

# China

China has seen a radical change in political commitment to TB control during 2003 and 2004. There has been a clear government decision to meet the global targets for diagnosis and treatment of TB by the end of 2005. This decision was endorsed by the State Council at a meeting on TB control in September 2004, and a pledge was secured to make an eight-fold increase in central government funding for TB control. Following the accelerated DOTS expansion undertaken in recent years, coverage will reach 95% by the end of 2004 and is expected to reach 100% in 2005. Building on the experience of the severe acute respiratory syndrome (SARS) epidemic, China has further recognized the importance of a public health approach to communicable diseases and has set up a new national Internet-based reporting system, under which all cases of several specified communicable diseases, including TB, must be notified. The recently revised law on infectious diseases also strengthens the mandatory reporting of TB, and this is expected to improve TB case reporting substan-

tially. The main challenge is to ensure the quality of TB services during a phase of rapid expansion and to address the shortages of staff and laboratory services needed to support the expanding programme.

## System of TB control

China introduced DOTS on a wide scale in 1992 by expanding DOTS to 13 of 31 mainland provinces, municipalities and autonomous regions ("provinces" hereafter) using funds from a World Bank loan. By 2000, most counties (1132 of 1208) in these 13 provinces had been using DOTS for at least five years. Further expansion of DOTS activities in other parts of China followed in 2002. By 2003, 91% of the population lived in areas covered by the DOTS strategy. Nationwide coverage is planned for the end of 2005.

The government is increasing its investment in public health substantially, and the MoH has put the control of TB among its top priorities. In 2004, an eight-fold increase in funding for the NTP has been pledged for TB control activities. A recent evalua-

tion of the progress towards the 10-year national TB control plan carried out by the MoH, Ministry of Finance, and the National Development and Reform Commission has resulted in further government commitment to TB control at all levels.

The TB laboratory network operates under the guidance of the NTP manager and consists of one national reference laboratory, 31 provincial TB reference laboratories, 336 TB laboratories at the prefecture/city level and 2683 peripheral laboratories. Microscopy is performed by all laboratories, while 16% carry out culture and less than 2% do drug susceptibility testing. Culture is occasionally performed in 5–10% of county laboratories, except in some major cities including Beijing where culture is done routinely for all TB suspects. Drug susceptibility testing is available to diagnose drug resistance at some provincial and prefecture level laboratories.

## Surveillance and monitoring

The estimated incidence rate for China was revised during 2004<sup>1</sup> and is believed to be falling by 1% per year, as is the measured rate of decline in the annual risk of TB infection over the decade since 1990. However, on the basis of the currently available data, these assessments of trend should be treated as approximate.

China made the second largest contribution to the increase in global case detection between 2002 and 2003, after India. The case detection rate achieved by the DOTS programme was 30% in 2002, and increased sharply to 43% by the end of 2003 as population coverage reached 91%. A rapidly implemented TB control programme faces the challenging task of maintaining quality as the programme

## PROGRESS IN TB CONTROL IN CHINA

### Indicators

DOTS treatment success, 2002 cohort	93%
DOTS case detection rate, 2003	43%
NTP budget available, 2004	88%
Government contribution to NTP budget, including loans, 2004	74%
Government contribution to total TB control costs, including loans, 2004	74%
Government health spending used for TB control, 2004	0.5%

### Major achievements

- A State Council TB control meeting on TB control involving all provinces
- Increased political commitment, especially at local levels, and increased funding from government and partners
- Establishment of a nationwide Internet-based system for the compulsory reporting of infectious diseases, including TB
- Monitoring mission to six priority provinces organized by the MoH

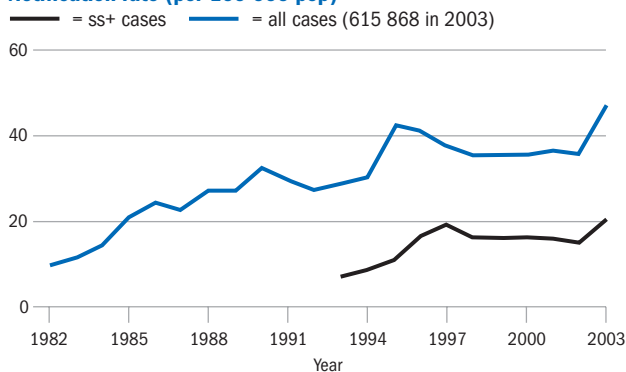
### Major planned activities

- Strengthen system of referral of TB patients from hospitals to local TB dispensaries
- Build human resource capacity according to the NTP guidelines
- Expand EQA system to all cities and counties, and drug resistance surveillance in additional provinces

