

Tuberculosis prevention, care and control

A practical directory of new advances



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1. Preface

During the late 20th century countries increasingly recognized tuberculosis (TB) as a public-health priority and intensified their TB prevention, care and control efforts. Many adopted a new strategy for effective TB control: DOTS. Expansion of DOTS was incomplete, however, and misdiagnosis of TB and poor-quality treatment persisted. Innovative new approaches and tools for TB control were needed to help countries increase access to high-quality TB care, while also responding to the deadly combination of HIV and TB and the emergence of drug-resistant strains of TB. In response, WHO and partners embraced a new six-point Stop TB Strategy that builds on and enhances DOTS in order address such new challenges.

Within the context of the Stop TB Strategy, countries and the international community have designed, implemented, evaluated and endorsed dozens of additional new approaches and tools for TB prevention, care and control. Extensive evidence and expert guidance exists for each of these advances. Supplemented by country experience, this information is a valuable resource for national TB control programmes (NTPs) that are preparing to evaluate or introduce new approaches and tools. A recent survey of NTP managers indicates, however, that despite this wealth of information it has been difficult for countries to comprehensively implement the available advances. The fast pace of innovation, combined with limited absorptive capacity, makes it hard to select and implement the advances that most effectively target existing constraints to progress.

Recognizing the gap between knowledge and practice, the Introducing New Approaches and Tools (INAT) subgroup of the Stop TB Partnership's DOTS Expansion Working Group has aimed to provide practical information for countries that can help them accelerate implementation of new proven advances in TB prevention, detection, diagnosis, treatment and care.

With this in mind the Stop TB Partnership and the World Health Organization (WHO), with financial support from the United States Agency for International Development (USAID), have produced this *Practical directory of new advances*.

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2. Introduction

This Directory supports the strategic planning efforts of NTP managers, staff and partners by offering a needs-based summary of 76 new approaches and tools for TB prevention, care and control that have been recommended or endorsed by WHO in the previous decade. Information in the Directory was collected from published guidance and standards, peer-reviewed literature and interviews with TB programme managers and international TB control experts. This is not a comprehensive list of all new approaches and tools for TB prevention, care and control. As a practical reference, it focuses on specific strategic or technical advances that can be put into practice in direct response to current constraints to TB programme implementation. To ensure that the Directory reflects the best available scientific evidence, only advances recommended or endorsed by WHO are included. All WHO policies are evidence-based.

The structure and organization of this Directory reflects the components of the Stop TB Strategy. For each advance, the Directory presents a summary of key evidence and relevant new international standards. Where appropriate, the Directory also provides information about the advance's advantages, barriers and limitations, programmatic requirements and/or other considerations. The Directory also provides simple indicators of the management/supervisory, procurement/supply and human resource costs to implement each intervention, where available.

Early advances in TB prevention, care and control

Robert Koch delivered one of the first major advances in TB control in 1882 when he discovered the TB bacillus. Many important advances followed, such as the Bacille Calmette-Guérin (BCG) vaccine and the programmatic implementation of short course chemotherapy using specific, powerful anti-TB medicines. Evidence from TB control practices led to international policies and recommendations for national programme management and implementation (1).

The endorsement and widespread adoption of the DOTS strategy was a major advance at the end of the 20th century that was later expanded upon in the WHO Stop TB Strategy. Underpinned by the Stop TB Strategy, in 2006 the Global Plan to Stop TB, 2006–2015 described strategies and financial requirements for achieving the Millennium Development Goals (MDGs) and other 2015 targets relevant to TB (2).

Recent advances (2000–2011)

With the launch of the first Global Plan to Stop TB, 2001-2005 came a revitalized focus on TB research. Encouraged by momentum towards the MDGs and the drive to reach its targets, countries and the international community delivered innovative new approaches and tools to prevent and control TB. This Directory describes many of these recent advances.

Historically, TB control activities largely focused on the most infectious patients – those who have sputum smear-positive pulmonary TB – because preventing TB from being transmitted (by preventing exposure; early detection and treatment of infectious patients; and preventing latent TB infection from developing into active TB disease) is a basic mechanism underlying the control of the TB epidemic. Recent advances reflect the evolution and expansion of NTPs and the Stop TB Strategy's emphasis on universal access for all persons to high-quality, patient-centered treatment. Nonetheless, highly infectious, smear-positive patients are still the focus of many advances, such as contact tracing and infection control.

In response to "demand from countries for immediate guidance on which collaborative TB/HIV activities to implement and under what circumstances," (3) policies and tools were developed to support collaboration between HIV and TB programmes; guidelines were established for the prevention and treatment of HIV-TB coinfection among a variety of different populations (including children and infants); and laboratory strengthening and diagnostics policy development was accelerated, especially to address the challenges of HIV-associated and drug-resistant TB.

The serious emerging threat of resistance to anti-TB drugs led to the development of international guidelines for programmatically managing multidrug resistant TB (MDR-TB), as well as new clinical and laboratory tools to diagnose and treat it in a variety of settings (4). Recognizing that many cases go undetected and that those infected are likely not receiving proper treatment (5), new tools for engaging and partnering with all health providers have also been developed. Additional advances have been designed to help countries achieve universal access and earlier detection in order to effectively cut TB

"No health system can achieve everything possible and desirable all at once, and all health systems face resource constraints. Therefore systematic, rational and explicit ways of identifying priorities are necessary... The greater the resource constraints, the more important prioritization becomes, in order to ensure the most effective use of the limited resources available."

Strategic framework to decrease the burden of TB/HIV. Geneva, WHO, 2002

transmission, avert deaths and prevent suffering due to TB. At the same time, efforts continue to improve existing guidelines for basic TB care services and to provide new tools for ensuring the appropriate human and financial resource capacity of the programmes implementing them.

3. Evaluating and implementing new advances

This Directory is a strategic planning tool that provides summary information about dozens of new advances. Specific guidance has been published for each advance, is referenced here and should be read for more detailed and nuanced information, if you think that a particular advance may benefit your programme. For more assistance, contact technical experts who have previously helped countries to select, implement and/or scale-up the advance (or directly implemented the advances themselves). For the purposes of this Directory, an *advance* is a recently endorsed tool or approach that, if implemented properly, can measurably improve TB prevention, care and control.

Understanding your needs

Every country faces different TB control needs and challenges that must be understood to assess the relevance and potential value of a new approach or tool. Before selecting a new advance to implement, carefully consider:

- **Known TB control challenges** Based on data collected, consider prioritizing advances that will have the greatest primary and secondary health impact among the populations and in the areas you are targeting. For example, current TB/HIV collaborative activities may be a priority if there is evidence of high ($\geq 1\%$) HIV prevalence among TB patients in the population.
- **Suspected challenges** Consider advances that will confirm the scope of potential problems and can inform effective solutions. For example, conducting a national public-private mix (PPM) situation assessment may be a priority if you suspect that many TB patients seek treatment from the private sector or from public health care providers that are not linked to the NTP network.
- **Future challenges** Consider advances that preemptively address challenges or constraints you anticipate. For example, implementing a programme to develop managerial capacity at district or regional level may be a higher priority if you are preparing to decentralize TB programme administration.

Selected sources of assistance/support for new advances		
WHO Stop TB Department	http://www.who.int/tb (email: tuberculosis@who.int)	
Stop TB Partnership	http://www.stoptb.org (email: stoptbadvocacy@who.int)	
Area requiring assistance/support	Starting points for assistance/support	Website
Advocacy, communication and social mobilization	Stop TB Partnership ACSM Subgroup	http://www.stoptb.org/countries/acsm/subgroup
Anti-TB drug development and procurement	Global Drug Facility (GDF) Working Group on New Drugs	http://www.stoptb.org/wg/gdf http://www.newtbdrugs.org
Diagnostics / laboratory strengthening	Global Laboratory Initiative (GLI)	http://www.stoptb.org/wg/gli
Engaging all care providers	Stop TB Partnership PPM Subgroup	http://www.stoptb.org/wg/dots_expansion/ppm
Increasing case detection	DOTS Expansion Working Group TB REACH	http://www.stoptb.org/wg/dots_expansion http://www.stoptb.org/global/awards/tbreach
Managing drug-resistant TB	Green Light Committee (GLC) Stop TB Partnership Working Group on MDR-TB	http://www.who.int/tb/challenges/mdr/greenlightcommittee http://www.stoptb.org/wg/mdrtb
Planning / implementing TB technical assistance	TBTEAM and the GLI	http://www.stoptb.org/countries/tbteam
TB/HIV collaboration	Stop TB Partnership TB/HIV Working Group	http://www.stoptb.org/wg/tb_hiv

Assessing an advance

Each new approach or tool for TB prevention, care or control has a specific purpose and a unique set of requirements to be effective. Keep in mind the following when reviewing potential new advances for your programme:

- **The evidence-base** This includes evidence not only of the efficacy of the tool under the conditions of controlled trials but also its effectiveness in actual field conditions. Define your needs based on your specific implementation context and ensure there is evidence that the advance meets them.
- **Costs** Some advances can be implemented with minimal incremental cost. Others have high initial costs (such as for some types of equipment) and/or ongoing costs (such as for maintenance or consumable products). The cost-versus-benefits of each tool should be carefully considered. Remember that many costs are not specific to TB and can be shared with the overall health system and other disease control programmes. Consider starting with the most cost-effective and aim for the greatest impact with available resources.
- **Infrastructure requirements** Some advances can only have the desired benefits if other health system components are already in place. Consider advances that can be implemented using existing capacity – or plan to develop the capacity before implementing the advance. For example, if you do not have the infrastructure to support certain diagnostic tools, account for the costs and time to develop that infrastructure when assessing the benefits of the advance. Likewise, expanding case detection or community involvement may be counterproductive if there is not a steady supply of high-quality anti-TB drugs or if treatment quality is poor.
- **Staff capacity and training needs** A key factor when assessing a new advance is the human resource capacity that you need to implement and scale it up. In some cases, a new advance will require additional staff, training and on-going supervision. In other cases, an advance can be implemented with very little additional capacity; however you may need to train existing staff in the benefits the advance and how to apply it in their work. Creative solutions can leverage existing infrastructure to support new TB prevention, care and control activities. For example, networks of community leaders and health volunteers that you already work with may be able to help you implement new local advances.
- **Tool-specific requirements** Finally, every new approach and tool has its own specific requirements. Before selecting an advance, review published guidance and confer with experts and TB control staff in other countries in order to understand these well. For example, when assessing new laboratory diagnostic tools, take into account such factors as the turnaround time for results; the regulatory and quality control measures required; the effect on work flow; and any biosafety considerations associated with the new tool.

