

# Strategic approach for the strengthening of laboratory services for tuberculosis control

**2006-2009**

# **Strategic Approach for the Strengthening of Laboratory Services for Tuberculosis Control, 2006-2009**

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## Abbreviations

AFB	acid-fast bacilli
DEWG	DOTS Expansion Working Group
DOTS	the internationally recommended strategy for TB control
DRS	drug resistance surveillance
DST	drug susceptibility testing
FIND	Foundation for Innovative New Diagnostics
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GLC	Green Light Committee
HBC	high-TB burden country
HIV	human immunodeficiency virus
IUATLD	International Union Against Tuberculosis and Lung Disease
MDR-TB	multidrug-resistant tuberculosis
NRL	national reference laboratory
NTP	national TB control programme
PPM	public-private mix
PSL	private sector laboratory
QA	quality assurance
SLCS	Subgroup on Laboratory Capacity Strengthening
SOP	standard operating procedure
SRL	supranational reference laboratory
TB	tuberculosis
TDR	UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases
UNAIDS	Joint United Nations Programme on HIV/AIDS
WHO	World Health Organization

## **1. Introduction**

Bacteriology is one of the fundamental aspects of national tuberculosis (TB) control programmes (NTPs) and a key component of the DOTS strategy. However, TB laboratory services are often neglected components of these programmes.

Given existing constraints, it will be difficult for many countries to achieve the global targets of 70% detection of infectious cases and 85% cure of these incidents by the year 2005. Although the global success rate under DOTS has reached 82%, the detection rate of the estimated prevalence has increased at a far slower rate (53% in 2004). In order to improve the case-detection rate, a global strategy for the development and strengthening of TB laboratory networks needs to be implemented urgently. In addition to improving sputum smear microscopy, the strategy recognizes the need to upgrade existing laboratory services and to strengthen/build capacity to perform culture and drug susceptibility testing (DST) in areas experiencing a high burden of acid-fast bacilli (AFB) smear-negative TB associated with human immunodeficiency virus (HIV) infection and to support DOTS-Plus projects.

## **2. Situation analysis**

Although diagnosis of TB and monitoring of treatment progress rely on bacteriological examination of clinical specimens, the laboratory network remains weak in most countries. Unsatisfactory performance of TB diagnostic services may be attributed to the following eight factors:

1. Underestimation of the importance of TB laboratory services
2. Weak communication between the NTP and the national reference laboratory (NRL)
3. Limited implementation of a quality assurance (QA) system, including supervision, for sputum smear microscopy and culture
4. Inadequate human resources
5. Insufficient financial resources
6. Delay in technology transfer from industrialized to resource-limited countries
7. Problems related to availability and accessibility of TB diagnostic services
8. No or minimal interaction with private-sector laboratories

### **2.1 Underestimation of the importance of TB laboratory services**

For several decades, the role of the diagnostic laboratory has not been fully recognized by either governments or multilateral and bilateral donors/agencies. Consequently, there has been insufficient investment in laboratories, resulting in weak infrastructure and inadequate services. With recent developments in addressing the global TB crisis, the need to develop and strengthen laboratory systems has now become an emergency. The DOTS Expansion Working Group (DEWG) of the Stop TB Partnership has therefore instituted a laboratory subgroup to deal with specific issues related to improvement of diagnostic services required for DOTS expansion and implementation of DOTS-Plus initiatives.

### **2.2 Weak communication between the NTP and the NRL**

Diagnostic bacteriology laboratory services are one of the fundamental activities of the NTP and should be closely coordinated with administrative, epidemiological and clinical components of the programme. Unfortunately, in many instances there is weak collaboration between the NTP and the NRL in planning and budgeting for TB control. These deficiencies are particularly problematic in the area of defining technical specifications for equipment, supplies and supplementary materials used in bacteriological investigations. In addition, weak interaction between the NTP and the NRL has been observed in budget development and estimation of resources required for laboratory services. In order to ensure the correct laboratory support, it is therefore important to improve communication and information-sharing and to provide technical guidance between the NRL and the NTP and with other programmes, e.g. HIV/AIDS and malaria.