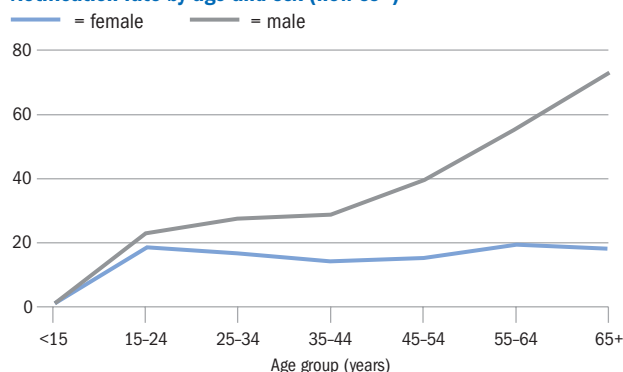
<sup>1</sup> Using the annual risk of TB infection (ARTI) measured in 2000, and by applying Stýblo's rule of thumb relating TB incidence to ARTI (smear-positive incidence increases by 50/100 000 population for every 1% increase in ARTI).

LATEST ESTIMATES <sup>a</sup>		TRENDS	2000	2001	2002	2003
<b>Population</b>	<b>1 304 196 022</b>	DOTS coverage (%)	68	68	78	91
Global rank (by est. number of cases)	2	Notification rate (all cases/100 000 pop)	36	37	36	47
Incidence (all cases/100 000 pop/year)	102	Notification rate (new ss+/100 000 pop)	16	16	15	21
Incidence (new ss+/100 000 pop/year)	46	Detection of all cases (%)	34	35	35	46
Prevalence (all cases/100 000 pop)	246	Case detection rate (new ss+, %)	34	34	32	45
TB mortality (all cases/100 000 pop/year)	18	DOTS case detection rate (new ss+, %)	31	31	30	43
TB cases HIV+ (adults aged 15-49, %)	0.7	DOTS case detection rate (new ss+)/coverage (%)	45	45	39	47
New cases multidrug resistant (%)	5.3	DOTS treatment success (new ss+, %)	95	96	93	-

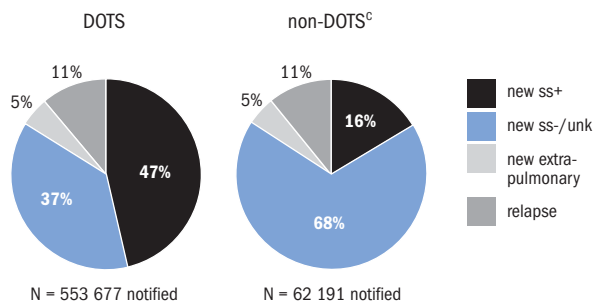
**Notification rate (per 100 000 pop)**



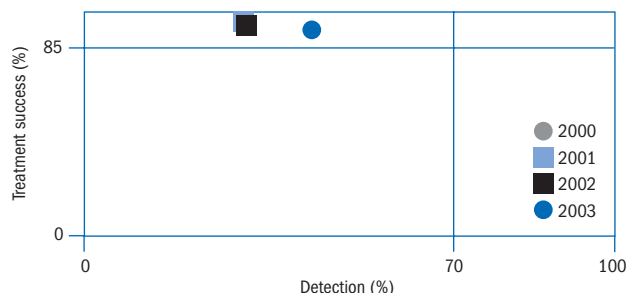
**Notification rate by age and sex (new ss+)<sup>b</sup>**



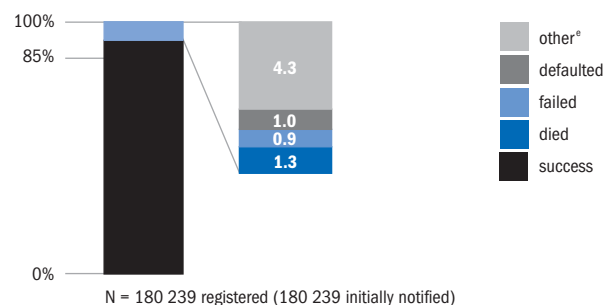
**Case types notified**



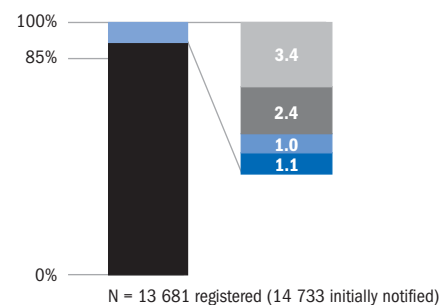
**DOTS progress towards targets<sup>d</sup>**



**DOTS treatment outcomes (new ss+)**



**Non-DOTS treatment outcomes (new ss+)**



**Notes**

ss+ indicates smear-positive; ss-, smear-negative; pop, population; unk, unknown.

Absence of a graph indicates that the data were not available or applicable.

<sup>a</sup> See Methods for data sources. Prevalence and mortality estimates include patients with HIV.