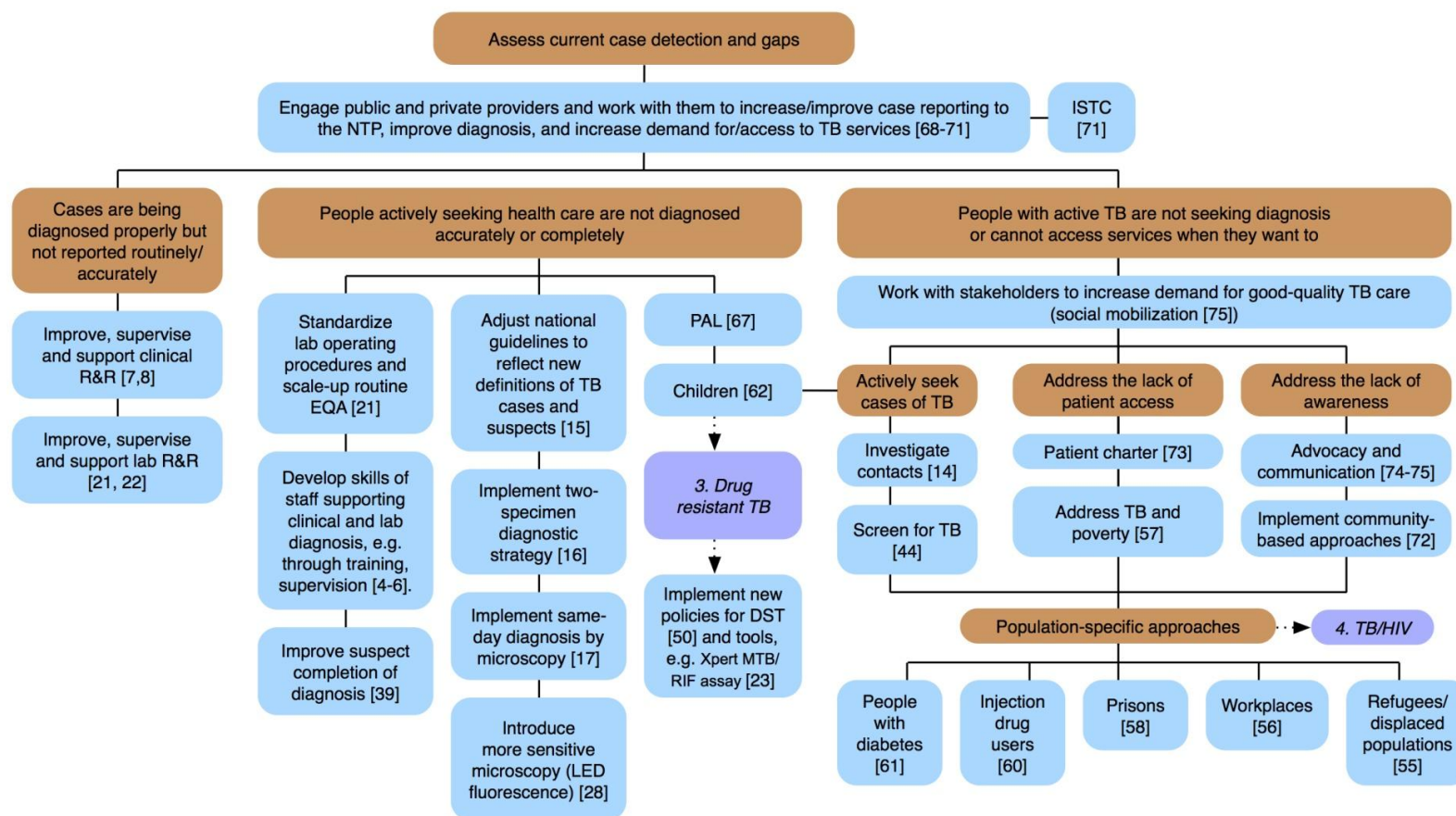
4. Applying new advances to address key problems in TB control

Every NTP faces unique challenges, but some challenges are common across many countries. Large-scale problems typically require more comprehensive approaches that involve multiple advances described in this Directory. The following maps demonstrate how advances can be implemented in combination to address four of the most common challenges faced by NTPs. The number in brackets refers to the ID of the advance: *not* the resources at the end of this Directory.

Important note These maps only show advances that are described in this Directory and are applicable to the problem being addressed by the map. Important existing approaches (such as sputum smear microscopy) and some approaches that have not yet been formally endorsed do not appear here. *Although the sequence of advances shown may be helpful, you do not need to implement them in that order.*

Map 1: Detecting more TB cases

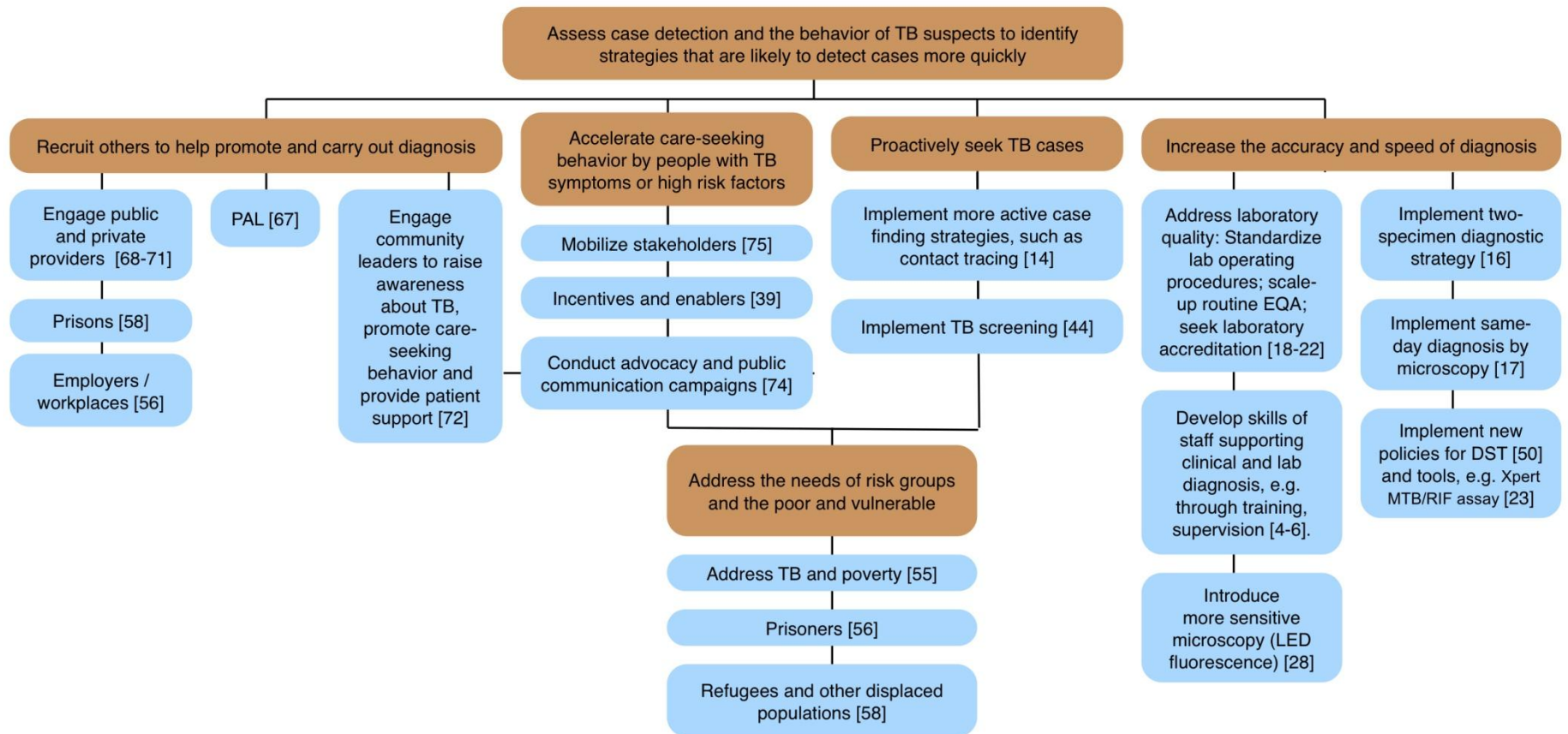
TB cases often go undetected. This may be because cases are diagnosed but not reported to the NTP. However, it is known that many suspects do not seek diagnosis (or face barriers that do not allow them access to diagnosis) and that some cases are not diagnosed accurately. To reduce transmission and save the lives of those infected, NTPs have implemented and assessed new approaches to increase case detection.



