WHO Global Task Force on TB Impact Measurement

Report of the seventh meeting of the full Task Force

1–4 May 2018
Glion-sur-Montreux
Switzerland
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1. BACKGROUND

1.1 The Task Force’s work 2006–2015

Global targets for reductions in TB disease burden (incidence, prevalence, mortality) by 2015 were set in the context of the Millennium Development Goals (MDGs) and WHO’s Stop TB Strategy. The WHO Global Task Force on TB Impact Measurement was established in 2006, convened by the TB Monitoring and Evaluation (TME) unit of WHO’s Global TB Programme (GTB), with the aim of ensuring that WHO’s assessment of whether the 2015 targets were achieved at global, regional and country levels was as rigorous, robust and consensus-based as possible.

Three strategic areas of work were pursued:

- strengthening routine surveillance of TB cases (via national notification systems) and deaths (via national VR systems) in all countries;
- undertaking national TB prevalence surveys in 22 global focus countries; and
- periodically reviewing methods used to produce TB disease burden estimates.

Work on strengthened surveillance included the development and application of a TB surveillance checklist of standards and benchmarks (with 10 core and three supplementary standards) to systematically assess the extent to which national notification and vital registration (VR) data provide a direct measurement of TB incidence and mortality, respectively; production of three handbooks, on electronic recording and reporting, inventory studies to measure the level of underreporting of detected TB cases, and analysis and use of data; expanded use of data from VR systems and mortality studies to produce estimates of TB deaths; and contributions to wider efforts to promote VR systems. By the end of 2015, 38 countries including 16 high burden countries had used the TB surveillance checklist, a few high TB burden countries had completed or started planning inventory studies, and in the 2015 WHO Global TB Report, VR data were used to produce estimates of TB mortality in 127 countries.

Between 2007 and the end of 2015, a total of 23 countries completed a national TB prevalence survey including 18 of the 22 global focus countries. A Task Force subgroup undertook a major review and update of methods between June 2008 and October 2009. A second thorough and comprehensive review was undertaken in 2015, with consensus reached on methods to be used for WHO’s 2015 targets assessment.

WHO published its assessment of whether the 2015 global TB targets were achieved in its Global TB Report 2015.

1.2 Task Force meeting, April 2016: reshaped mandate and strategic areas of work for the SDG and End TB Strategy era

In the context of a new era of Sustainable Development Goals (SDGs) and WHO’s End TB Strategy, the Task Force met in April 2016 to review and reshape its mandate and strategic areas of work (Link to 2016 meeting report, which was also background document A for the May 2018 meeting).

An updated mandate and five strategic areas of work for the period 2016–2020 were agreed.

The mandate was defined as:

- To ensure that assessments of progress towards End TB Strategy and SDG targets and milestones at global, regional and country levels are as rigorous, robust and consensus-based as possible.
- To guide, promote and support the analysis and use of TB data for policy, planning and programmatic action.

The End TB Strategy targets and milestones referred to in the mandate are the targets (2030, 2035) and milestones (2020, 2025) set for the three high-level indicators: TB incidence, the number of TB deaths and the percentage of TB-affected households that face catastrophic costs as a result of TB disease
For 2030, the targets are to reduce the annual number of TB deaths by 90% and to reduce TB incidence by 80%, compared with 2015; the 2020 milestones are reductions of 35% and 20%, respectively. For the third indicator, a milestone of zero is set for 2020, to be sustained thereafter. The target for TB within the SDGs (where it is part of Target 3.3) is to end the TB epidemic; TB incidence is the SDG indicator for monitoring of progress.

Table 1. Targets and milestones set in WHO’s End TB Strategy

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Milestones</th>
<th>Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage reduction in the absolute number of TB deaths per year</td>
<td>2020</td>
<td>2025</td>
</tr>
<tr>
<td>(compared with 2015 baseline)</td>
<td>35</td>
<td>75</td>
</tr>
<tr>
<td>Percentage reduction in the TB incidence rate (new cases per 100 000 population per year)</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>(compared with 2015 baseline)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of TB-affected households experiencing catastrophic costs due to TB disease</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The five strategic areas of work were defined as:

1. Strengthening national notification systems for direct measurement of TB cases, including drug-resistant TB and HIV-associated TB specifically.

2. Strengthening national VR systems for direct measurement of TB deaths.

3. Priority studies to periodically measure TB disease burden, including:
   a. national TB prevalence surveys
   b. drug-resistance surveys
   c. mortality studies
   d. surveys of costs faced by TB patients and their households.

4. Periodic review of methods used by WHO to estimate the burden of TB disease and latent TB infection.

5. Analysis and use of TB data at country level, including:
   a. disaggregated analyses (e.g. by age, sex, location) to assess inequalities and equity;
   b. projections of disease burden; and
   c. guidance, tools and capacity building.

Strategic areas of work 1–3 are focused on direct measurement of TB disease burden (epidemiological and, in the case of cost surveys, economic). The underlying principle for the Task Force’s work since 2006 has been that estimates of the level of and trends in disease burden should be based on direct measurements from routine national information systems and surveys as much as possible (as opposed to indirect estimates based on modelling and expert opinion).

Strategic area of work 4 remains necessary because indirect estimates will be required until all countries have the routine national information systems or the periodic studies required to provide direct measurements.

Strategic area of work 5 recognizes the importance of analysing and using TB data at country level (as well as generating data, as in strategic areas of work 1–3), including the disaggregated analyses that are now given much greater attention in the SDGs and End TB Strategy.

1.3 Rationale for meeting held 1–4 May 2018

Two years after the Task Force agreed on a reshaped mandate and strategic areas of work for the period 2016–2020, the purpose of the 1–4 May 2018 meeting was to review and discuss progress in the five strategic areas of work since April 2016, and to define priority next steps in 2018 and 2019.
2. MEETING OBJECTIVES, EXPECTED OUTCOMES, AND OVERALL APPROACH

2.1 Objectives

Five meeting objectives were defined. These were:

1. To provide an overview of Task Force work related to strengthening national notification systems for direct measurement of TB cases (including drug-resistant TB and HIV-associated TB specifically), with particular attention to where demonstrable progress has occurred, and to discuss priority next steps for the Task Force to support countries to meet surveillance quality and coverage standards.

2. To present a global overview of the status of progress in strengthening national vital registration systems for direct measurement of causes of death, with particular attention to aspects relevant to TB.

3. To review progress in priority studies to periodically measure TB disease burden and discuss priority next steps for the Task Force:
   a. national prevalence surveys;
   b. drug resistance surveys;
   c. patient cost surveys.


5. To review progress in analysis and use of TB and related data since 2016\(^1\) and discuss priority next steps for the Task Force to further strengthen this work in countries:
   a. guidance on country-level TB modelling;
   b. regional and national workshops, and associated safeguarding, analysis and use of TB data at country level;
   c. TB modules for reporting and analysis of aggregated and case-based data and associated user guide and training materials in DHIS2, as part of a WHO Health Data Collaborative initiative covering multiple diseases, programmes and cause of death;
   d. framework for using the optimum combination of evidence and tools for data analysis and use to inform prioritization and planning at country level.