### **2.3 Limited implementation of quality assurance system, including supervision, for sputum smear microscopy and culture**

Effective control of TB is dependent on a network of laboratories that provides accurate and reliable services for diagnosis, treatment and monitoring. Serious deficiencies in laboratory operations may be observed when insufficient attention is given to the quality of outcome, leading to both under-diagnosis of disease in patients with life-threatening illnesses and increased rates of infection transmission. However, over-diagnosis exposes individuals to unnecessary treatment, expense and stigma associated with TB. Frequently, NTPs do not consider the quality of laboratory services to be a high priority. Furthermore, insufficient human resources and constant rotation of trained staff who are familiar with or experienced in the management and operation of a national QA system can hamper the establishment of a sound programme. As a result, in many countries, the external QA programmes for sputum smear microscopy and culture are either not implemented or very weak.

On-site evaluation (supervision) is a very effective method to assess laboratory conditions. One of the main activities of the NRL is therefore to organize and carry out regular supervisory visits to the lower-level laboratories (i.e. regional and peripheral). In general, given the restricted availability of trained staff and scarcity of financial resources, supervision is rarely, if ever, implemented. In addition, there is often no feedback mechanism to allow staff at peripheral levels to identify problems and areas where improvement is needed. Without a mechanism to follow up on recommendations formulated during an initial supervisory visit, subsequent visits become less efficient and operate as separate entities.

### **2.4 Inadequate human resources**

An unprecedented lack of human resources at national and international level currently jeopardizes the laboratory component of TB control. The following factors contribute to this problem:

- The generalized human resources crisis in high-TB burden (HBC) and high-TB pandemic countries, often associated with the effects of the HIV epidemic.
- The perception that sputum smear microscopy is cumbersome and “not pleasant to perform”.
- Poor morale and motivation of laboratory staff related to low salaries and poor working conditions, especially in the public sector.
- No career structure or opportunities for career progression.
- The retirement of many international laboratory experts.
- Lack of interest among young professionals in the field.

The scarcity of qualified human resources in the field is a global problem. At the country level, lack or limited expertise aggravated by recruitment constraints and constant rotation of trained staff significantly hampers proper supervision, implementation of QA programmes and improvement measures.

In addition, the importance of staff development and motivation in TB laboratories is frequently overlooked, especially in developing countries. It is generally recognized that manipulating sputum is unpleasant and that microscopy of largely negative smears is tedious. Moreover, staff in peripheral-level laboratories may feel isolated and neglected. There is a lack of staff development plans in most countries. In addition, the absence of or suboptimal feedback to laboratory technicians limits their full engagement in the fight against TB.

At the international level, laboratory support relies mainly on the network of supranational reference laboratories, which comprises 23 institutions. However, only a limited number of these institutions are familiar with field conditions and the role of laboratory networks in high-TB burden countries. Therefore, the number of experts able to provide technical assistance to countries is also limited. Time constraints and restricted availability of qualified laboratory experts are significant impediments to organizing laboratory assessment missions and providing technical assistance to countries.

## **2.5 Insufficient financial resources**

Neglect of the laboratory component of NTPs has resulted in limited funding for activities related to improvement of diagnostic services. Financial resources designated for TB laboratories are often restricted to the purchase of laboratory equipment (e.g. microscopes and reagents). Frequently, there is no budget line for laboratory activities, and the estimation of laboratory financial needs is performed by the NTP without consultation with the head of the NRL. As a result, the designated budget is not sufficient to support NRL activities and maintain a proficient peripheral-level laboratory network.

Furthermore, when submitting grant proposals to funding mechanisms such as the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) and other bilateral agencies, NTP managers often do not consult with the NRL. Consequently, most GFATM funding proposals fail to adequately address the TB laboratory component. The limited number of proposals that do incorporate laboratory activities focus on administrative issues, such as the organization of meetings and support to participants. What is therefore lacking is the investment in development of the overall laboratory system, e.g. management and infrastructure.

Moreover, laboratory equipment and activities related to QA programmes are perceived to be relatively costly. The majority of NTPs, as well as some partner organizations and donors, are reluctant to provide funds that would be sufficient to fulfil the financial needs of TB diagnostic services.

## **2.6 Delay in technology transfer from industrialized to resource-limited countries**

Weak laboratory infrastructure and inadequate financial and human resources have contributed to a significant delay in the transfer of technology from industrialized to developing countries. For example, bilateral and donor funding have enabled countries to purchase sophisticated laboratory equipment, but the lack of maintenance plans and sustainability of funding have rendered equipment either underused or no longer in use.