Map 2: Detecting TB cases earlier

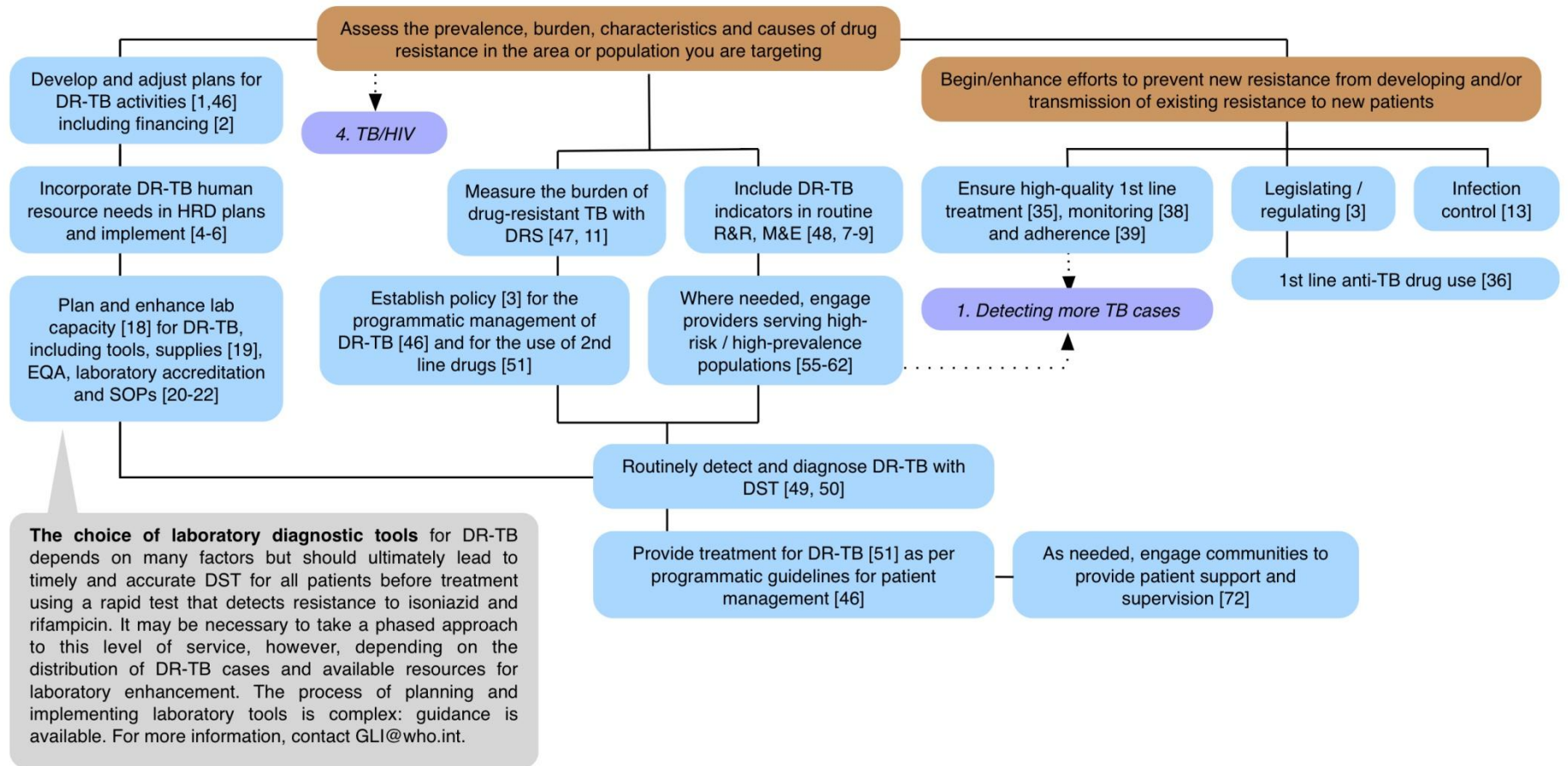
As countries continue to improve TB treatment and address gaps in case detection, they simultaneously are looking for ways to detect and treat TB cases more quickly so as to decrease transmission and improve the outcomes of treatment. The map below highlights several advances in this Directory that could (depending on your priorities and context) help detect TB cases more quickly.

Important note Like most challenges faced in TB control, if you begin by assessing and understanding the characteristics of the problem and the behavior of populations at risk, you will be able to shape a more effective response and guide collaboration between partners and stakeholders.



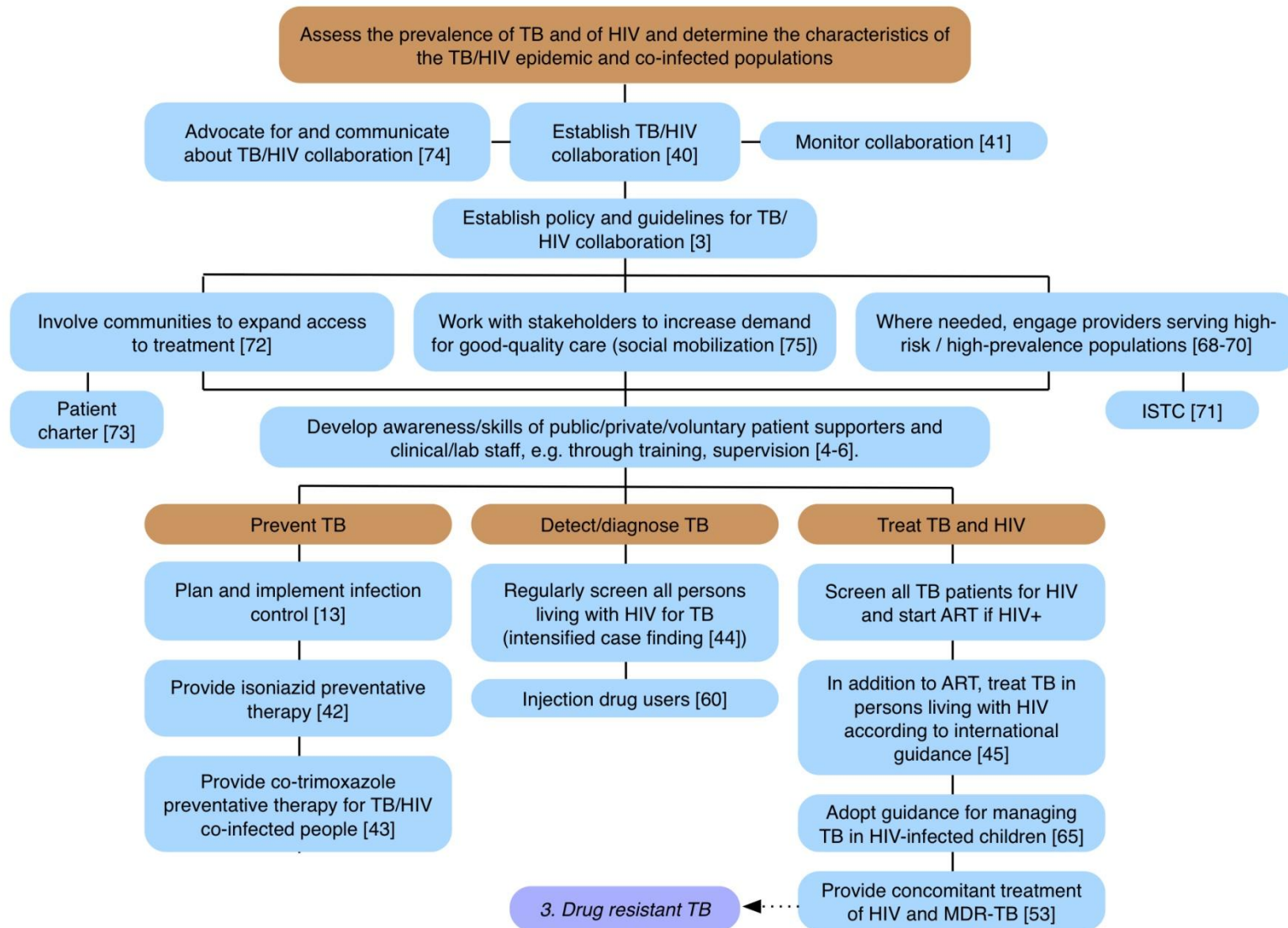
Map 3: Detecting and managing drug-resistant TB

Preventing and managing anti-TB drug resistance is a complex challenge that requires a multi-faceted response, ranging from surveillance to drug management and patient treatment. The map below displays several areas in which new advances are appropriate to support the response to anti-TB drug resistance in countries.



Map 4: Addressing TB/HIV coinfection

TB infection is a leading cause of death among people living with HIV and is therefore a major priority in countries with a high HIV prevalence and an important challenge that must be addressed in nearly all TB endemic countries. Collaboration between different international and national programmes and projects offers unique challenges and opportunities for TB control, as highlighted in the map of TB/HIV advances that appear below.



5. Key new approaches and tools for TB prevention, care and control

WHO launched its six-point Stop TB Strategy in 2006 to enhance DOTS, while also addressing new challenges such as TB/HIV, MDR-TB and the lack of adequate involvement of communities, patients and all health care providers in public and private sectors. The six components of the Stop TB Strategy are:

1. Pursue high-quality DOTS expansion and enhancement
2. Address TB-HIV, MDR-TB and the needs of poor and vulnerable populations
3. Contribute to health system strengthening based on primary health care
4. Engage all care providers
5. Empower people with TB, and communities through partnership
6. Enable and promote research

Made possible in part by efforts to effectively implement all of the components, including the sixth component (Enable and promote research), many new tools and approaches have been developed, evaluated and are now recommended for use when implementing the other five components.

The tables below summarize some of the most critical advances.

Key to new advances	
●	Implementing and sustaining this advance makes use of available resources with minor changes to their management and minimal (or no) new costs.
●●	Advance requires careful management attention during implementation, but activities (including supervision) may be incorporated into routine work over time. There are new costs associated with the advance, but they may be reduced by careful procurement and cost-sharing.
●●●	Advance places a great demand on management. New supervisory/operational tasks must be sustained over time. This advance may require specialized infrastructure and/or have high immediate and on-going costs.

Note: The indicators in this key are intended to give a general impression of the resources needed to implement an advance. They do not reflect a scientific grading of resource requirements. Assignment of values to specific advances was based on published literature, country experience and input from experts. Actual resource requirements may vary significantly from those indicated here.