2.2 Expected Outcomes

Five expected outcomes from the meeting were defined. These were:

1. The Task Force is well informed about current work related to strengthening national notification systems for direct measurement of TB cases and priority next steps for the Task Force to support accelerated progress in countries have been identified.

2. The Task Force is well informed about the status of global progress in strengthening national vital registration systems for direct measurement of causes of death.

3. The Task Force is well informed about the status of global progress in implementing priority studies to measure TB disease burden, and priority next steps have been defined.

4. The Task Force is well informed about recent developments in estimates of TB disease burden published by WHO and their likely future direction.

5. The Task Force is well informed about recent developments to support analysis and use of TB-relevant data at country level, with guidance on country-level TB modelling reviewed and endorsed and priority next steps defined for both modelling and other areas of work.

\(^1\) The Task Force established analysis and use of data as a strategic area of work in April 2016
2.3 Overall approach

**Background documents** were prepared for the meeting and circulated 1–2 weeks in advance, along with a list of more general reference documents. The lists are provided in Annex 1.

The first 2 days and part of Day 3 of the meeting were structured in five major sessions, with one session for each objective. Most of the third day was used for group work and side discussions, with topics and groups defined based on a survey of meeting participants one week in advance of the meeting. Four main topics were discussed in group work: national TB prevalence surveys, national surveys of costs faced by TB patients and their households; estimation of disease burden at subnational level; and a framework for optimizing the analysis and use of available data and tools. The last half day of the meeting was used for feedback from group work in plenary. The full meeting agenda is provided in Annex 2.

Meeting participants (total of 68) included staff from national TB programmes and other staff from ministries of health; experts in the fields of epidemiology, statistics and modelling from universities and research institutes; representatives from international technical and funding agencies; and staff from WHO headquarters as well as Regional and Country Offices. The full list of participants, as well as those who were invited but unable to attend, is provided in Annex 3.

3. INTRODUCTION, OVERVIEW, BROADER CONTEXT

The first presentation of the meeting was given by Katherine Floyd (WHO) ([view presentation](#)). This provided a general introduction to the work of the Task Force, including its mandate and five strategic areas of work for 2016–2020; an overview of progress to date, including some highlights to be featured in more detail later in the meeting; and illustrated how the work of the Task Force fits into the broader context of WHO’s work, both in terms of WHO’s six core functions and the organization’s General Programme of Work (GPW) 2019–23. Of note, the GPW refers to several important themes that are long-established components of the Task Force’s work, including “building health information systems”, “strengthening data collection systems”, “strengthening civil registration and other vital statistics”, “population surveys” and “strengthen capacity to collect, analyse, disseminate and use national and subnational data”.

The April 2018 edition of the Task Force brochure ([background document B, view document](#)) provides an up-to-date overview of the Task Force’s work.

4. STRENGTHENING NATIONAL NOTIFICATION SYSTEMS FOR DIRECT MEASUREMENT OF TB CASES

Most of the first day of the meeting was dedicated to the first strategic area of work of the Task Force, that of strengthening national notification systems for the direct measurement of TB cases.

4.1 An overview of progress

The opening presentation, by Babis Sismanidis (WHO), provided an overview of progress ([view presentation](#)), based on background document 1 ([view document](#)). Particular attention was given to the period since the last Task Force meeting in April 2016, and to three priority topics for this strategic area of work that were agreed upon during that meeting. These were national TB epidemiological reviews including systematic assessments of the performance of TB surveillance using the WHO checklist of standards and benchmarks (S&B); transitioning from paper-based to electronic, case-based TB surveillance; and national TB inventory studies to measure the underreporting of detected TB cases, and associated policies on mandatory notification of detected TB cases.

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In 2016 and 2017, a national TB epidemiological review was completed in 28 countries, with a further 17 planned for 2018. Repeat epidemiological reviews using the standard terms of reference (TORs) developed in 2013 have been completed by 23 countries. As part of this work, considerable effort has been made to build capacity at global, regional and national levels, both through training workshops and on-the-job training and mentoring. A global roster of 35 consultants and local staff has been established and the aim is to expand it further in 2018.

In addition to the great progress evident in implementation of national TB epidemiological reviews including S&B assessments, evidence of progress in the quality and coverage of national notification systems in countries where repeat reviews have been conducted was summarized.

One of the major reasons for gaps between TB incidence and TB notifications is underreporting of detected TB cases. In national TB epidemiological reviews, a common finding from the S&B assessment is that the level of underreporting of detected TB cases is not known, and mandatory notification is not in place. To minimize levels of underreporting, a legal framework to make notification of TB cases mandatory is required, and assessing the level of underreporting can be done using an inventory study.4

The latest status of progress in implementation of national TB inventory studies to measure the level of underreporting of detected TB cases was summarized. In 2016 and 2017, national TB inventory studies were successfully implemented in Indonesia, Pakistan and Viet Nam, while studies have started in China, Denmark, Finland, Portugal, Slovenia and South Africa.

Progress in the availability of electronic case-based surveillance systems for TB cases has been seen in three WHO regions: the Americas, Europe and the Western Pacific. However, the African, South-East Asia and Eastern Mediterranean regions lag behind, despite some advancement in systems for cases of drug-resistant TB (which are typically only a small fraction of the total TB cases in a country).

To help to address these gaps, GTB/TME is actively participating in the work of the Health Data Collaborative (https://www.healthdatacollaborative.org/) and, in particular, contributing to the working group on routine health facility data. The deliverables of this group include standard District Health Information System 2 (DHIS2) modules for aggregate (https://tbhistoric.org) and case-based (https://who.dhis2.net) data, a core set of health facility indicators and guidance for countries to establish and maintain a master health facility list. A strong collaboration has been established between WHO (TB, HIV, malaria and health information departments), the University of Oslo (which developed DHIS2) and The Global Fund.

4.2 Country examples of national inventory studies to measure the underreporting of detected TB cases: Indonesia, Pakistan, Viet Nam

Three recently completed national TB inventory studies to measure the underreporting of detected TB cases were presented. The Indonesia study was presented by MN Farid (National Institute of Health Research and Development) (view presentation 1) and Sulisty (Directorate of Prevention and Communicable Disease Control) (presentation 2). The study in Pakistan was presented by Razia Fatima (national TB programme) (view presentation). The study in Viet Nam was presented by Nguyen Binh Hoa (national TB programme) (view presentation).