New diagnostics are eagerly awaited and in high demand. All too often, NTPs have prematurely launched these techniques in regions where conventional bacteriology has yet to be efficaciously applied. Some of the new diagnostic tests have proven effective; their sensitivity and specificity are high and tests are easy to perform. However, inadequate laboratory conditions, especially in resource-limited countries, and the high unit cost of these techniques, have made their widespread implementation unfeasible at present. Nevertheless, countries and donors are often keen to support implementation of such technologies. The solution to resolve this dilemma relies in improving and upgrading existing laboratory conditions, wherever feasible, in order to facilitate future transfer of technology.

## **2.7 Problems related to availability and accessibility**

It is important to provide TB sputum smear microscopy services that operate at an acceptable level of proficiency and are accessible to the entire population, including equitable access for the poor and underprivileged. To accomplish this objective, peripheral-level laboratory services must be competent in AFB sputum smear microscopy and supported by larger regional-level laboratories. This network of diagnostic services should be overseen by an NRL. In planning microscopy services, careful consideration should be given to population distribution, transport facilities and expected workload based on TB prevalence.

Poor accessibility of health facilities can significantly hinder timely TB diagnosis and treatment. However, if too many diagnostic units are established, the quality of service will deteriorate as a result of the low number of specimens processed by each laboratory and difficulties in maintaining high proficiency.

## **2.8 Lack of or minimal interaction with private-sector laboratories**

Private sector laboratories are present in many countries and may perform sputum smear microscopy on a substantial proportion of the total number of patients presenting as TB suspects. These laboratories frequently operate independently of, and may not contribute any data to, the NTP. Private sector laboratories should be included in activities that strengthen their performance and encouraged to use national standard operating procedures (SOPs) and training modules, to provide data to the NTP and, ideally, to become involved in laboratory training and participate in EQA.

### **3. Efforts to strengthen laboratory performance**

#### **3.1 Establishment of the Subgroup on Laboratory Capacity Strengthening**

In 2002, recognizing the pressing need to improve laboratory performance in most of the HBCs, WHO and partners in the DOTS Expansion Working Group established a Subgroup on Laboratory Capacity Strengthening (the SLCS). The SLCS is composed mainly of the directors of supranational reference laboratories and representatives of Stop TB partners.

#### **3.2 Stop TB Strategy and Global Plan to Stop TB**

To provide reliable diagnosis for all TB patients every country should develop/strengthen capacity to perform proper smear microscopy as well as culture and DST. More specifically, the following should be attained by 2015:

1. All countries will have developed capacity to perform culture and DST according to national policies and within the framework of established, quality-assured AFB microscopy services.
2. New diagnostic tools will be introduced gradually and are expected to cover 50% of the eligible population.

#### **3.3 Development of the strategic approach for the strengthening of laboratory services**

The ultimate goal of the strategic approach is to improve TB case detection and cure rates in all countries that support TB control efforts in order to reach, maintain and exceed the targets of 70% case detection and 85% cure rate and to achieve the health-related Millennium Development Goals.

##### **3.3.1 Objectives**

1. To support countries to improve the access and performance of TB laboratories in order to ensure the provision of reliable diagnostic services for TB control by 2009. Countries are required to achieve the following:
  - a. Establish TB laboratory services within the primary health care wherever relevant and improve access to TB diagnosis by involving all laboratory service providers.
  - b. Implement a well-functioning QA programme for AFB smear microscopy in 100% of microscopy centres.
  - c. Ensure access to culture and DST services for at least 40% of the eligible population (this will be determined according to national policy).
2. To promote a fully functional laboratory network united by common objectives, programming, supervision and evaluation.

### **3.3.2 Priority countries**

Countries that meet any of the following five criteria will be considered priority countries for implementation of the strategy:

- Global HBCs,
- Regional HBCs,
- Priority countries for implementation of drug resistance surveillance (DRS),
- Countries planning for immediate implementation of the DOTS-Plus strategy,
- Countries with available financial resources from the GFATM or other sources.

### **3.3.3 Targets**

Countries meeting the above-mentioned criteria should have the following in place:

- A national reference laboratory fulfilling its terms of reference.
- An appropriately equipped and staffed diagnostic network that is accessible to the whole population.
- A fully functional external QA system for sputum smear microscopy, culture and DST.