Component 1. Pursue high-quality DOTS expansion and enhancement

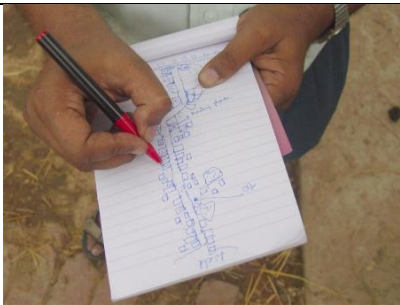
TB programme planning, budgeting and financing				Approximate costs to implement ¹		
ID	Advance	Year ²	Description	Manage / supervise	Procure / Supply	Staff / Train
1	Planning and budgeting TB control activities	2008	WHO published the first handbook for NTPs in 1998. Since then important changes have taken place in TB control. Updated guidance (6) for NTP managers and staff describes the essential elements of a comprehensive TB control programme and summarizes the recommended strategies and activities that can help you achieve TB control targets.	●	●	●
2		2010	NTP plans must address technical and financial requirements within the framework provided by the Global Plan and the Stop TB Strategy. The <i>Stop TB Planning Matrix and Frameworks</i> was developed to guide mid-term strategic planning help develop funding proposals for donors (7). The <i>Stop TB Planning and Budgeting</i> software (8) developed by WHO allows you to develop plans and estimate budget requirements for TB control at all levels of the health system. Plans can be used as the basis for resource mobilization from governments/donors.	●	●	●
3	Legislating and regulating TB	2010	Evidence-based legislation and regulations are essential to sustain a comprehensive public health strategy for TB control, protect public health and safeguard the legal rights of individuals. Examples include legislation that:	●●	●	●●





¹ Indicative cost to the NTP. Costs will vary significantly depending on the current level of health system functions and resources, NTP capacity (e.g. training costs may be reduced if an advance, such as a TB prevalence survey, has been previously introduced) and the phase (e.g. evaluation, scale-up, maintenance) and scope (e.g. national, district-level) of implementation.

² The year in which guidance on the new approach or tool was most recently revised.

	control		ensures full notification by all providers; bans over-the-counter sales of anti-TB drugs; and promotes evidence-based diagnosis and treatment by certification and accreditation. Best practices for drafting and advocating for effective TB policy have been documented. Recent guidance on responding to ethical issues in TB prevention, care and control includes guidance on appropriate policy and regulation (9).			
4	Developing human resources (HRD)	2011	HRD refers to the process of planning, managing and supporting the workforce that delivers TB control services. A framework is available to help countries implement strategies to achieve an effective and sustainable health workforce (10) and a checklist is available (2005) for review of the HRD component of national plans for TB (11). Additional practical guidance (2009) describes how to develop HRD plans, including templates for strategic plans and implementation plans, with examples (12).	•••	••	•••
5		2005	Guidance describes how to organize training (13) for district TB control managers. Includes a curriculum and the materials needed to teach managers to plan, supervise, implement, monitor and evaluate the activities of a district TB control program (14). Guidance is also available for training managers of collaborative TB/HIV activities (15).	••	••	••
6		2002	Guidance outlines a strategy for managing human resources, including task analysis (16), training for health facility staff (17) and other forms of human resource development (18).	••	••	••

Monitoring, evaluating and measuring the impact of the TB epidemic				Approximate costs to implement			
ID	Area of advance	Year	Description	Manage / supervise	Procure / Supply	Staff / Train	
7	TB recording and reporting	2006	A standardized recording and reporting (R&R) system that allows assessment of treatment results is an essential component of the Stop TB Strategy. The recommended TB R&R system was revised to align the forms and registers with the Stop TB Strategy and is available for country adaptation (19). Computerized implementations of TB R&R forms, registers and quarterly reports are in use in countries. Some costs are associated with the production and distribution of revised forms or implementation of computerized systems.		••	••	••
8		2011	The Routine Data Quality Assessment tool can be used to routinely assess and improve the quality of TB data in R&R systems (20). Doing so requires some training of staff to conduct assessments and analyze their results.		•	•	••
9	Monitoring and evaluation	2004	New standard TB monitoring and evaluation indicators have been compiled for TB, including guidance on how to define indicators that can be compared over time and between different programs (21).	••	•	••	
10		2004	Best practices for combined monitoring and evaluation of HIV, malaria and TB have been gathered, assessed and documented (22). This includes common indicators for the three diseases and disease-specific technical information. Coordinating combined monitoring across programmes requires additional management time, such as for routine meetings of programme managers and monitoring and evaluation staff.	••	•	••	
11	Conducting surveillance	2011	TB prevalence surveys measure the absolute burden of disease caused by TB and trends in the disease. Originally published in 2007 as a guide for TB experts, survey investigators, researchers and advisers at national and international levels, new guidance (23) explains how to design and implement repeatable surveys and to analyze and compare the data collected.	••	•••	••	

Preventing TB				Approximate costs to implement		
ID	Advance	Year	Description	Manage / supervise	Procure / Supply	Staff / Train
12	BCG vaccination	2008	First administered to humans in 1921, WHO continues to recommend that in countries with a high burden of TB, a single dose of BCG should be given to all infants as soon as possible after birth. BCG is part of the immunization programme because of its high direct protection against acute forms of TB (e.g., miliary TB or TB meningitis) in children; it has little impact on TB transmission or preventing TB among adults. BCG should not be given to HIV-infected infants and children or children known to have other immunodeficiencies (24).	•	••	•
13	Planning and implementing TB infection control	2009	 <p>ventilation systems) may have higher costs and require different implementation approaches than other activities (such as training in infection control practices).</p> <p> TB programmes should ensure infection control in healthcare and congregate settings. Recent evidence-based policy (25) for TB infection control includes infection control in households and recommends national activities (such as infection control policy and standards for health facility design, construction and use) and measures for facility-level TB infection control (such as prompt identification of TB symptoms; separation of infectious patients; and the use of particulate respirators and ventilation systems). Infection control is also an important consideration for both hospital-based and ambulatory MDR-TB treatment (26). Practical guidance is available to help advocate (27) for infection control policies and to implement them (28). Some infection control activities (such as refitting of clinics with new </p>	••	••	••
Other advances to prevent TB		N/A	Several other advances described in this document are effective interventions that can help prevent TB occurrence, such as providing isoniazid preventative therapy (IPT) to people living with HIV (see advance #42) and addressing risk factors and social determinants, such as diabetes (advance #61), poverty (advance #57) and tobacco (advance #59). Other approaches not described in detail in this Directory, such as earlier provision of ART for eligible people living with HIV, are also important preventative measures to consider.			


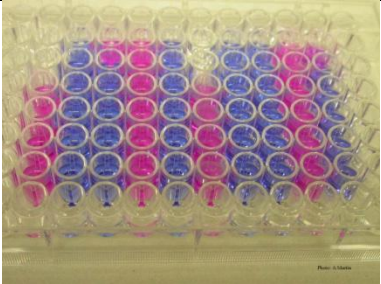
Detecting and diagnosing TB earlier				Approximate costs to implement		
ID	Advance	Year	Description	Manage / supervise	Procure / Supply	Staff / Train
14	Contact investigation	2008	 <p> TB contact investigation contributes to early identification of TB patients and can increase case detection by identifying and examining people that have come into close contact with a known active TB case (29). According to WHO, household contacts of an infectious TB case need to be the first focus of TB screening and treatment, especially if they are living with HIV. Although contact investigation has been in use for years, new standards (30) recommend investigations for children (particularly those under 5 years of age) who are close contacts of smear-positive TB cases (31). New guidance is available for quality improvement of chest X-ray reading in TB suspects (32). Other active case finding, such as intensified case finding for TB/HIV (advance #44), are described below. </p>	••	•	••

15	Revised definitions of TB suspects and TB cases	2010	The definitions for suspected TB and drug-susceptible TB cases have evolved and been revised (33). Among other changes, this includes the (2007) definition of a new sputum smear positive pulmonary TB case, which is now based on the presence of at least one acid fast bacillus (AFB) in at least one sputum sample in countries with a well-functioning external quality assurance (EQA) system.	•	•	•
16	Two-specimen strategy for diagnosing TB	2007	Evidence shows that good-quality microscopy of two consecutive sputum specimens identifies most (95–98%) smear-positive TB patients (34). Therefore, WHO recommends that the number of specimens examined for screening TB cases be reduced from three to two, in places where a well-functioning EQA system exists, the workload is very high and human resources are limited (35).	•	•	•
17	Same-day diagnosis by microscopy	2011	Countries that have successfully implemented a two-specimen strategy should switch to same-day diagnosis, especially in settings where patients are likely to default. Countries that are still using a three-specimen strategy should gradually change to same-day diagnosis (36).	•	•	•

Improving laboratory diagnosis of TB				Approximate costs to implement		
ID	Advance	Year	Description	Manage / supervise	Procure / Supply	Staff / Train
18	Strengthening and standardizing laboratories and laboratory networks	2010	Building adequate laboratory capacity requires that many essential elements be addressed simultaneously within comprehensive strategies and national plans, based on local epidemiology and resources. Several management tools (37, 38, 39) for laboratory planning have been introduced to help implement recommended TB laboratory techniques/services within the context of National Laboratory Strategic plans, including updated guidance on the selection and use of WHO-endorsed laboratory approaches and tools.	•••	•• ³	•••
19		2010	To be fully functional, a laboratory service relies on a steady supply of equipment and consumables, such as laboratory reagents and diagnostic kits. New guidance (40) describes recommended practices for procuring and managing TB laboratory supplies and new tools can be used to improve procurement, such as tools to help calculate the supplies needed for sputum smear microscopy, culture and DST (41). External technical assistance is likely required, such as to help adapt guidance and implement laboratory enhancements.	••	••	••
20		2011	Appropriate laboratory infrastructure and biosafety allows safe handling of biological material and living organisms in laboratory settings and helps minimize risks to human health and the environment. WHO has published guidance (42) on TB laboratory biosafety, including new principles of risk assessment. For example, the conventional biosafety level (BSL) 1-3 classification has been replaced with a new classification (low, moderate and high TB risk precautions). The term “Containment laboratory” replaces “BSL 3 laboratory” to describe the minimum requirements necessary for the manipulation of cultures of <i>M. tuberculosis</i> for identification or indirect DST. The minimum requirements can be enhanced based on procedures and technologies used in laboratories at different health service levels. Minimum requirements can be upgraded based on the results of a risk assessment that considers, among other factors, the bacilli load of materials (e.g. cultures and specimens); the viability of bacilli; whether the material handled is prone to generate aerosols; the number of maneuvers generating infectious aerosols of each technique; the workload of the laboratory; the epidemiological characteristics of patients; and the medical fitness of laboratory workers.	••	• - ••• ⁴	••
21		2010	Care of patients with TB starts with a quality assured diagnosis. Standardized operating procedures (SOPs), routine quality assurance and laboratory accreditation are keys to high-quality laboratory practices. New tools explain how to adapt and implement SOPs, with examples of SOPs for testing equipment; laboratory organization; quality control; safety practices; and record keeping. A package of training materials has been	•••	••	••




³ Does not include the costs to develop new laboratory infrastructure or purchase laboratory equipment or commodities.