In Indonesia, 23 districts were sampled. A total of 1687 health-care providers that diagnose or treat TB were eligible to participate, of which 99% did so. During the study period (the first quarter of 2017), 21,320 TB cases were detected. The level of underreporting to the national surveillance system was 41% overall, ranging from 15% in primary health care centres to 65% in hospitals and 96% among general practitioners, clinics and laboratories. More than 95% of the TB cases identified

3 The TORs and a detailed implementation document and standardised Terms of Reference are available in English and French.

during the study were treated using a drug regimen that adhered to national TB guidelines. Clinically diagnosed and extra-pulmonary TB cases as well cases among children were more likely to be underreported.

In Pakistan, the study focused on children (following a previous study of adults in 2012). 12 districts were sampled, in which 8,419 health-care providers were eligible to participate, of which 84% did so. During the study period (second quarter of 2016), 5258 childhood TB cases were detected. The level of underreporting to the national surveillance system was 78% overall, with higher levels in the most remote parts of the country.

In Viet Nam, 17 districts were sampled (in two strata: 5 districts from Ho Chi Minh City and 12 from the rest of the country), in which 592 health-care providers were eligible to participate, of which 93% did so. During the study period (the fourth quarter of 2016), 2862 TB cases were detected. The level of underreporting to the national surveillance system was 31% overall, and 10% when the analysis was restricted to bacteriologically-confirmed TB cases.

The policy and programmatic implications for each country were highlighted. Examples included:
- An up-to-date master health facility list (both for the public and private sectors) needs to be maintained.
- Record-linkage between the database of the national TB programme and other databases is essential.
- Data recording and reporting should be simplified as much as possible, especially for private sector providers.
- Dedicated staff to work on data entry and reporting and integrated information systems are required, especially for private sector providers.
- A unique identifier (e.g. health insurance number) strongly facilitates disease surveillance in general, and record-linkage in particular.

It was also emphasized that the studies have provided national TB programmes with successful models of how to engage with the various types of health-care providers, particularly those that are not yet part of their networks.

Commentaries were provided by Babis Sismanidis and Philippe Glaziou (WHO), and by Charlotte Colvin (USAID). They emphasized the value of all three studies, and their clear policy and programmatic implications. Final remarks were made by Laura Anderson (WHO), based on experience with an inventory study in England and Wales and the subsequent “routinization” of record-linkage as part of national TB surveillance activities.

4.3 Country examples of the introduction of mandatory notification

Country examples of the establishment and implementation of a legal framework for mandatory notification of TB were presented for India by Sunil Kharparde (national TB programme) (view presentation), for Indonesia by Sulistyö (Directorate of Prevention and Communicable Disease Control) (view presentation), for Pakistan by Razia Fatima (national TB programme) (view presentation), and for Myanmar by Si Thu Aung (national TB programme) (view presentation).

These presentations showed that there has been major progress in introducing legal frameworks that make notification of TB mandatory in high TB burden countries. India introduced its framework in 2012, and there have subsequently been two amendments in 2015 and 2018 to expand its applicability to all health-care providers, pharmacies and self-reporting by patients. Indonesia introduced a legal framework in 2016. Pakistan introduced a legal framework in 2017 in three out of four provinces; at the time of the meeting, the fourth province and the country as a whole were in the process of introducing it. In Myanmar, a framework has been developed and at the time of the meeting was at the stage of being reviewed by the national parliament.
While the development and introduction of legal frameworks demonstrates progress, successful implementation is required for them to have an impact on the notification of cases. Three important recommendations based on country experience that were shared were:

- Simplified recording of information (based on a minimum core set of variables).
- Provision of easy-to-use tools for reporting (e.g. web portals, mobile phones).
- The right balance needs to be struck between offering incentives to health-care providers (e.g. monetary), while at the same time holding them accountable for their public health responsibilities (e.g. linking issuance and renewal of licenses to practice with notification).

### 4.4 Country examples of the transition from paper to case-based electronic surveillance

Case studies of the successful implementation of DHIS2 for aggregate TB data were presented for Myanmar by Si Thu Aung (national TB programme, Myanmar) (view presentation), for Tanzania by Beatrice Mutoyoba (national TB programme, Tanzania) (view presentation), and for Pakistan by Razia Fatima (national TB programme) (view presentation). Patricia Bartholomay (national TB programme, Brazil) (view presentation) gave an overview of the case-based surveillance system in Brazil, which was established several years ago.

### 4.5 Priority next steps

The focus of this strategic area of work in the next 1–2 years will include:

1. Continued support to countries for accelerated progress in improving the coverage and quality of national notification systems for direct measurement of TB cases, based on findings from national TB epidemiological reviews and associated S&B assessments.
2. Specific attention to supporting the transition from paper to case-based electronic surveillance, including via existing efforts to strengthen national surveillance systems using DHIS2.
3. Support for the implementation of national inventory studies to measure the underreporting of detected TB cases in priority countries, and associated introduction of mandatory notification.
4. Implementation of key components of inventory studies on a routine basis, where appropriate. This includes establishing successful models of reporting from different types of health facilities, maintaining an up-to-date master health facility list, and record-linkage exercises (including de-duplication of records in the national TB programme database, and record-linkage between existing databases of TB cases in the country, on an annual basis).

It was also agreed that it was a priority to conduct an up-to-date assessment of what the ratio of bacteriologically-confirmed to clinically diagnosed pulmonary TB is expected to be in different settings. This is a topic that was explored when the WHO TB surveillance checklist of standards and benchmarks was developed between 2011 and 2013, but it was not possible to identify a suitable benchmark (or benchmarks) at that time. The issue needs to be reassessed, especially in the context of findings from inventory studies in which a large proportion of detected cases have been clinically diagnosed, an increasing share of notified cases of pulmonary TB are being clinically diagnosed rather than bacteriologically confirmed in some countries, and the possibility of over-diagnosis in the context of pressure to increase TB notifications to “close the gap” between estimates of TB incidence and reported notifications. Several Task Force members volunteered to be part of a group to work on this topic (Chen-Yuan Chiang, Ted Cohen, Andrei Dadu, Philippe Glaziou, Rein Houben, Eveline Klinkenberg, Knut Lönnroth and Ikushi Onozaki), which WHO will convene.
5. STRENGTHENING NATIONAL VITAL REGISTRATION SYSTEMS FOR DIRECT MEASUREMENT OF CAUSES OF DEATH

Systems for Civil Registration and Vital Statistics (CRVS) are an essential source of information for public health priority setting. The data are also essential for reporting on several indicators of the SDGs, and the best primary source of data to monitor TB mortality.

An overview of mortality data sources and a progress update on CRVS was presented by Doris Ma Fat (WHO) (view presentation). This included a summary of current global and regional initiatives, new training courses, options for collecting mortality data in resource-poor settings, standards to ensure data quality and comparability (including the upcoming ICD-11), current challenges and solutions. The presentation covered sections 1 and 2 of background document 2 (view document).

Commentaries were provided by Charlotte Colvin (USAID) (view presentation) and Estifanos Shargie (The Global Fund) (view presentation). They described the support being provided by USAID and The Global Fund to strengthen CRVS in selected countries.