<sup>b</sup> The sum of cases notified by age and sex is less than the number of new smear-positive cases notified for some countries.

<sup>c</sup> Non-DOTS is blank for countries which are 100% DOTS, or where no non-DOTS data were reported.

<sup>d</sup> DOTS case detection rate for given year, DOTS treatment success rate for cohort registered in previous year.

<sup>e</sup> "Other" includes transfer out and not evaluated, still on treatment, and other unknown.

expands. At least two aspects of the monitoring data from China need closer scrutiny. One is the steady decrease in the proportion of DOTS patients diagnosed as smear-positive from 1996 to 2003; the other is the exceptionally high treatment success rate, reported to be 93% for the 2002 cohort of new smear-positive patients.

A full analysis of the year 2000 prevalence survey has confirmed that, in the 13 World Bank project provinces implementing DOTS between 1991 and 2000, culture-positive TB prevalence fell by 37% more than in other areas of the country, with a 30% decline directly attributable to DOTS.<sup>1</sup> Although the geographical coverage of DOTS increased substantially between 2002 and 2003, the case detection rate within DOTS areas was only 47% in 2003. Case detection will be improved by the new communicable disease surveillance system (implemented by the Chinese Center for Disease Control and Prevention), which has begun to notify TB patients via the Internet from all major hospitals and health centres as well as the TB dispensaries.

### Improving programme performance

During 2003, 27 of 31 provinces in China began scaling up existing and new TB control projects, and the country's two largest projects – funded by the World Bank/DFID and GFATM – are now fully operational. With anti-TB drugs provided free of charge by grants from the Government of Japan and the central government, 2003 is the first year that all provinces in China have had sufficient resources to implement the complete DOTS technical package. This is the main reason for the increase in case detection for both old and new DOTS areas and accounts for the increase in the case detection rate in DOTS areas from 35% in 2002 to 47% in 2003.

Insufficient human resources – both the quantity and expertise of staff

– is a major constraint to TB control. China has begun to address this problem by developing a new national TB training plan. With new funding from the GFATM and the ISAC initiative, China plans to recruit and train additional staff at the central and provincial levels.

With the aim of reaching the global targets by 2005, China has developed a national TB health promotion strategy to increase case detection and cure rates, especially among the poor and vulnerable. Special efforts are being made to increase public awareness of TB. The capacity of TB control staff to carry out health promotion activities at national and provincial levels will be enhanced, as will their communication and outreach skills.

Given the size of China, drug resistance surveys are carried out in individual provinces rather than nationally. The first survey began in 1996 in Henan Province, and since then six additional mainland provinces and Hong Kong SAR have reported drug-resistance data. China has an organized DRS plan, and many provinces are in various stages of planning and implementation. Another three provinces have completed drug resistance surveys; four more provinces have surveys in progress. A nationwide survey in 2000 estimated that 10% of prevalent bacteriologically confirmed TB cases have MDR-TB disease. MDR-TB patients are treated on an individual basis and have to pay for the services. Second-line drugs are produced in the country and are widely available.

Diagnostic and laboratory services, TB/HIV coordination and links with other health-care providers are three priority areas in which programme performance needs to be improved.

### Diagnostic and laboratory services

With 500 000 people for every microscopy diagnostic unit, diagnostic services offer a challenge to TB control in China. As activities expand, improving the quality of laboratory services is a priority. Rapid expansion of the new internationally recommended EQA system is also a priority for China, and a new national EQA manual for smear microscopy was developed and issued to TB control

institutions at each level. Training courses are being held on EQA implementation. Quality assurance for smear microscopy currently includes a quarterly review, on-site evaluation and panel testing. The national reference laboratories have set an EQA target for 2004 to cover 100% of provincial and prefecture laboratories and 60% of county laboratories. There are, however, no quality assurance systems in place for culture testing.

### TB/HIV coordination

The Chinese government estimates that there are currently 840 000 people living with HIV in the country, but by the end of 2003, only around 62 000 had been reported to the authorities, of which nearly 9000 were reported with AIDS; reported AIDS deaths have been rapidly increasing. While less than 0.2% of Chinese adults are currently infected with HIV, high rates of HIV infection have been found among intravenous drug users and among people who sold blood plasma to supplement their incomes in provinces such as Anhui, Henan and Shandong.<sup>2</sup> The Government of China is planning to collect data on HIV prevalence among TB patients in provinces known to have a relatively high HIV prevalence, and to use sentinel surveillance or surveys to determine trends in HIV prevalence among TB patients in provinces where the prevalence of HIV is not known. The MoH plans to establish a national TB/HIV coordinating body.