⁴ Varies depending on the need to construct and/or upgrade laboratories, in order to ensure adequate biosafety given the procedures and technologies required.

			developed to facilitate scale-up of EQA (43). Laboratory accreditation programs can ensure accountability and quality services by clearly outlining and enforcing standards; new guidance (44) exists to help national-level TB diagnostic laboratories meet the requirements for international standards of laboratory accreditation. Although guidance exists, external assistance and training support is still advised.			
22		2010	A Management Information System (MIS) can facilitate and help standardize laboratory recording and reporting and promote better analysis, internal quality control and follow-up (37). Free laboratory MIS software is available.	●●	●●	●●
23	Automated detection and MDR screening (Xpert MTB/RIF assay)	2011	<p>Amplification and detection of <i>M. tuberculosis</i> DNA is one of the fastest and most sensitive ways to detect TB and it allows the detection of genetic mutations associated with drug resistance. The Xpert MTB/RIF assay is a fully automated system that allows a relatively untrained operator to perform sample processing, DNA amplification and detection of <i>M. tuberculosis</i> and screening for rifampicin resistance in less than 2 hours and only minutes of hands-on time. Xpert MTB/RIF can be done outside of conventional laboratory settings. WHO strongly recommends (45) that countries use the Xpert MTB/RIF as the initial diagnostic test in individuals suspected of having MDR-TB or HIV-associated TB and (when appropriate) as a follow-on test to microscopy in settings where MDR-TB and/or HIV is of lesser concern, especially in smear-negative specimens. Guidance exists to support implementation of the Xpert MTB/RIF assay (46, 47). Adoption and scale-up of Xpert MTB/RIF has significant resource implications: the GeneXpert device that automates the procedure is a computer-driven, sophisticated piece of equipment that requires security, uninterrupted and stable electrical power and annual calibration. Xpert MTB/RIF is suitable for all levels of laboratories but capacity of one device is limited to 20 specimens per day. Higher-volume settings may require more than one device (48). Test costs are much higher than microscopy; however, once implemented the running costs of Xpert MTB/RIF are much lower than liquid culture or line probe assays. Xpert MTB/RIF does not eliminate the need for conventional microscopy culture and DST, which are required to monitor treatment progress and to detect resistance to drugs other than rifampicin. Recommended coverage is dependent on local prevalence of TB, MDR-TB and HIV.</p> 	●●	●● - ●●● ⁵	●●
24	Noncommercial culture and DST methods	2010	Commercial systems for rapid detection of drug-resistant TB may not be practical for all settings because of their complexity, cost and/or infrastructure requirements. Noncommercial culture and DST methods have been developed for resource-constrained settings. Three of these methods (see <i>CRI</i> , <i>MODS</i> and <i>NRA</i> below) have been recommended by WHO for use under clearly defined programme and operational conditions, in reference laboratories and under strict laboratory protocols, as an interim solution while capacity for genotypic or automated liquid culture and DST is being developed (49). Since these techniques are not commercialized, special efforts are needed to follow SOPs and to ensure quality.	●●	●●	●●●
25		2010	 <p>Colorimetric redox indicator (CRI) methods are indirect tests, done on <i>M. tuberculosis</i> isolates grown from conventional liquid culture and exposed to different antibiotics. An indicator solution is added and isoniazid and rifampicin resistance is detected by a change in the color of the indicator. The time to diagnose resistance is not faster than liquid culture or LPAs, but CRI requires less equipment and consumables than conventional liquid culture methods. CRI methods have been standardized and testing protocols are available. CRI methods should be performed in a TB containment laboratory and are suitable for use at reference laboratory level only; scale-up and decentralization to lower-level laboratories is not recommended (49).</p>	●● - ●●●	●●	●●●
26		2010	Microscopic observation drug susceptibility (MODS) is a manual liquid culture technique that uses basic laboratory equipment (including an inverted light microscope) and microscopy skills to detect TB bacteria and	●● - ●●●	●●	●●●

⁵ Preferential pricing of the GeneXpert device and Xpert MTB/RIF cartridges is available to the public sector in 145 countries.

			drug resistance with high accuracy (49, 50). Colonies of TB are observed in the culture media using an inverted microscope, through the bottom of a sealed plastic container. Concurrent culture of sputum in drug-free and drug-containing media enables testing for isoniazid and rifampicin resistance. MODS has been standardized and testing protocols are available. Like CRI, MODS requires less equipment and consumables than conventional liquid culture methods, but (unlike CRI) MODS requires additional staff skills. Because MODS requires significant biosafety controls, including a laboratory separated from other areas and appropriate biosafety cabinets, scale-up and decentralization to lower-level laboratories is not recommended.				
27		2010	Nitrate reductase assay (NRA) is a solid culture technique that measures nitrate reduction to indicate resistance to isoniazid and rifampicin (49). This technique is based on the property of TB to reduce nitrate to nitrite, which is revealed as a color change of the culture media. Procedures for NRA have been standardized and testing protocols are available. In comparison with conventional liquid culture methods, NRA requires fewer staff, equipment and consumables. Although the biosafety requirements are similar to those for conventional solid culture, there is a significant risk for aerosol generation and NRA therefore requires an appropriate biological safety cabinet.	••	••	••	
28	Fluorescent light-emitting diode (LED) microscopy	2010	Fluorescence microscopy is more sensitive than conventional light microscopy. Such microscopes allow a much larger area of the smear to be seen, resulting in more rapid examination of the specimen (up to four times faster). Fluorescence microscopy can be more efficient than light microscopy for detection of TB in HIV-infected patients with paucibacillary disease. But use has been limited by high costs, infrastructure/maintenance requirements and (in some cases) low user acceptance. LEDs have been developed to offer the benefits of fluorescence microscopy without the associated costs. WHO recommends (51) that conventional fluorescence microscopy be replaced by LED microscopy and that LED microscopy be phased in as an alternative for conventional light microscopy. The switch to LED microscopy should be carefully phased in at country level, with LED technology that meets international standards. One microscopy centre per 100,000 population is usually sufficient; however, expansion should also account for the location and utilization of existing services, urban/rural population distribution and mechanisms for transporting specimens.		••	••	••
29	Interferon gamma release assay and the tuberculin skin test (TST)	2011	Exposure to <i>Mycobacterium tuberculosis</i> may result in latent TB infection. Like TST, interferon gamma release assays (IGRAs) are designed to detect latent TB infection. They are 'indirect tests' - they do not detect the actual TB bacilli but instead an immune response that suggests past or present exposure to TB bacilli. According to WHO (52), there is insufficient data and low quality evidence on the performance of IGRAs in low- and middle-income countries, typically those with a high TB and/or HIV burden. IGRAs and TST cannot accurately predict the risk of infected individuals developing active TB disease. Neither IGRAs nor the TST should be used for the diagnosis of active TB disease. IGRAs are more costly and technically complex to do than the TST. Given comparable performance but increased cost, replacing TST by IGRAs as a public health intervention in resource-constrained settings is not recommended.	••	••	••	
30	Commercial antibody-based serodiagnostic tests	2011	Although not recommended by any international guideline, dozens of commercial antibody-detection serological tests are available in many high burden countries. WHO recommends that current commercial TB serodiagnostic tests should not be used in adults or children with suspected TB, irrespective of their HIV status. The available evidence (53, 54) indicates that current tests lack either the sensitivity or specificity (or both) that is required to be an effective diagnostic test. False results far outnumber true results. This also applies to the use of commercial serodiagnostic tests as add-on tests in smear-negative individuals given the high risk of false-positives and consequent adverse effects (55).	N/A	N/A	N/A	

31	Molecular line probe assays	2008		<p>Strip test simultaneously detects TB bacteria and genetic mutations associated with drug resistance (to rifampicin, with/without isoniazid resistance) from smear-positive sputum specimens or culture isolates after DNA extraction and PCR amplification. Studies have shown LPAs perform well when used directly on smear-positive specimens (56). LPAs are high-throughput tests suitable for use at reference laboratory level. They require skilled and specially trained personnel as well as adequately designed laboratory infrastructure (e.g. three separate rooms with differential air exchange to avoid DNA cross-contamination). They do not eliminate the need for conventional culture and DST capacity, needed to monitor treatment and conducting DST to drugs other than rifampicin and isoniazid. Recommended coverage is at least one LPA laboratory for a population of 500,000 - 1 million.</p>	●●	●●-●●●	●●
32	Use of liquid medium for culture and DST	2007	<p>Liquid medium is recommended as the gold standard by WHO for culture and DST in middle- and low-income countries (57). Liquid culture is more sensitive than solid culture and can reduce the delays in obtaining results to days rather than weeks. For DST, the delay may be reduced to as little as 10 days, compared to 28-42 days with conventional solid media. With increased sensitivity and reduced delays, liquid systems can contribute significantly to improved patient management. Liquid systems are, however, more prone to contamination by other microorganisms and the manipulation of large volumes of infectious material mandates appropriate, adequate biosafety measures. Procedures to prevent cross-contamination must be strictly followed. Recommended coverage is at least one culture laboratory for a population of 500,000 - 1 million.</p>	●●	●●-●●●	●●	
33	Commercial broth-based systems	2007	<p>Commercial broth-based systems, such as the BACTEC MGIT 960 system, detect TB bacteria and be configured for DST. They detect fluorescence in a liquid culture medium, enriched with oxygen, to indicate the presence of TB. As the bacteria grow in the culture, the oxygen is utilized, causing it to be fluorescent when placed under ultraviolet light. Methods for DST follow the same principle but use two culture samples: one with a drug added and one without the drug (a growth control). If the test drug is active against the TB bacteria, it will inhibit growth and suppress fluorescence. A small manual reader is available to identify fluorescence or a technician may visually identify fluorescence using a hand-held ultraviolet (UV) lamp. Alternatively, automated systems have the capacity for up to 960 cultures at a time (58). Such systems have been thoroughly evaluated in clinical settings and approved for use in industrialized countries for years. These systems provide results significantly faster than solid culture techniques: on average, diagnosis takes 7-14 days. DST takes on average 7-14 days after the initial culture. Automated systems can benefit laboratories with a high workload, but the infrastructure requirements are high, equipment required is expensive and it must be maintained. A TB containment laboratory is required to manipulate specimens (such as for DST and/or speciation). Establishing long-term support agreements with suppliers is critical.</p>		●●	●●●	●●
34	Rapid speciation	2007		<p>Speciation is necessary to discriminate between <i>Mycobacterium tuberculosis</i> and nontuberculous mycobacteria (NTM) that grow in cultures. NTM are more common in HIV-infected patients; prevalence varies from country to country. Treatment of NTM is different from treatment of drug-resistant TB. As a minimum, laboratories using liquid culture and/or performing DST must conduct speciation tests to distinguish NTMs from <i>M. tuberculosis</i> Complex (further speciation is not recommended at programmatic level). Traditional biochemical methods of speciation can take weeks. Rapid immunochromatographic assays (so-called strip speciation tests) for species identification on culture isolates provide a definitive identification of <i>M. tuberculosis</i> in 15 minutes and are recommended by WHO (59). Studies have shown that rapid tests that can detect MPB64 antigens specifically produced by an <i>M. tuberculosis</i> complex compare favourably with other established phenotypic or genetic methods. Rapid speciation tests require a TB containment laboratory, including a class I or class II safety cabinet. Laboratory technicians require training in safety precautions and use of the assay.</p>	●	●●	●●