6. PRIORITY STUDIES TO PERIODICALLY MEASURE THE BURDEN OF TB DISEASE

6.1 National TB prevalence surveys

6.1.1 Overview

A progress update was presented by Irwin Law (WHO) (view presentation).

Between 2007 (when prevalence surveys were first defined as a strategic areas of work of the Task Force) and April 2018, 25 national TB prevalence surveys in 24 countries were implemented (there were 2 survey in the Philippines). Since the last Task Force meeting in April 2016, surveys were completed in Bangladesh, Democratic People’s Republic of Korea, Kenya, and the Philippines. As of May 2018, field operations were ongoing in Mozambique, Myanmar, Nepal and South Africa. Field operations were completed in Namibia and Viet Nam in early 2018 and final results are expected towards the end of the year. Surveys are expected to start in Botswana, India, Lesotho and Swaziland during 2018. Several examples of the use of modern technologies were provided.

Further details are provided in background document C (view document), background document 3a (view document) and background document 3b (view document).

Three main issues were discussed during group work on Day 3:
1. The future role (including parallel use) of Xpert MTB/RIF (or Ultra) and culture as diagnostic tools in surveys.
2. Development of a package of key elements and standard procedures to ensure surveys adhere to Good Clinical Practice (GCP) principles, in collaboration with WHO/TDR.
3. Updates to some aspects of the handbook on TB prevalence surveys (i.e. lime book), including content on laboratory algorithms (to reflect the greater use of Xpert MTB/RIF or Ultra), case definitions in the context of wider use of molecular tests, and digital data management.

Discussions on the first topic were informed by a prior meeting on discordance between Xpert MTB/RIF (or Ultra) and culture results in recent surveys, held at WHO on 30 April. During this meeting, which brought together experts in surveys and laboratory experts, data from Bangladesh, Kenya and the Philippines alongside preliminary data from Myanmar, South Africa and Viet Nam were presented and discussed in detail.

5 Discordance is to be expected. Reasons include the different sensitivity and specificity of Xpert compared with culture, and the performance of culture testing in the context of surveys.
6.1.2 Priority next steps

The priority next steps for Task Force work on prevalence surveys are:

1. To obtain consensus on the optimum use of diagnostic tools in prevalence surveys, (specifically, the use of Xpert MTB/RIF, Xpert Ultra, smear and culture), and associated interpretation and analysis of results, and to develop updated guidance based on such consensus. This work will require further discussions among an expert group, informed by additional data, and analysis of these data, from Myanmar, South Africa and Viet Nam.

2. To pursue work on GCP-related guidance for prevalence surveys. Additional funding needs to be secured for this.

6.2 National surveys of anti-TB drug resistance

The Global Project on Anti-TB Drug Resistance Surveillance is the oldest and largest antimicrobial surveillance project in the world. An overview of progress was presented by Anna Dean (WHO) (view presentation), based on background document C (view document) and background document 3c (view document). This showed that a wealth of data have been collected since the Project’s launch in 1994, covering a range of drugs (though reporting and analysis of data have focused primarily on MDR-TB), for both adults and children. Data are available from continuous surveillance for 90 countries (mostly high-income countries) and from surveys for 70 countries. Overall, these 160 countries account for 97% of the global TB burden. Of the 40 high MDR-TB and/or TB burden countries, data are available from 37.

Sequencing and other molecular tools have an important role to play in achieving universal drug susceptibility testing, as called for in the End TB Strategy. The increasingly important role of molecular tools in the surveillance of drug-resistant TB was highlighted. Given the limitations of conventional phenotypic methods, molecular tools provide clear advantages and can be less costly in certain settings. In addition, a recent global project has shown that sequencing is a useful tool for surveillance, allowing consistent estimates (compared with phenotypic methods) of the prevalence of resistance for a range of drugs. It can also inform the development of new molecular diagnostics and predict resistance to new drugs.

More information on the role of sequencing is provided in background document 3d (view document) and background document 3e (view document), and WHO will release guidance on this topic in late 2018.

6.3 National surveys of costs faced by TB patients and their households

6.3.1 Overview

An overview of progress was presented by Nobu Nishikiori (WHO) (view presentation), based on background document C (view document) and background document 3f (view document). Following a summary of survey objectives and methods, the key points were:

- By April 2018, nine countries had completed national surveys, five countries had started a survey and 12 were planning a survey.
- Although cost drivers vary among countries, the overall percentage of TB patients and their households facing catastrophic costs is consistently high, ranging from 35% to 83%.
- Experience from pathfinding countries has shown that findings have major policy implications, related both to how TB services are delivered and the need to enhance social protection. Timely initiation of policy dialogue with relevant stakeholders is critical to facilitate effective translation of survey results into policy and programmatic action.

Results and actions being taken based on results from national surveys in Ghana and Viet Nam were then presented by Frank Bonsu (national TB programme, Ghana) (view presentation) and Nguyen Binh Hoa (national TB programme, Viet Nam) (view presentation). Besides the core survey indicators, the survey in Ghana also found that the proportion of TB patients living in poverty was higher than the general population (46% vs.24%), and this worsened after TB treatment (to 60%).
Multisectoral dialogue has been initiated by the Ministry of Health with other relevant ministries, particularly those in charge of health insurance, social protection, poverty alleviation and social development. In Viet Nam, 63% of TB-affected households faced catastrophic costs, and a multisectoral roadmap for action has been developed that includes the Ministry of Health, the Ministry of Labour and the Ministry of Social Affairs.

During plenary discussion, issues raised included methods used to assess time costs, especially in settings with high levels of unemployment among TB patients. The issue of how to communicate and use survey findings in the context of the upcoming UN high level meeting (HLM) on TB in September 2018 was also raised. It was noted that one opportunity for further discussion on this point would be the meeting of WHO’s Strategic and Technical Advisory Group for TB, scheduled for 6–7 June, since this meeting includes a major focus on preparations for the HLM. Participants commented on the value of including analysis of the impact of costs related to TB on poverty levels, as had been done in the Ghana survey.

The group that met on Day 3 included participants from four national TB programmes (Ghana, Indonesia, Myanmar and Pakistan), agencies providing technical assistance, and WHO staff from HQ, the regional offices for the Americas and Europe, and the Country Office in Ethiopia. The main topics discussed were advocacy, survey logistics, dissemination of results and policy translation.

Participants from Ethiopia, Indonesia and Pakistan expressed interest in conducting a survey in 2018/2019, provided funding can be mobilised. In the region of the Americas, three countries are ready to start surveys if funding can be secured: Colombia, Cuba and Dominican Republic. Development of survey materials in Spanish is already underway. The WHO European Region is planning to translate survey materials into Russian.