## **4. Components of the strategic approach**

The strategic approach provides the main direction of work at the international, regional and country level. This strategy should be implemented via an annual operational workplan, with clearly defined activities, indicators, budget and responsibilities.

The strategic approach comprises four main elements and a number of supportive activities.

The main elements are:

- Standardization of laboratory documents
- Assessment of laboratory network and formulation of recommendations
- Support to countries in planning, training and identification of funding
- Monitoring and evaluation of progress

### **4.1 Standardization of laboratory documents**

#### **4.1.1 The laboratory assessment tool**

Development of a standardized laboratory assessment tool was among the first achievements. The document contains the minimum information requirements for an effective laboratory assessment.<sup>1</sup> Depending on the specific circumstances in-country, additional data may be collected. However, this tool recommends that the assessment focus on the following areas:

- Laboratory network structure and organization
- human resources, training and supervision
- Diagnostic services, laboratory methods and SOPs
- External QA that includes proficiency testing, rechecking, supervision, internal quality control and quality improvement
- Laboratory equipment, supplies and procurement
- Biosafety aspects

#### **4.1.2 Training**

- Standardization of training curricula (evaluation of existing courses)
- Development of a training module for country-specific external QA
- Revision of laboratory management training course
- Development of standardized training curricula for culture and DST
- Development of a training curricula for laboratory consultants who will provide technical assistance to countries

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<sup>1</sup> *Guidelines for surveillance of drug resistance in tuberculosis*. Geneva, World Health Organization, 2003 (WHO/TB/2003.320).

### **4.1.3 Standard operating procedures**

WHO will liaise with a task force of international laboratory experts to develop a SOPs manual. In general, biosafety measures are often not clearly defined in all levels of TB laboratories. This subject has therefore been included in SOP guidelines to ensure adherence to good hygiene practices and safety procedures.

### **4.1.4 Supervision**

It is crucial that high-quality supervision is carried out regularly and that a feedback mechanism is developed. Supervisory visits should therefore be planned carefully and use of a standardized checklist for sputum smear microscopy, culture and DST services should be considered. Such an approach would ensure consistency in laboratory evaluations and provide immediate feedback to laboratory staff to facilitate rapid corrective actions. In addition, a checklist may serve as documentation of the visit, i.e. provide a record of current conditions and specify needs for corrective measures.

To enhance the efficacy of the supervisory visits, the following activities will need to be implemented:

- Development of a supervisory checklist for culture and DST services.
- Implementation of the use of laboratory checklists for sputum smear microscopy, culture and DST as a means of standardizing quality supervision.
- Design of a system of data analysis, feedback and follow up.

## **4.2 Assessment of laboratory network and formulation of recommendations**

Priority will be given in the coming years to the improvement of AFB smear microscopy and culture techniques at all country levels. Although national TB diagnostic services may vary, laboratory assessments have determined that many countries share common problems and deficiencies in TB diagnostics.

The following activities should be carried out to achieve this component:

- Promote systematic use of the assessment tool.
- Organize the assessment missions to cover global and regional HBCs.
- Promote systematic participation of laboratory experts in programme reviews and monitoring missions.
- Formulate recommendations to facilitate planning of laboratory strengthening at country level.

## **4.3 Support to countries in planning, training and identification of funding**

Support to countries will be provided at global and regional levels, with close collaboration and coordination with partners. The mechanism of coordination with partner organizations at the country level will follow that established by the DEWG.

#### **4.3.1 Identifying needs to be included in country plans and incorporated in funding applications**

- Review country plans and grant proposals for either GFATM or bilateral donors to ensure that laboratory improvements have been fully addressed and sufficient funds allocated.
- Develop laboratory improvement plans in conjunction with the NTP strategic plans and grant proposals.
- Design and implement TB laboratory supervision programmes, including development of feedback mechanisms.
- Make available sufficient funds for training activities.
- Include a maintenance plan for laboratory equipment in contract agreements with vendors.

#### **4.3.2 Quality assurance**

- Design internal QA programmes.
- Design country-specific external QA programmes for sputum smear microscopy.
- Assist countries to implement internal and external QA programmes for sputum smear microscopy.
- Develop an external QA programme for culture and DST.
- Assist countries to implement internal and external QA programmes for culture and DST.