Providing high-quality care and first-line treatment for patients				Approximate costs to implement		
ID	Advance	Year	Description	Manage / supervise	Procure / Supply	Staff / Train
35	Treating drug-susceptible TB in adults	2010	In 2003, guidelines for treating active TB were updated to reflect new experience from countries implementing DOTS. Advances and experience in TB control made it necessary to revise these guidelines again in 2010 (60). This includes several changes that can improve the quality of patient treatment and clinical outcomes, including new regimens. The recommended new patient regimen now contains 6 months of rifampicin; the regimen with 2 months of rifampicin (with the 6-month continuation phase of isoniazid and ethambutol) is no longer an option. New guidance on the choice of TB regimens in special situations (i.e. pregnancy, concurrent use of oral contraceptives, liver disease and renal failure) is also available.	●	●● ⁶	●
36	First-line anti-TB drug use	2002	Fixed-dose combination drugs (FDCs) combine two or more drugs into a single pill or capsule with specific dosages, such as a pill that combines rifampicin (150mg) and Isoniazid (75mg). WHO recommends (61) the use of FDCs in TB treatment and includes them in its Model List of Essential Medicines ⁷ . FDCs can help reduce the risk of drug resistance, simplify treatment and facilitate procurement and supply chain management (e.g. stock management, shipping, distribution). The formulations and combinations of anti-TB drugs available in each country should conform to the WHO Model List of Essential Medicines.	●●	●● ⁸	●●
37		2010	New guidance (62) on first-line anti-TB drugs has been developed, including information about the use of isoniazid (maximum daily dose for three times per week) and streptomycin (maximum dose and adjustments in persons aged over 60 years or weighing less than 50 kg). Thioacetazone is no longer a recommended first-line drug.	●●	●●	●●
38	Monitoring treatment	2010	Better approaches for monitoring TB treatment have been developed. For example, performing sputum smear microscopy at the completion of the intensive phase of treatment is only conditionally recommended, given evidence that a positive smear at this stage has a very poor ability to predict relapse or pretreatment isoniazid resistance. However, it is still useful in detecting problems with patient supervision and for monitoring programme performance. A positive sputum smear at the end of the intensive phase in new patients should trigger sputum smear microscopy at the end of the third month. If the latter is positive, culture and DST should be performed (62).	●●	●	●●
39	Improving patient adherence	2010	Building on the experience from countries implementing DOTS, new approaches to ensuring adherence to TB treatment have been developed. In the Stop TB Strategy, direct observation of drug intake and patient support remain the cornerstone of DOTS and help programmes to achieve treatment success targets. WHO recommends that, as active partners in TB care, patients have the right to support (63). Enablers and incentives can contribute to improve adherence when combined with peer assistance, staff training and other supportive activities (64). For children, the support of parents and immediate family is vital to ensure treatment success (65).	●● - ●●●	●●	●●

⁶ Does not include the cost of anti-TB drugs, but does include costs to update national treatment guidelines and produce/disseminate new guidance to national staff and clinicians.

⁷ <http://www.who.int/medicines/publications/essentialmedicines>

⁸ May be higher, depending on the current drug supply.

Component 2. Address TB-HIV, MDR-TB and the needs of poor and vulnerable populations

Addressing TB-HIV coinfection				Approximate costs to implement		
ID	Advance	Year	Description	Manage / supervise	Procure / Supply	Staff / Train
40	Establishing TB/HIV collaboration and planning	2011	In 2002, WHO endorsed HIV and TB programme collaboration and interventions to control TB in high HIV prevalence settings (66). Guidelines for implementing collaborative activities were subsequently published in 2003 and in 2004, an interim official policy (67) defined the collaborative TB/HIV activities to implement and under what circumstances. These activities reduce the morbidity and mortality from TB in people living with HIV, such as through earlier provision of antiretroviral therapy and the <i>Three I's for HIV/TB</i> : intensified case-finding of TB, isoniazid preventive therapy and infection control (68).	•••	•• ⁹	••
41	Monitoring and evaluating TB/HIV collaboration	2009	Standards for monitoring and evaluating collaborative TB/HIV activities were revised in 2009 with new guidance on the methods of monitoring TB/HIV activities and fewer indicators, harmonized with new HIV and TB recording and reporting tools (69).	••	•	••
42	Isoniazid preventive therapy (IPT)	2011	IPT has been a key public health intervention preventing TB among people living with HIV since 1998. In 2011, WHO published new guidance for IPT, including a simplified screening algorithm that relies on four clinical symptoms to identify those eligible for either IPT or further diagnostic work-up for TB and other conditions (70).	••	••	••
43	Co-trimoxazole preventive therapy (CPT)	2009	CPT substantially reduces mortality in HIV-positive TB patients. WHO recommends that TB and HIV programmes establish a system for providing CPT and that CPT is initiated as soon as possible for all HIV-positive TB patients and given throughout TB treatment. The drug (co-trimoxazole) is inexpensive and widely available. Co-trimoxazole is manufactured and sold by many different companies. New guidance is available on CPT, including dosages, contraindications and side effects and their management (71, 72).	••	••	••
44	Intensified case finding for people living with HIV	2011	Intensified case finding is the regular screening for evidence of TB in people infected with HIV, at high risk of HIV, or living in congregate settings (73). All people living with HIV, wherever they receive care, should be regularly screened for TB using a clinical algorithm at every visit to a health facility or contact with a health worker (74). WHO has published guidance and algorithms for TB screening in adults, adolescents and children living with HIV (75).	••	•	••
45	Treating TB in persons living with HIV	2010	Among treated TB patients, death rates are higher in HIV-positive than in HIV-negative patients. Guidance on treating TB in persons living with HIV has been published by WHO and should be incorporated into national treatment guidelines. In addition to immediate treatment with ART for eligible patients, it is recommended that TB patients who are living with HIV should receive at least the same duration of TB treatment as HIV-negative TB patients (76). TB patients with known positive HIV status and all TB patients living in HIV-prevalent settings should receive daily TB treatment at least during the intensive phase. For the continuation phase, the optimal dosing frequency is also daily for these patients. New training materials have been designed to introduce the principles of interpersonal communication and counseling to TB medical workers and to provide practical experience in TB/HIV counseling (77).	••	••	•



⁹ Does not include the costs to implement specific collaborative activities, such as ART or IPT, but does include the cost of management activities to support programme collaboration.

Managing drug-resistant TB				Approximate costs to implement		
ID	Advance	Year	Description	Manage / supervise	Procure / Supply	Staff / Train
46	Establishing programmatic management of drug-resistant TB	2011	<p>Drug-resistant TB develops when treatment of fully sensitive TB is interrupted and the levels of drug in the body are insufficient to kill all TB bacteria. MDR-TB can usually be cured with second-line drugs, but treatment is longer and requires more expensive drugs and properly trained staff for adequate management of adverse drug reactions and support to enable adherence to treatment. Effective management of drug-resistant TB requires input and cooperation from different aspects of the TB programme, including case detection; treatment; prevention; surveillance; drug procurement and supply; and monitoring and evaluation. Guidelines for the programmatic management of drug-resistant TB were issued in 2006, updated in 2008 and revised in 2011 after a review of new evidence (78).</p> 	•••	•• ¹⁰	••
47	Monitoring and evaluating drug resistance	2009	Countries conduct drug resistance surveillance (DRS) to measure the burden of drug-resistant TB and to help plan and monitor the impact of their programs. New DRS guidance incorporates advancements in DST; data management/analysis; ethical considerations; and associations between TB drug resistance and other risk factors (79). Free software (such as SDRTB4 and Stata ¹¹ scripts) is available to support collection and analysis of DRS data.	••	••	••
48		2010	A minimum set of indicators was established for national or project level monitoring of MDR-TB programmes (80). The indicators are classified into four groups (detection, enrolment, interim results and final outcomes); are suitable for use by different partners; and are consistent with approaches used in earlier monitoring systems.	••	••	••
49	Diagnosing drug resistance (see also <i>Improving laboratory diagnosis of TB</i> on page 15)	2010	WHO has established four different categories of drug resistance (81). <i>Mono-resistance</i> is resistance to one anti-TB drug. <i>Poly-resistance</i> is resistance to more than one anti-TB drug, other than both isoniazid and rifampicin. <i>MDR-TB</i> is resistance to at least isoniazid and rifampicin. Extensively drug resistant TB (<i>XDR-TB</i>) is MDR-TB that also demonstrates resistance to any fluoroquinolone and at least one of three injectable second-line drugs (capreomycin, kanamycin and amikacin).	•	•	•
50		2011	Definitive diagnosis of MDR-TB and XDR-TB requires DST. The tools and policies for DST have evolved with new evidence, needs and technological advances. In 2009, WHO recommended that all previously treated patients should have access to culture and DST at the beginning of treatment, in order to identify MDR-TB as early as possible (82). Updated policy recommends that DST be conducted for all patients before treatment using a rapid test that detects resistance to isoniazid and rifampicin as the best strategy for averting deaths and preventing acquired MDR-TB. Rapid DST of isoniazid and rifampicin (or of rifampicin alone) was recommended over conventional testing or no testing at the time of diagnosis of TB, subject to available resources (83). Training materials have been developed to support expansion of culture and DST techniques (84). Recommended coverage is at least one DST laboratory for a population of 500,000 - 1 million.	••	•••	••

¹⁰ Does not include the cost to implement programmatic management, such as for diagnostic tools or second-line medicines, but does include the costs of activities to support planning and management, such as technical assistance and routine stakeholder meetings.