6.3.2 Priority next steps

The priority next steps for Task Force work on surveys of costs faced by TB patients and their households are:

1. Continue to coordinate and provide guidance and support for surveys, building on the WHO handbook (published in 2017) that sets out recommended methods for survey design, implementation, analysis and reporting of results, and experience gained from surveys implemented to date.
2. Increase advocacy about the importance of implementing surveys, especially to countries and to funding agencies. It should be emphasized that these surveys are essential to measure the third high level indicator of the End TB Strategy – an indicator to which Member States have committed through adoption of the End TB Strategy. Opportunities for such advocacy include regional meetings, the upcoming HLM, and meetings with the Global Fund.
3. Highlight and emphasize the complementary links between surveys of costs faced by TB patients and their households and broader work on measurement of levels of financial risk protection related to monitoring of progress towards universal health coverage (SDG indicator 3.8.2).
4. Encourage all countries – not only high TB burden countries - to implement surveys, and provide support as needed. As noted in the background document, surveys are already being considered in a few high-income countries.
5. Develop case studies that highlight the value of survey results in informing policy and other actions to reduce the proportion of TB patients and their households that face catastrophic costs.
6. Develop guidance on how to map existing mechanisms for social protection that are of relevance to TB patients.
7. METHODS USED BY WHO TO ESTIMATE THE BURDEN OF TB DISEASE

Two main topics were discussed. The first was methods used to estimate the incidence of drug-resistant TB, on which recommendations were made at the last Task Force meeting in April 2016. The second was a new topic on which there is increasing interest and related demand for guidance: estimation of disease burden at subnational level. Both topics were covered in background document 4a (view document).

The background document and the presentation also included a high-level comparison of the latest estimates of TB incidence and TB deaths published by WHO and the Institute of Health Metrics and Evaluation (IHME), Washington University, and a brief review of the extent to which burden estimates for the same year have varied in consecutive annual updates for both TB (by WHO and IHME) as well as for HIV (by UNAIDS and IHME) and malaria (by WHO and IHME).

7.1 Estimates of the burden of drug-resistant TB

All except one of the recommendations related to estimates of the burden of drug-resistant TB from the Task Force meeting of April 2016 were implemented in 2016 (as described in background document 4a, view document). A pending recommendation, related to the need to address the double-counting of retreatment cases with primary rifampicin-resistant TB, was discussed further in this May 2018 meeting. A relatively simple method to address the problem was presented by Philippe Glaziou (WHO) (view presentation). This was further elaborated by Pete Dodd (Sheffield University), who described recent work that he has been doing to implement a more complex Bayesian model that accounts for case misclassifications. This model appears to give similar results to the simpler method, and will be further developed and explored in the context of work to produce estimates of disease burden for the 2018 edition of WHO’s global TB report.

7.2 Estimates of TB disease burden at subnational level

Three potential approaches to estimating TB incidence at subnational level were presented by Philippe Glaziou (WHO) (view presentation), with further details available in background document 4a (view document). The three approaches were: use of case notification data; ecological modelling combined with results from a national TB prevalence survey; and using surveys of infection (e.g. using IGRA) to inform estimation of the heterogeneity of TB incidence (as opposed to the absolute level of TB incidence; WHO made a recommendation that surveys of infection were not suitable for estimating the incidence of TB disease in 2009). The limitations of each of these approaches were explained.

An example of an attempt to produce estimates of TB incidence at subnational level in Indonesia was presented by Rein Houben (London School of Hygiene and Tropical Medicine) and MN Farid (National Institute of Health Research and Development, Indonesia) (view presentation). The estimated national incidence was distributed by district, using an ecological approach that predicts cluster prevalence as measured in the last national prevalence survey using covariates such as floor space. The model did not use case notification data. A constant ratio of incidence:prevalence was assumed (using the value for the national level), thus implying a nearly invariant rate of case detection across districts. The predicted incidence at district level was compared with case notifications, which highlighted some validity issues. For example, the predicted incidence in several districts in Papua province was lower than the number of case notifications.

During group work (view group work summary), three main topics were discussed. These were: small area estimation approaches in countries with national prevalence survey results; the relevance of infection surveys using IGRA or a future more specific tuberculin test to inform assessment of the distribution of TB disease at the subnational (or subpopulation) level, especially in countries with no prevalence survey data; and the surveillance and containment of local epidemics in the context of settings with high-performance TB surveillance.
Two things clearly emerged from the survey prior to the Task Force meeting about what topics participants wanted to discuss in group work, the background document, presentations and the group work itself. First, there is considerable interest in the topic of estimates of disease burden at subnational level; second, there is growing demand for guidance on this topic, which currently does not exist.

7.3 Priority next steps

The key priority next step for the Task Force is to develop a guidance document on estimation of disease burden at subnational level. This requires further discussions among an expert group, including of options that would address country needs for target setting at subnational level that would not require estimates of disease burden. A total of 16 people volunteered to be part of a group that would do further work on the relevance of infection surveys (using IGRA or a future more specific test) to estimates of TB disease burden at subnational level: Mirjam Bakker, Ken Castro, Pete Dodd, Mohammed Farid, Philippe Glaziou, Rein Houben, Sunil Khaparde, Eveline Klinkenberg, Dina Lolong, Adam Macneil, Finn Mc Quaid, Nick Menzies, Sahu Suvanand, Marina Tadolini, Richard White and Norio Yamada. It will likely make sense for this group to discuss not just this specific topic, but also other options, and to be the group that works on an associated guidance document on estimation of disease burden at subnational level.

As already highlighted in section 4, the Task Force will also convene a small group to reassess whether it is possible to establish a benchmark for the proportion of cases of pulmonary TB disease that is expected to be bacteriologically confirmed (using recommended diagnostic tests), as opposed to clinically diagnosed. This is also of considerable relevance to estimation of TB burden at subnational level and the interpretation of subnational notification data, in the context of growing concern that the increasingly common practice of setting targets for case detection at subnational levels (based on subnational estimates of TB incidence) will result in perverse incentives to over-diagnose TB, an associated increase in the proportion of “cases” that are clinically diagnosed, and an increase in the number of people treated unnecessarily for TB.

8. ANALYSIS AND USE OF TB DATA AT NATIONAL LEVEL

8.1 Guidance on country-level TB modelling

Guidance for country-level TB modelling (background document 5b, view document), developed under the leadership of TB MAC between January 2017 and April 2018, was presented for consideration by the Task Force by Nick Menzies (Harvard University) (view presentation). Prior to the Task Force meeting, the guidance had already benefited from extensive input and review, including at a two-day TB MAC/WHO meeting dedicated to the topic in September 2017. Following the presentation and a short discussion, which included a few specific suggestions for minor revisions to content, the Task Force agreed to endorse the guidance.

Next steps that were agreed included sending any final comments to Nick Menzies within one week of the meeting and making minor revisions to address Task Force comments (for example, additional content to comment on when it is appropriate to use modelling and when other approaches could be chosen instead). These steps were completed by 14 May. The guidance has subsequently proceeded to the final production stages of editing and graphic design. It is anticipated that the guidance will be issued as a WHO publication a bit later in 2018, as recommended and agreed by stakeholders during the TB MAC/WHO meeting held in September 2017.