#### **4.3.3 Evaluating/reorganizing TB laboratory networks**

1. TB diagnostic services must be fully integrated within the NTP. Therefore, NTP and NRL management must evaluate the organization of the TB laboratory network based on the following principles:
  - Adoption of national standards for methods and laboratory techniques in accordance with international guidelines.
  - Decentralization of diagnostic levels with maintenance of high proficiency.
  - Effective supervision and quality control from the immediately superior level.
  - Continuous interaction between members and various levels of the network in order to exchange expertise.

Besides support for training and supervision, motivation of laboratory staff should become an essential activity under the TB control strategy.

2. Improvements related to laboratory network management must address timeliness of sputum examinations and timely reporting of results of sputum examination.
3. Ensure professional and friendly relationship between TB suspects/patients and laboratory staff to increase confidence towards TB control services.

This would enable the development of a system of laboratory networks working at different levels of service complexity and linked by the common objectives of the NTP.

#### **4.3.4 Human resource development**

##### *4.3.4.1 Identify and strengthen NRLs to build capacity for training and supervision*

- Ensure that sufficient human resources in both quantity and quality are available.
- Maximize use of existing human resources and implement staff development plans.
- Ensure inclusion of professional development activities for laboratory staff in country plans.
- Design or revise training curricula for sputum smear microscopy according to international standards.
- Conduct training or retraining of TB laboratory supervisors.
- Conduct training or retraining of laboratory microscopists.

##### *4.3.4.2 Strengthen the managerial capacity of NRL heads*

Laboratory management training has been developed with the intention of strengthening the management capacity of NRL heads. The training focuses on the development of the necessary skills that will enable senior NRL staff to plan, manage and evaluate diagnostic services and to deliver training, supervision and QA programmes within the NTP.

#### **4.4 Monitoring and evaluation of progress**

Deficiencies in the performance of TB laboratory services constitute a severe impediment to DOTS expansion efforts and should be addressed by the NTP and the NRL. Laboratory assessment missions have formulated recommendations and remedial actions for improvement of laboratory networks. It has not been determined, however, to what extent these remedial actions are reflected in the five-year national TB control plans prepared for DOTS expansion. In some countries, programmes have already initiated improvements of TB laboratory services. However, in some instances these efforts were not recognized because of lack of proper documentation. Therefore, a mechanism for follow up (i.e. progress reports) of the recommendations made by assessment missions must be developed to monitor implementation and results of specific interventions. In addition, follow-up missions should be organized to evaluate the effectiveness of these recommendations.

According to previously established relationships, each country will be assisted either by designated laboratory experts or by an international institution. This assistance will focus on building/strengthening local technical capacity and will enable regular monitoring of activities. Such relationships will also facilitate coordination among partners. For this purpose, the SLCS secretariat will develop a laboratory coordination mechanism to ensure that the relevant information is collected and is available to countries and partners. Such a mechanism will avoid duplication of effort, ensure continuity and maximize use of available resources.

## **5. Supportive activities**

### **5.1 Development of new diagnostic tools and transfer of existing modern technology to resource-limited countries**

Although AFB microscopy is inexpensive and specific, it is labour-intensive and does not detect patients with smear-negative disease and cases of extrapulmonary TB. Newly developed immunodiagnostic tests are the focus of active research. At present, the high cost of equipment and materials, combined with a lack of information on their specificity under field conditions, makes these tests difficult to adopt in settings with limited resources. Nevertheless, the SLCS supports initiatives that focus on the development, evaluation and use of rapid, high-quality diagnostic tools in resource-limited countries. The SLCS has initiated collaborative activities with the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR) and the Foundation for Innovative New Diagnostics (FIND). These collaborative efforts will focus mainly on evaluation of accuracy and effectiveness of the prospective products in laboratory and field trials.

In the interim, SLCS and TDR have decided to optimize methods for sputum smear microscopy. The first step will focus on review of methodologies that would improve the operational utility of direct smear microscopy. It is therefore proposed to organize a consortium meeting to review existing/published methodologies. Afterwards, the most promising approaches, suitable for low-income countries, will be evaluated in field trials.

### **5.2 Scaling-up resources**

#### **5.2.1 Human resources**

In order to ensure availability of human resources, the following steps should be implemented immediately:

##### *5.2.1.1 At global level*

- Establish a solid coordination team in WHO HQ.
- Encourage young professionals to work closely with senior laboratory experts. This will include on-the-job training in an office environment and during assessment, monitoring and review missions.
- Expand SLCS membership to other laboratory experts either retired or not included in the SRL network.
- Establish a core group comprising SLCS members to facilitate coordination of activities and decision-making.
- Maximize the use of existing human resources for technical support to laboratory services via coordination and close collaboration among partners and WHO regional offices.
- Encourage recruitment of young laboratory staff to ensure continuity of activities.
- Develop or revise a training programme for new laboratory experts.
- Encourage and facilitate secondment of laboratory experts to work at the

global and regional levels.