¹¹ <http://www.statacorp.com>

51	Treating drug-resistant TB	2011	<p>Increasing evidence from drug-resistant TB treatment programmes has led to many new policies for managing drug-resistant TB, including recommendations for second-line anti-TB regimens (85). For example, recent guidance recommends that at least four effective second-line anti-TB drugs (as well as pyrazinamide) be used during the intensive phase of treatment. The regimen should include pyrazinamide; a fluoroquinolone; a parenteral agent; ethionamide (or prothionamide); and cycloserine (or PAS if cycloserine cannot be used). Ethambutol may be used but is not included among the drugs making up the standard regimen. The recommended duration of second-line anti-TB regimens have also recently changed. An intensive phase of at least 8 months' duration is now recommended (2 months longer than the minimum previously recommended) and total treatment duration of at least 20 months is recommended in patients without any previous MDR-TB treatment. Until better evidence is available to determine the optimal regimens for treating patients with XDR-TB, the same principles used to design MDR-TB regimens should be used, based where possible on the DST pattern of the individual patient.</p>		•••	•••	•••
52	Managing MDR-TB patients	2011	<p>New approaches can improve adherence among MDR-TB patients (85). Several models of care for managing MDR-TB patients exist, including community-based care, clinic-based treatment and hospitalization. Recent evidence suggests that the overall cost-effectiveness of care for a patient receiving treatment for MDR-TB can be improved with an ambulatory model. As a result, it is recommended that patients with MDR-TB should be treated using mainly ambulatory care rather than models of care based principally on hospitalization. In some settings, home-based ambulatory treatment (provided by a worker in the community) might improve the cost-effectiveness of treatment and adherence to treatment. NTPs are encouraged to add community-based care and support into their national strategies and plans for the programmatic management of DR-TB. Regardless of the model you use, however, drug intake must always be directly observed.</p>		•••	••	••
53	Treating HIV and MDR-TB together	2011	<p>New standards for concomitant treatment of HIV and MDR-TB have been established (85), with guidance for timing the initiation of ART and MDR-TB treatment and important drug interactions between the two. ART is recommended for all patients with HIV and drug-resistant TB requiring second-line anti-TB drugs, irrespective of CD4 cell-count, as early as possible (within the first 8 weeks) following initiation of anti-TB treatment.</p>		•••	•••	••

Managing TB among other vulnerable populations and settings


Managing TB in congregate settings

Approximate costs to implement


ID	Advance	Year	Description	Manage / supervise	Procure / Supply	Staff / Train
54	Preventing and controlling TB during air travel	2006	<p>Countries should establish clear and effective procedures to reduce the risk of transmission of TB during air travel and ensure appropriate follow-up when needed. Guidelines (86) describe new approaches for managing air travel and patients with infectious TB and of common challenges. There are practical ways to reduce the risk of exposure to TB and procedures to follow when TB is diagnosed in a patient who has a history of recent air travel, including contact tracing, notifying and screening for possible interventions.</p>	••	•	••

55	Addressing TB in refugee and displaced populations	2007	<p>Refugees and displaced populations are at high risk of developing TB. Their crowded, precarious living conditions facilitate TB transmission. Other illness (e.g. HIV and poor nutrition) can weaken their immune system and accelerate progression from TB infection to active TB. Experience has shown that a TB programme can be implemented effectively and produce good treatment outcomes in these settings. WHO and the Office of the High Commissioner for Refugees have produced comprehensive guidance on TB programmes for refugees and displaced populations, including criteria that should be met before beginning to implement. The guidance also recommends practices for monitoring, training, drug supply management and TB and TB/HIV patient management. Note that given the complexity and cost of treating MDR-TB, the priority for those working with such populations is to ensure that the basic TB care and control services, including the provision of first-line TB drugs, are effectively implemented. The provision of effective TB care and control services will reduce the risk of MDR-TB and, therefore, the need to use second-line TB drugs in these populations (87).</p>		••	•••	•••
56	TB in the workplace	2003	<p>TB is a workplace issue because health is essential not only to the well-being of individuals but the functioning of economies. An employee with TB may lose months of work per year, resulting in significantly less annual household income. Some workplaces are a source for disease transmission as employees work for long periods in close proximity. Loss of wages and job discrimination are barriers to accessing TB services. Addressing TB in the workplace can help overcome these barriers and facilitate access to health care in general and TB care in particular. Addressing TB in the workplace can help overcome these barriers and facilitate access to health care in general and TB care in particular. In 2003, WHO and the International Labor Organization (ILO) released guidelines (88) for TB control activities in the workplace. These describe cost-effective steps to protect workforce productivity. Drawing on the practical experience of employers and workers and the technical expertise of WHO and ILO, the guidelines target employers, employees and their associations and health workers – all of whom can play a significant role in their implementation. In some cases, it may be necessary to provide additional supervisory services or supplies (such as anti-TB drugs) to facilitate high-quality treatment.</p>		••	••	••
57	Addressing TB and poverty	2005	<p>Poor and vulnerable groups are at greater risk of TB infection compared with the general population because of overcrowded and substandard living/working conditions; poor nutrition; other diseases (such as HIV/AIDS); and migration between higher-risk communities or nations. Economic, geographical and cultural barriers limit their access to effective TB diagnosis and treatment. NTPs should include pro-poor objectives in their plans that enhance efforts to detect and successfully treat more TB patients. Based on best practices from countries, the following six principal steps are recommended (89): identify the poor and vulnerable groups in the country/region; determine which barriers prevent access of the vulnerable groups to services; assess potential actions to overcome the barriers; review the situations and population groups requiring special consideration; explore possibilities for harnessing additional resources; and evaluate the impact of pro-poor measures.</p>		••	••	••

58	Addressing TB in prisons	2009	<p>Effective TB control in prison protects prisoners, staff, visitors and the community. Prisons represent dynamic populations where at-risk groups congregate in a setting that exacerbates disease and its transmission, including TB. Prevalence of TB in prisons usually exceeds prevalence elsewhere in the country. HIV prevalence is also often high among prisoners. TB control programs in prisons require cooperation between the NTP and penitentiary health systems. To facilitate this, the NTP should consider prisons when planning and budgeting. Prison health services should be incorporated into NTP training, supervision, monitoring and evaluation and laboratory services. This cooperation reinforces the use of nationally accepted standard TB control procedures and activities in prisons. In addition, case finding should be conducted actively to avoid gaps and delays in diagnosis and treatment initiation. This involves screening prisoners at different points during incarceration and using various methods, including symptom-based screening, chest radiography, tuberculin skin testing (TST), contact investigation, or a combination of methods (90).</p>		●●	●●●	●●●
Managing TB among clinical risk groups							
59	Addressing TB and tobacco	2007	<p>Tobacco smoking is a very important risk factor for TB. It accelerates the progression from latent infection to active TB and increases the likelihood of relapse and case fatality. WHO recommends (91) that national TB and tobacco control programmes collaborate to control tobacco use everywhere, but especially where people are at risk of TB infection. Their collaborative approach should use available health care providers throughout the whole health system to ensure integrated care of TB and smoking cessation. Guidance recommends active involvement of TB control programmes in tobacco control, both inside the clinical setting and through coordinated, complementary policies. In particular, the two programmes should cross-train TB and tobacco control health workers, register TB patients' tobacco use and offer them counseling and treatment; and promote and enforce smoke-free policies, particularly where TB services are delivered (92).</p>		●●	●	●●
60	TB services for injection drug users	2008	<p>Injecting drug users are often marginalized with poor access to healthcare. Responding to their needs requires collaboration between HIV and TB services, specialist drug services and the criminal justice system. Building on broader TB/HIV recommendations, specific guidelines describe a strategic approach to reducing TB and HIV-related morbidity and mortality among at-risk drug users and their communities. This includes recommendations for joint planning and other key interventions, such as access to IPT and appropriate treatment, that have procurement costs associated with them (93).</p>		●●	●●	●●
61	Addressing TB and diabetes	2011	<p>Diabetes triples the risk of developing TB and is a common comorbidity in people with TB. TB can worsen glycaemia control in people with diabetes. Recognizing this, strategies have been developed to ensure that optimal care is provided to patients with both diseases. TB must be diagnosed early in people with diabetes; diabetes must be diagnosed early in people with TB. Joint coordination should be established between TB and non-communicable disease programmes, especially diabetes programmes. Surveillance of TB should be initiated among diabetes patients in settings with medium-to-high burdens of TB. People with diabetes should be screened for chronic cough. Patients with TB should be screened for diabetes at the start of their treatment. The available evidence for the effectiveness and cost-effectiveness of collaborative interventions is weak however. Because of this, existing guidance (94) is provisional and is expected to be updated based on new evidence in the near future.</p>		●●	●	●●