The presentation on the guidance also included an overview of next steps. These include the development of accompanying products that customize the guidance for particular audiences; development of benchmarks that can be used to assess model applications; and a checklist, including these benchmarks, for reviewers to use to assess a modelling application. These will be discussed at a TB MAC/WHO meeting scheduled for 10–11 September in Washington DC.
8.2 Analysis and use of TB-related data – an overview

An overview of progress in the new strategic area of work on analysis and use of data that was defined by the Task Force in April 2016 was presented by Babis Sismanidis (WHO) (view presentation), based on background document C (view document) and background document 5a (view document). The presentation covered three topics: regional and national workshops on analysis and use of TB data; joint work being done on TB, HIV, malaria and health information systems, under the umbrella of the Health Data Collaborative; and a framework for the optimization of evidence and tools to guide action.

8.2.1 Regional and national workshops

A common recommendation from national TB epidemiological reviews (section 4.1) has been to safeguard historical national and subnational TB data and to provide support for their visualization, analysis and use. To address this recommendation, three regional workshops on analysis and use of TB data were organized in 2016–2017 (two by WHO and the Global Fund, and one by these two organizations as well as the Stop TB Partnership). The workshops covered 16 countries in West Africa, 16 countries in Central and East Africa and 10 countries in Asia. For each workshop, preparatory work focused on the compilation of all available historical national and subnational TB surveillance data required to undertake the analyses recommended in the WHO handbook on understanding and using TB data, definition of actions required to strengthen TB surveillance, and identification of key areas for policy and programmatic action.

The future focus of this area of work includes national workshops for priority countries and regional workshops in other WHO regions.

8.2.2 Health Data Collaborative

Knut Staring (WHO) presented progress in strengthening analysis and use of the data generated by health systems, and ensuring quality in both of these areas through the development of guidance, tools, technical assistance and institutional capacity building within regional and national institutes, under the umbrella of the Health Data Collaborative (view presentation).

It was explained that a joint group with representatives from the HIV, TB, malaria and health information systems departments of WHO has been established to facilitate collaborative work across WHO and with The Global Fund. The group has identified three priority areas of work for the period 2017–2020:

- Strengthening surveillance systems and the data they produce through strong national and subnational integrated routine health information systems.
- Analysis, interpretation and use of data.
- Ensuring data quality (cross-cutting for all elements of the first two areas of work).

8.2.3 Framework for programmatic prioritization and planning

Globally, there has been a concerted effort to increase the availability of quality data, and to ensure that these data are used to inform policy, planning and programmatic action. Investments in data systems, surveys, and tools have led to a substantial increase in the quantity and quality of national and subnational data that are available for analysis and use. However, this has not necessarily been translated into decision-making for programmatic impact.

To optimize the use of evidence and tools for priority setting and planning by national TB programmes in a coordinated and complementary way that is supportive of national TB programmes without being overwhelming, a working group of international TB partners has been formed. The first deliverable from the group is a framework that provides a systematic approach to using evidence for policy, planning and priority-setting. A draft of this framework was presented by Nobu Nishikori

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(WHO) (view presentation). The Kenyan experience of using the draft framework to inform the country’s national strategic plan for TB was presented by Enos Masini (WHO Kenya) (view presentation).

Following the overview presentation, two tools for analysis and use of data that had not been previously discussed at a Task Force meeting were presented. The first was patient pathway analysis (background document 5c, view document), which was presented by Mike Osberg (Linksbridge) (view presentation); the second was Mapping and Analysis for Tailored Disease Control and Health System Strengthening (MATCH-TB) (background document 5d, view document), which was presented by Mirjam Bakker (KIT) (view presentation).

The group work on Day 3 was used for more detailed discussions about the draft framework for programmatic prioritization and planning, and associated products. These products include a white paper describing the difficulties and complexities associated with developing an evidence-based, people-centred, national plan of policy and programmatic action for TB, as well as the position of the study team on how to address it; a case study of the use of the framework in Kenya; and an encyclopaedia to describe available tools and sources of evidence, and when it is appropriate to use them.

Participants in the group included representatives from the national TB programmes of Indonesia, Philippines, South Africa and Tanzania, and representatives from universities, technical and funding agencies. The main issues that were discussed (view group work summary) were the problem statement (i.e. what is the problem that the framework is trying to address?); higher-level concepts included in the framework (such as the need for evidence-based prioritization of activities, the importance of ensuring a people-centred approach that covers the whole care continuum, and the need for meaningful collaboration between the various international agencies that provide technical assistance in response to country-led planning initiatives); the need for alignment between in-country plans and processes and framework implementation; the Kenyan experience and plans for follow-on in-country work; linking the framework with use of modelling for projections of disease burden and impact; and the structure of the encyclopaedia of evidence and tools.

**8.3 Priority next steps**

The priority next steps for this topic are:

1. Editing, graphic design, printing and distribution of the guidance on country-level TB modelling.
2. Continued development of the draft framework for programmatic prioritization and planning, and associated white paper, case studies and encyclopaedia, by a core team. This will be informed by in-country experience, stakeholder engagement and peer-review.
3. In-country work to pilot the framework for programmatic prioritization and planning in four pilot countries: Indonesia, Kenya, Philippines and South Africa.
4. Exploration of synergies with other Task Force work, in particular that related to estimation of disease burden at subnational level. It should be noted that since the fourth strategic area of work of the Task Force is about national estimates of TB disease burden needed to track progress towards End TB Strategy milestones and targets and the SDG target of ending the TB epidemic, while subnational estimates are based on analysis and use of data at national level, the topic of subnational estimates of TB disease burden should be pursued as part of the Task Force’s strategic area of work on analysis and use of TB data.
ANNEX 1: List of background documents and general references

List of background documents

<table>
<thead>
<tr>
<th>Number/letter</th>
<th>Title</th>
<th>Document Batch</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Meeting report from April 2016 meeting of Task Force</td>
<td>Batch 1</td>
</tr>
<tr>
<td>B</td>
<td>Task Force brochure (April 2018 edition)</td>
<td>Batch 1</td>
</tr>
</tbody>
</table>
| C             | Task Force quarterly update (April 2018)  
This covers five topics: prevalence surveys; drug resistance surveys; patient cost surveys; epidemiological reviews and standards and benchmark assessments; regional/national workshops for analysis and use of data | Batch 1 |

Overarching background documents  
(the first two are relevant to all meeting objectives; the third is relevant to 3 meeting objectives)

Objective 1: Strengthening national notification systems for direct measurement of TB cases

1  
Strengthening national notification systems for direct measurement of TB cases: An overview of progress | Batch 2 |

Objective 2: Strengthening national vital registration systems for direct measurement of causes of death

