement and link with person writing concept note process key
  • Detailed discussion on intervention scenarios was insufficient – rushed results can lead to unhelpful contributions

• Learned from experience --> adjusted process and model approach
Modelling to rationalise TB policy

South Africa TB Think Tank (2014 – current)

• Funded by Bill and Melinda Gates Foundation
• Government-led group to bring together:
  – Policy makers, NTP, academics, NGOs, funders

• Think Tank addresses short and long-term policy questions

• TIME modelling framework used to:
  – Develop TB/HIV Investment Case
  – Operational Research Priorities (MRC UK/SA)

• Linked to development of cost-effectiveness tool
Capacity building

• Aim: Build independent capacity in South Africa to provide modelling support for TB policy questions

• Training – National and provincial level
  • National: Intensive training --> independent user
  • Provincial: Become informed consumer of TIME modeling results

• Current outcomes
  • National expert leading TB modelling of TB/HIV investment case
  • Provincial TB programmes receive local TIME support
Provincial-level modelling

South African TB Notification Rates

HIV prevalence per province

Western Cape

KwaZulu-Natal
Provincial-level modelling

- Slide courtesy of Piotr Hippner
- Work part of TB/HIV Investment case
- Initial provincial models have been created
- Aim is to estimate the impact of the three 90s strategy in each province
Lessons learned

• Great desire for training and local ownership of modelling tool
  • Positive experience with local training

• Example feedback from **Eastern Cape and North West**
  “Model is useful. Even the districts need to be empowered to use this system because it is important for planning purposes. E.g. projection of these key indicators allow us to plan. “

• Work ongoing, new round of workshops with provinces to refine fit, and adjust assumptions based on local understanding.
Modelling to reprogram response

Ghana (2015 – current)

• In collaboration with NTP, USAID and Global Fund
• Requested to model current epidemic and implementation of interventions.
Country visits

Shift in policy focus informed by discussions around modelling and outputs

Visit 1
Introductions and Baseline modelling

Visit 2
NSP discussions and review

Visit 3
Feedback to NTP and plan forward

Visit 4
Modelling NSP and reprogramming

Key themes that emerged from work:
1. Engagement and ownership
2. Data strengthening
3. Finding missing cases
Model Baseline: total notifications

- Estimates **15,659** total notifications in 2013 [target = 15,606]
- Reproduces flat trend in past 5 years.
- Matches distribution of total notifications between smear status.
Modelling the Performance Framework

- Decrease in prevalence will cause a decrease in PPV and a loss of efficiency in case detection.
- Will need to move towards more strategic interventions which will increase the PPV in screening population and consider implementing a more specific diagnostic test.
# Summary of impact

## Baseline policy focus

- **NTP:** focus on active case finding in high risk groups.
- **GF:** reduction in funding for enablers.

## Shift in policy focus informed by discussions around modelling and outputs

### Visit 1
- **Baseline modelling**

### Visit 2
- **NSP review**

### Visit 3
- **Feedback**

### Visit 4
- **Reprogramming**

- **NTP:** missing cases on agenda.
- **NTP:** +23 districts.
- **NTP:** improved ICF now on agenda.
- **NTP:** committed to improve OPD data.
- **GF:** enablers back on agenda (conditional).
- **GF/NTP:** mass Xpert is not solution.
- **GF/NTP:** reprogramming needed, TIME team to support.
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Capacity building in practice
Progress made…

TB Prevalence

Estimate

Per 100,000


TB Prevalence

Estimate

Per 100,000

Key lessons learned

• No substitute for spending time with NTP and locally aware TA

• Important to take time developing scenarios that are proposed
  • ‘Pause, think, discuss’
  • What are assumptions, what is rationale, what are key consequences?
  • A model can provide an answer, but is it useful?

• Great desire for model projections, but also training and local ownership of modelling

✓ Pause
✓ Think
✓ Discuss
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Challenges

Capacity building
• Identifying right individuals – link to local TA critical
• Sustaining interaction from distance, competing priorities

Modelling
• Data: Prevalence survey, underreporting over time, screening algorithm
• Shift to BAC pos and neg
• Long-term relationship with country – revisit old work
• Model can be misused
Challenges

Modelling interventions - resource allocation

• Go beyond ‘what happens if NTP diagnoses N more cases’

• What does 100 USD of NTP activity buy? How does this change during scale-up?

• Example: ICF/clinic based screening
  • What is screening algorithm, what is prevalence of disease in cohort?
  • What is expected yield, PPV?
  • What does it cost?

• Note: Important gap - identified by TB MAC, proposal with funders
Limitations

• Model is not ‘The Answer’

• One Model cannot do everything
  • Work with other modelling tools, e.g. WHO Screen TB
  • Ad hoc operational tools

• Socio-economic and structural determinants

• Homogenous mixing
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TIME – principles and direction

• Development and learning ongoing
• Direction of travel is to long-term interactions with countries
  • ‘Horizontal’ rather than ‘Vertical’ modelling input in process
• Develop local ownership and capacity, illuminate the ‘black box’
• Improve policy decisions through rational discussions
TIME Impact – development

**Epidemiological:** (Potentially) possible with data
- Risk group stratification – gender?
- Private sector (further develop)
- Heterogeneous mixing by age
- XDR/pre-XDR stratification (for Central Asia/Eastern Europe)
- Recurrent TB

**Epidemiological:** Priority but limited by data/technical understanding
- Trends in socio-economic and structural determinants - priority for wider TB community

**Functionality**
- Formal automated fitting and uncertainty framework
  - Take into account uncertainty in burden, natural history and interventions
- Outputs linked to revised OHT TB section
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Link to work of Task Force?

TIME is tool for disaggregated projections, impact estimation and resource allocation, as well as building analytical capacity in countries

• Model brings together data from priority studies in single logical framework

• Can complement Epidemiological Review – opportunities for synergy
  • E.g. screening algorithms, underreporting over time.
  • Identify in-country analytical needs
  • National Analysis Team
Link to work of Task Force?

TIME is **tool** for **disaggregated projections, impact estimation** and resource allocation, as well as **building analytical capacity** in countries.

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