62	Implementing TB management for children	2010	Children contribute significantly to TB burden (estimated between 9.6% and 11% of all incident cases) but have historically been neglected because it is difficult to definitively diagnose TB in children and it rarely presents as smear-positive TB (thus making it a lower public health priority). The first WHO guidance on managing TB in children was published in 2006 (95) and updated in 2010 (96) with ten new recommendations, including dosages of anti-TB medicines for use in children and the regimens that should be used for different manifestations of TB in children.		••	•	••
63	Diagnosing TB in children	2006	WHO recommends a 6-step approach to diagnose TB in children, beginning with a careful history of the child (including a history of close TB contacts and symptoms consistent with TB). Diagnosis should also include clinical examination and TST; bacteriological confirmation whenever possible; investigations relevant for suspected pulmonary and extra pulmonary TB; and HIV testing (in high HIV prevalence areas) (97, 98).		•	••	•
64	Treating TB in children	2006	In general, TB in children is treated with the same drugs as in adults. Based on a review of evidence relating to the dosage, toxicity and pharmacokinetics of ethambutol in children, WHO recommends that children of all ages can be given ethambutol in daily doses of 20 mg/kg (range 15–25 mg/kg). Increasing the dose beyond this range might increase the risk of ethambutol ocular toxicity. For intermittent treatment, WHO recommended doses of 30 mg/kg (range 20–35 mg/kg) three times weekly or 45 mg/kg (range 40–50 mg/kg) twice weekly – as currently recommended for adults (99).		•	••	••
65	Managing TB in HIV-infected children	2010	Because HIV-infected children are at increased risk of TB disease and their response to TB treatment is poorer, customized approaches for preventing, diagnosing and treating TB in HIV-infected children have been developed (100).		••	••	••



Component 3. Contribute to health system strengthening based on primary health care

				Approximate costs to implement			
ID	Advance	Year	Description	Manage / supervise	Procure / Supply	Staff / Train	
66	Implementing a health system strengthening approach to TB control	2008	TB control relies on the general health system, especially the primary health care (PHC) system. Weak systems pose barriers to effective/sustainable TB control. NTPs should be aware of national HSS strategies/initiatives and engage in them proactively, where possible, to facilitate them and help assure priority/funding for TB control. NTPs can also help strengthen the general health system through its approaches to TB control. This includes, for example, harmonizing TB planning and budgeting process with sector-wide planning frameworks; sharing resources (such as frontline health staff) with other programmes; and reducing duplicative structures (101).		•••	••	••
67	Practical Approach to Lung health (PAL)	2006	PAL is an integrated approach that aims to improve the quality of diagnosis and treatment of all respiratory illnesses in a PHC setting, including TB. It does so by standardizing service delivery through development and implementation of symptom-based clinical guidelines (102).		••	•	••
Other advances that strengthen health systems		N/A	Many other advances in this Directory also contribute to stronger health systems, such as by strengthening and standardizing laboratories and laboratory networks (advances #18-22) and by implementing infection control measures (advance #13).				

Component 4. Engage all care providers

				Approximate costs to implement		
ID	Advance	Year	Description	Manage / supervise	Procure / Supply	Staff / Train
68	Planning and implementing PPM approaches	2006	<p>Engaging all care providers is a core component of the Stop TB Strategy. People with TB symptoms seek care from a wide range of providers, including public, private and/or corporate providers. Many of these providers do not follow recommended TB management practices. PPM seeks to reduce misdiagnosis, malpractice and the cost of treatment by providers – and thus increase access, including for the poor, marginalized and most vulnerable. Failure to involve these providers can hamper case detection, increase drug resistance, lead to incomplete epidemiological data and reduce management capacity. Country experiences and scientific evaluations of PPM have demonstrated the feasibility, effectiveness, cost-effectiveness and scalability of engaging non-programme care providers in TB care and control. According to WHO, evaluations have shown that PPM can help increase case detection (between 10% and 60%), improve treatment outcomes, reach the poor and save costs. PPM can also reduce diagnostic delays, helping to cut the chain of transmission at an early stage (103).</p> 	•	••	•
69		2010	<p>The PPM toolkit provides guidance and 14 tools for implementing PPM. Several tools explain basic aspects of PPM implementation. Others address engagement of specific types of care providers (i.e. private practitioners, hospitals, nongovernmental organizations, workplaces, social security organizations) and for DR-TB management and TB/HIV collaboration (104). More specific guidance exists for some of the tools in the toolkit, such as for the International Standards of TB Care (advance #71).</p>	•	••	•
70	Conducting a PPM Situation Assessment	2007	<p>Conduct a National PPM Situation Assessment (NSA) before implementing PPM activities. A NSA helps you collect information on all aspects of PPM for TB care and control in the area and use this information to systematically implement PPM. Countries have used the NSA to determine their PPM priorities and the best ways to implement PPM. Based on the results of the NSA, countries can develop informed PPM operational plans (105).</p>	••	••	•
71	International Standards for Tuberculosis Care (ISTC)	2009	<p>The ISTC is a tool that can help you effectively engage TB care providers. It describes a level of care that all practitioners should try to achieve when managing TB suspects and patients. The ISTC includes 21 standards that address four main categories of activities: diagnosis, treatment, HIV infection and other co-morbid conditions and public health. The ISTC has been endorsed by dozens of national and international organizations, both public and private, concerned with TB care and control. However, the ISTC itself cannot be implemented; it requires that strategies be developed and implemented to enable the standards to be met (106, 107).</p>	••	•	••

Component 5. Empower people with TB, and communities through partnership

				Approximate costs to implement		
ID	Advance	Year	Description	Manage / supervise	Procure / Supply	Staff / Train
72	Involving communities in TB control	2008	<p>Increased involvement of nongovernmental and other civil society organizations in community-based TB prevention, care and control can expand access to treatment; help ensure early and enhanced detection of persons with presumptive TB; and help improve treatment outcomes. WHO recommends that NTPs, health service providers and communities harness the contribution of community-based stakeholders in their TB response, particularly (but not only) in settings poorly covered with public TB services or where the TB caseload outstrips available resources. Country experiences have shown that effective involvement means promoting people's responsibility for health through health-related education; identifying problems and solutions together with affected communities; and fostering community self-reliance and ownership of health initiatives. In 2008, WHO provided updated guidance and recommendations for eight specific activities to promote and implement community involvement (108). The process to simplify the document and provide an operational step-by-step guidance and a standardized set of indicators is currently ongoing. In 2010, the Global Fund to Fight AIDS, Tuberculosis and Malaria described the terminology for community systems strengthening and several ways in which community systems contribute to improving health outcomes (109).</p> 	•••	••	••
73	Patients' Charter for Tuberculosis Care	2006	<p>The Patients' Charter for Tuberculosis Care (110) outlines the rights and responsibilities of people with TB. It empowers people with the disease and their communities through this knowledge. Developed in tandem with the ISTC to promote a 'patient-centered' approach. Contributes to help address other priorities, such as equitable access to TB services for the vulnerable and poor population, TB/HIV coinfection and the issue of human rights.</p>	••	•	••
74	Advocacy, Communication and Social Mobilization (ACSM)	2007	<p>Thank you for heeding to Afghanistan's voice..</p>  <p>Advocacy can help secure the support of key stakeholders for new TB control policies, approaches, and resources. Communication, such as through the media (111), can raise awareness about TB; prompt people to seek timely TB diagnosis and treatment; and create the social environment where patients and communities are able to express their needs and take action. Tools (112) exist to help plan and implement strategic ACSM, including examples of good practices for ACSM; tools for assessing ACSM needs; and guidance to help design and implement effective ACSM interventions based on identified needs.</p>	••	••	••
75		2008	<p>Social mobilization is the process of working with all stakeholders to increase demand for good-quality TB care, assist in the delivery of services and strengthen community participation for sustainability. To bring about sustainable change, social mobilization efforts need to be evidence-based. A well-designed and carefully conducted survey produces data that can help you plan TB advocacy, communication and social mobilization activities (113).</p>	••	••	•

Component 6. Enable and promote research

				Approximate costs to implement		
ID	Advance	Year	Description	Manage / supervise	Procure / Supply	Staff / Train
76	Operational research for TB prevention, care and control	2011	Operational research provides decision-makers with information to improve the performance of programs. It can help you identify solutions to problems that limit program quality, efficiency and effectiveness, and to determine which alternative service delivery strategy would likely yield the best outcomes. Evidence from operational research projects can help pave the way for ensuring many more people have access to vital TB health services by shedding new light on how current TB policies and practices can be 'fine-tuned' and further improved. It can also give important insight on how new advances in TB prevention, care and control can be introduced in ways that deliver maximum benefits. New guidance from WHO (114) describes the current areas where gaps in knowledge are hindering the optimal implementation of TB control activities and how these obstacles can be removed. Guidance includes questions that must be addressed to improve TB care and control at the community, national, regional and international levels together with a synopsis of a suitable study design and the methods required to identify and test suitable solutions.	●●	● - ●●	●●

6. Acronyms

Acronym	Definition	Acronym	Definition
ACSM	Advocacy, communication and social mobilization	NTM	nontuberculous mycobacteria
AFB	acid-fast bacilli	PAL	Practical Approach to Lung Health
AIDS	acquired immunodeficiency syndrome	PAS	para-aminosalicylic acid
BCG	Bacille Calmette–Guérin (vaccine)	PHC	primary health care
BSL	biosafety level	PPM	public-public and public–private mix
CPT	cotrimoxazole preventive therapy	R&R	recording and reporting
CRI	colorimetric redox indicator	SOP	standard operating procedure
DNA	deoxyribonucleic acid	TB	tuberculosis
DR-TB	drug-resistant TB	TST	tuberculin skin test
DRS	drug resistance surveillance	USAID	United States Agency for International Development
DST	drug susceptibility testing	UV	ultraviolet (light)
EQA	external quality assurance	WHO	World Health Organization
FDC	Fixed dose combination (drugs)	XDR-TB	extensively drug-resistant TB
HIV	human immunodeficiency virus		
HRD	human resource development		
ILO	International Labour Organization (Office)		
IPT	isoniazid preventive therapy		
ISTC	International Standards for Tuberculosis Care		
LED	light-emitting diode		
LPA	line probe assay		
MDR-TB	multidrug-resistant TB		
MIS	management information system		
MODS	microscopically observed drug susceptibility		
NRA	national regulatory authority		
NSA	national situation assessment		
NTP	national TB control programme		

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