2  
Progress in strengthening civil registration and vital statistics for the monitoring of causes of death | Batch 1 |

Objective 3: Priority studies to periodically measure disease burden

3a  
National TB prevalence surveys: An overview of progress | Batch 2 |
3b  
National TB prevalence surveys: Progress on recommendations from 2016 Task Force meeting | Batch 2 |
3c  
Twenty years of global surveillance of antituberculosis drug resistance (N Eng J Med 2016) | Batch 1 |
3d  
Population-based resistance of *Mycobacterium tuberculosis* isolates to pyrazinamide and fluoroquinolone: results from a multicountry surveillance project (Lancet Infect Dis 2016) | Batch 1 |
3e  
Genetic sequencing for surveillance of drug resistance in tuberculosis in highly endemic country: a multi-country population-based surveillance study (Lancet Infect Dis 2018) | Batch 1 |
3f  
TB patient cost surveys to improve TB care delivery and social protection: An overview of progress | Batch 2 |

Objective 4: Estimates of TB disease burden

4a  
Latest developments in WHO estimates of TB disease burden | Batch 2 |
4b  

Objective 5: Analysis and use of data

5a  
Analysis and use of TB data: An overview of progress since April 2016 | Batch 2 |
5b  
Guidance for country-level TB modelling | Batch 1 |
5c  
Conducting patient-pathway analysis to inform programming of tuberculosis services: methods (JID, 2017) | Batch 2 |
5d  
MATCH-TB: Mapping and Analysis for Tailored disease Control and Health system strengthening | Batch 2 |
Reference documents


## ANNEX 2: Meeting Agenda

### DAY 1: Tuesday 1 May 2018, morning session

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>09:00 – 09:15</td>
<td>Welcome and introduction of participants Declaration of conflict of interest</td>
<td>Jaap Broekmans (Chair)</td>
</tr>
<tr>
<td>09:15 – 09:45</td>
<td>The WHO Global Task Force on TB Impact Measurement: introduction, overview, broader context</td>
<td>Katherine Floyd</td>
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</table>

**Objective 1. Strengthening national notification systems for direct measurement of TB cases**

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Presenter</th>
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</thead>
<tbody>
<tr>
<td>09:45 – 10:30</td>
<td>Presentation: Strengthening national notification systems for direct measurement of TB cases: an overview of progress  (Background document 1)</td>
<td>Babis Sismanidis</td>
</tr>
</tbody>
</table>
| 10:50 – 12:10 | Presentations: The introduction of mandatory notification and the 2017 inventory study of underreporting in Indonesia  
1) The introduction of mandatory notification – rationale and results (10min)  
2) The 2017 inventory study - key methods and results (20min)  
3) Main messages and next steps (15min)  
Commentaries from WHO and USAID (15min)  
Plenary discussion (20min) | Indonesia study team  
Babis Sismanidis  
Philippe Glaziou  
Charlotte Colvin  
All                        |
| 12:10 – 12:30 | Presentation: The 2017 inventory study of underreporting in Viet Nam (15min)  
Commentary from CDC (5min) | Nguyen Binh Hoa                      |

**13:00 – 14:30 Lunch**
### DAY 1: Tuesday 1 May 2018, afternoon session

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>14:30 – 15:45</td>
<td><strong>Presentations</strong>: Transitioning to case-based electronic surveillance</td>
<td>Si Thu Aung, Razia Fatima, Beatrice Mutayoba</td>
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<td>Countries using DHIS2:</td>
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<td></td>
<td>1) Myanmar (10min)</td>
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<td>2) Pakistan (10min)</td>
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<td></td>
<td>3) Tanzania (10min)</td>
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<td>Country-specific solutions:</td>
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<td></td>
<td>1) Brazil (10min) – an example of an established system</td>
<td>Patricia Bartholomay</td>
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<tr>
<td></td>
<td><strong>Plenary discussion</strong></td>
<td>All</td>
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<tr>
<td>15:45 – 16:00</td>
<td><strong>Tea break</strong></td>
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**Objective 2. Strengthening national vital registration systems for direct measurement of causes of death**

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>16:00 – 16:30</td>
<td><strong>Presentation</strong>: An overview of the status of progress in strengthening national vital registration systems for direct measurement of causes of death <em>(Background document 2)</em></td>
<td>Doris Ma Fat</td>
</tr>
<tr>
<td>16:30 – 17:00</td>
<td><strong>Presentation</strong>: Current efforts by global agencies to support strengthening of national vital registration systems</td>
<td>Charlotte Colvin, Estifanos Shargie</td>
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<tr>
<td>17:00 – 17:30</td>
<td>Wrap-up of Day 1</td>
<td>Jaap Broekmans</td>
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</tbody>
</table>
## DAY 2: Wednesday 2 May 2018, morning session

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00 – 09:15</td>
<td>Summary of main discussion/outcomes from Day 1</td>
<td>Jaap Broekmans</td>
</tr>
</tbody>
</table>

**Objective 3. To review progress in priority studies to periodically measure TB disease burden**

| 09:15 – 09:50 | **Presentation:** National TB prevalence surveys: an overview of progress, including actions taken on recommendations from 2016 meeting (20min)  
(Background documents – C, 3a, 3b) | Irwin Law         |
|               | **Plenary discussion** (15min)                                                                                     | All                |
| 09:50 – 10:30 | **Presentation:** Drug resistance surveys: an overview of progress and latest developments (20min)  
(Background documents – C, 3c, 3d, 3e) | Anna Dean         |
|               | **Plenary discussion** (15min)                                                                                     | All                |

### 10:30 – 10:50 Coffee break

| 10:50 – 11:55 | **Presentations:** Patient cost surveys  
1) Patient cost surveys: an overview of progress (20min)  
2) The 2016 patient cost survey in Ghana: results and implications (15min)  
3) The 2017 patient cost survey in Viet Nam: results and implications (15min)  
(Background documents – C, 3f) | Nobu Nishikiori Frank Bonsu Nguyen Binh Hoa |
|               | **Plenary discussion** (15min)                                                                                     | All                |

**Objective 5. Analysis and use of TB data**

| 11:55 – 12:45 | **Presentation:** Guidance on country-level TB modelling, and next steps (30min)  
(Background document – 5b) | Nick Menzies |
|               | **Plenary discussion** (20min)                                                                                     | All                |