#### *4.2.1.2 At regional level*

- Recruit a laboratory professional or manager experienced in laboratory issues to work as a focal point for laboratory improvement and DRS in close collaboration with the SLCS and the DEWG secretariat.
- Maximize the use of existing human resources for technical support to laboratory services by improving coordination and close collaboration among partners.
- Ensure that available human and financial resources are adequate to carry out activities for laboratory improvements as specified in regional plans.

### **5.2.2 Financial resources**

The level of available funds for TB control activities is currently unprecedented. Despite financial difficulties in a number of countries, funding in general is no longer an important constraint. Unfortunately, diagnostic services are not adequately funded because planning and budgeting for this component of the NTP is very weak. Therefore, a defined strategy at country and regional levels, based on the global strategy, needs to be developed to ensure that activities associated with strengthening of TB diagnostic services are included in grant applications.

Countries should develop a two-year workplan for laboratory improvement, with a clearly defined budget. This will facilitate the development of grant proposals for financial institutions (e.g. GFATM and the World Bank), bilateral donors and nongovernmental organizations.

## **5.3 Strengthening partnership and advocacy**

### **5.3.1 Collaboration within WHO**

Within WHO, a number of clusters/departments/units are working on laboratory issues. At present, coordination among departments and professionals working on laboratory strengthening is limited. However, improvements in general laboratory conditions, biosafety measures, and recording and reporting systems will also benefit other programmes (e.g. HIV/AIDS, malaria) and overall health system strengthening.

#### *5.3.1.1 Coordination with other projects in Stop TB*

- Include information on laboratory performance in HBCs in the annual WHO report on global tuberculosis control.
- Collaborate with anti-TB DRS and DOTS-Plus projects.
- Work with the WHO Global Drug Facility to procure and supply of anti-TB diagnostic kits.
- Collaborate with the private-public mix task force to involve private laboratories in TB control.

#### 5.3.1.2 *Coordination with other WHO departments and regional offices*

- Foster strong internal communication among the key leaders from each disease-specific programme and regional and country offices.
- Develop an annual workplan focusing on laboratory strengthening in collaboration with various WHO departments, especially TDR and regional offices.

### **5.3.2 Partnership**

Coordination of activities among partners is a key issue. All efforts should be directed towards facilitating global DOTS expansion plans and achieving global targets for TB control. WHO, as the SLCS secretariat, should orchestrate this coordination. The following actions need to be considered:

- Integrate the laboratory component in the country coordination mechanism to exchange information on technical issues and planned activities among partners. This would improve coordination of efforts designed to strengthen capacity of TB laboratories.
- Establish a country-specific mentoring programme giving priority to improving sputum smear microscopy, then addressing culture and DST. This would require identification of laboratory experts available to provide technical assistance to designated country(ies) and serve as a focal point for laboratory-related issues.
- Ensure involvement of partners working on laboratory issues in planning and implementation of global, regional and country activities.
- Establish a strong relationship with donors (including the GFATM) to ensure that the laboratory components are adequately funded.
- Organize the yearly SLCS meeting as a forum for global planning, evaluation and exchange of information and to broaden the access of membership to the SLCS.

### **5.3.3 Advocacy**

Advocacy has a major role to play in raising awareness among partners and donors of the need to strengthen laboratory services.

- Promote full involvement of the NRL with the NTP in planning and budgeting of the national TB control strategy.
- Ensure that laboratory issues are included in each meeting or event agenda.
- Encourage presence of the head of NRL in meetings organized by WHO headquarters or regional offices to foster collaboration between the NTP and the NRL.
- Identify and document the contribution of the laboratory network in countries that

have already achieved 2005 targets (success stories in Peru and Viet Nam).

- In collaboration with advocacy experts in WHO and the Stop TB Partnership, design an advocacy campaign stressing the importance of laboratory work and targeting NTP managers and donors.
- Develop a campaign to increase funds for laboratory strengthening at global, regional and country levels.