### 12:45 – 14:00 Lunch
DAY 2: Wednesday 2 May 2018, afternoon session

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>14:00 – 14:40</td>
<td><strong>Presentation:</strong> Analysis and use of TB-related data: an overview of progress (30min)</td>
<td>Babis Sismanidis</td>
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<tr>
<td></td>
<td>Particular attention will be given to:</td>
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<tr>
<td></td>
<td>1) regional and national analysis workshops, including DHIS2 platform for safeguarding, analysis and use of subnational data</td>
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<td></td>
<td>2) the development of guidance, tools and materials as part of a joint workplan for HIV, TB, malaria and HMIS</td>
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<td></td>
<td>3) optimizing the use of available evidence and tools for programmatic prioritization and planning</td>
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<td><em>(Background document 5a)</em></td>
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<td></td>
<td><strong>Plenary discussion</strong> (10 mins)</td>
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<tr>
<td>14:40 – 15:30</td>
<td><strong>Presentations:</strong> Overview of framework for programmatic prioritization and planning, and two tools that are part of it</td>
<td>Nobu Nishikiori</td>
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<tr>
<td></td>
<td>Framework for optimal use of evidence and tools for programmatic prioritization and planning (20min)</td>
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<tr>
<td></td>
<td>1) Patient pathway analysis (10min + 5min for Q&amp;A)</td>
<td>Christy Hanson</td>
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<td></td>
<td>2) MATCH (10min + 5min for Q&amp;A)</td>
<td>Mirjam Bakker</td>
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<td><em>(Background documents 5c, 5d)</em></td>
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<tr>
<td>15:30 – 16:00</td>
<td><strong>Presentation:</strong> Health Data Collaborative: an overview with specific focus on the joint workplan for HIV, TB, malaria and HMIS</td>
<td>Knut Staring</td>
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<td><em>(Background document 5a)</em></td>
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**16:00 – 16:20 Tea break**

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<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>16:20 – 16:40</td>
<td><strong>Presentation:</strong> The Kenyan experience in the optimal use of available evidence and tools to inform policy and programmatic action</td>
<td>Enos Masini</td>
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<tr>
<td>16:40 – 17:00</td>
<td><strong>Plenary discussion</strong></td>
<td>All</td>
</tr>
<tr>
<td>17:00 – 17:15</td>
<td>Wrap-up of Day 2 and explanation of Day 3</td>
<td>Jaap Broekmans</td>
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<td>Katherine Floyd</td>
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<td>Time</td>
<td>Topic</td>
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<tr>
<td>09:00 – 09:15</td>
<td>Summary of main discussion/outcomes from Day 2</td>
<td>Jaap Broekmans</td>
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<tr>
<td></td>
<td><strong>Objective 4. Methods to estimate TB disease burden</strong></td>
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<tr>
<td>09:15 – 10:40</td>
<td><strong>Presentations and Q&amp;A:</strong></td>
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<td></td>
<td>Latest developments in WHO estimates of TB disease burden</td>
<td>Philippe Glaziou</td>
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<td></td>
<td>Methods for estimating the burden of drug-resistant TB</td>
<td>Pete Dodd</td>
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<td></td>
<td>Estimation of TB disease burden at subnational level in Indonesia</td>
<td>Rein Houben MN Farid</td>
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<td></td>
<td><em>(Background documents 4a, 4b)</em></td>
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<tr>
<td>10:40 – 11:00</td>
<td><strong>Coffee break</strong></td>
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<td></td>
<td><strong>Group or side-discussions related to all five objectives</strong></td>
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<tr>
<td>11:00 – 13:00</td>
<td><strong>Group discussions on four priority topics</strong></td>
<td>All in groups</td>
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<tr>
<td></td>
<td>1) Prevalence surveys</td>
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<td></td>
<td>2) Estimates of TB disease burden at subnational level</td>
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<td></td>
<td>3) Patient cost surveys</td>
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<td></td>
<td>4) Framework for optimal use of evidence and tools for programmatic</td>
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<tr>
<td></td>
<td>prioritization and planning</td>
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<td><em>(pilot countries are Indonesia, Kenya, Philippines, South Africa)</em></td>
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<td></td>
<td><strong>Side meetings on other topics as needed</strong></td>
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<tr>
<td>13:00 – 14:00</td>
<td><strong>Lunch</strong></td>
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<tr>
<td>14:00 – 15:30</td>
<td><strong>Group discussions and side meetings (continued)</strong></td>
<td>All in groups</td>
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<tr>
<td>15:30 – 15:50</td>
<td><strong>Tea break</strong></td>
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<tr>
<td>15:50 – 17:00</td>
<td><strong>Group discussions and side meetings (continued), followed by</strong></td>
<td>All in groups</td>
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<tr>
<td></td>
<td>preparation of slides (3 slides per group) for presentation on Day 4</td>
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<td></td>
<td><strong>Side meeting of TB MAC Advisory Panel (15:00 – 17:00)</strong></td>
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<td>Time</td>
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<td>Presenter</td>
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<tr>
<td>09:00 – 10:30</td>
<td>Feedback on main outcomes of group discussions</td>
<td>Lead facilitators of each group</td>
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<tr>
<td></td>
<td>3 slides for each group, covering:</td>
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<tr>
<td></td>
<td>1) main topics discussed;</td>
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<td>2) main areas of agreement (or disagreement);</td>
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<td></td>
<td>3) plan for the next year</td>
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<tr>
<td></td>
<td>Plenary discussion</td>
<td>All</td>
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<tr>
<td>10:30 – 10:50</td>
<td><strong>Coffee break</strong></td>
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<tr>
<td>10:50 – 11:30</td>
<td>Feedback on main outcomes of group discussions (continued)</td>
<td>Lead facilitators of each group</td>
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<td>3 slides for each group, covering:</td>
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<tr>
<td></td>
<td>1) main topics discussed;</td>
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<td></td>
<td>2) main areas of agreement (or disagreement);</td>
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<td></td>
<td>3) plan for the next year</td>
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<tr>
<td></td>
<td>Plenary discussion related to group discussions</td>
<td>All</td>
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<tr>
<td></td>
<td>Other feedback to share from side-discussions on Day 3</td>
<td>All</td>
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<tr>
<td>11:30 – 12:00</td>
<td>Meeting summary and closing</td>
<td>Jaap Broekmans Katherine Floyd</td>
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<td><strong>Lunch followed by departure</strong></td>
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</tbody>
</table>
ANNEX 3: List of participants, and those who were invited but could not attend

Participants

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48. **Mr Fukushi Morishita**  
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49. **Dr Rafael Lopez Olarte**  
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**WHO/HQ Secretariat**

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53. **Dr Anna Dean, GTB/TME**  
54. **Ms Ines Garcia-Baena, GTB/TME**  
55. **Dr Philippe Glaziou, GTB/TME**  
56. **Ms Lice Gonzales Angulo, GTB/LDR**  
57. **Dr Christian Gunneberg, GTB/TSC**  
58. **Dr Irwin Law, GTB/TME**  
59. **Ms Doris Ma Fat, IER/MHA**  
60. **Mr Tomas Matas, GTB/TME**  
61. **Dr Nobuyuki Nishikiori, GTB/PSI**  
62. **Ms Cicilia Gita Parwati, GTB/PSI**  
63. **Dr Andrew Siroka, GTB/TME**  
64. **Mr Knut Staring, IER/GPM**  
65. **Dr Charalampos Sismanidis, GTB/TME**  
66. **Mr Hazim Timimi, GTB/TME**  
67. **Dr Yinyin Xia, GTB/RTE**  
68. **Dr Matteo Zignol, GTB/TME**
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