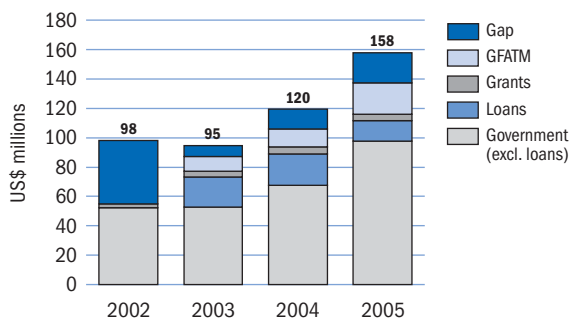
### Links with other health-care providers

TB suspects and patients seek care from public hospitals at all levels. The focus of PPM DOTS in China is to link hospitals to TB dispensaries, which is potentially the most important way to increase case detection and to improve the quality of patient care. Data from the prevalence survey conducted in 2000 indicate that more than 75% of smear-positive cases are initially managed in either county general hospitals or township hospitals in China. In the past, many cases diagnosed and treated in hospitals were not reported to the TB dispensaries. Patients in hospitals should now also be reported through the new surveillance

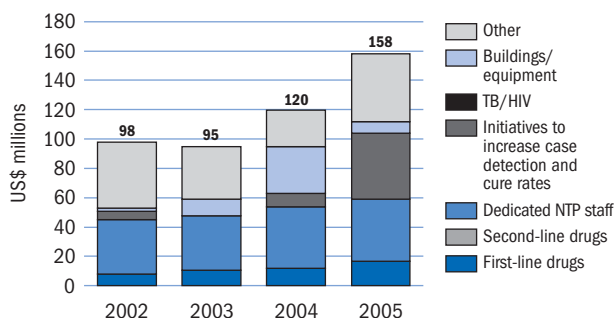
<sup>1</sup> China Tuberculosis Control Collaboration. The effect of tuberculosis control in China. *Lancet*, 2004, 364:417–422.

<sup>2</sup> UNAIDS 2004 Report on the global AIDS epidemic. Geneva, Joint United Nations Programme on HIV/AIDS, 2004.

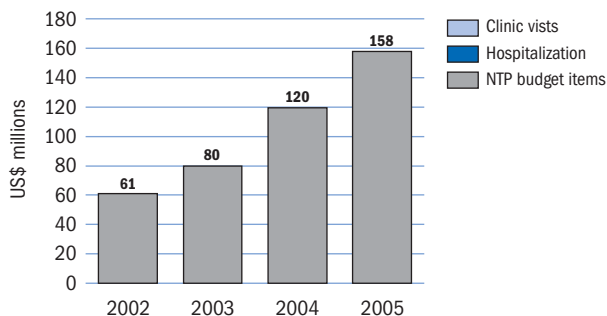
(a) NTP budget by source of funding



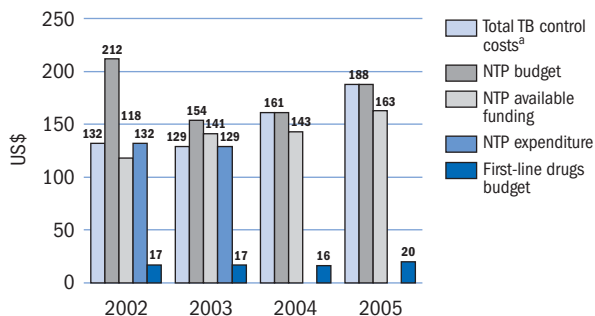
(b) NTP budget by line item



(c) Total TB control costs by line item<sup>a</sup>



(d) Per patient costs, budgets, available funding and expenditures



<sup>a</sup> Total TB control costs for 2002 and 2003 are based on expenditures, whereas those for 2004 and 2005 are based on budgets. See Methods for further details.

system. Pilot initiatives to involve hospitals are in place and are showing encouraging results.

**Partnerships**

In addition to the government funding for TB control, funds are provided for TB control projects from outside sources, with technical assistance from WHO and KNCV. The World Bank/DFID project provides funding for 16 project provinces. The Government of Japan provides funds for anti-TB drugs, microscopes and health promotion materials in 12 provinces. The GFATM has approved US\$ 25.4 million for the first two years of a five-year TB project, with initial funds disbursed to 24 provinces. Another GFATM project was approved in July 2004. The Damien Foundation Belgium supports TB control activities in Tibet (since 1995), Inner-Mongolia (since 2001) and Qinghai (since 2003). CIDA began

funding TB control activities through WHO in 2003, and the project now covers a population of 75 million in its second year. FIDELIS, run by IUATLD, is exploring new approaches to improve quality of DOTS services and increase case detection.

**Budgets and expenditures**

In line with plans to reach the global targets for case detection and treatment in 2005, the budget is projected to increase from around US\$ 100 million in 2002 and 2003 to US\$ 160 million in 2005. Due to a large funding gap, actual expenditures were only around US\$ 60 million in 2002.

Budgets from 2003 onwards have been substantially boosted by increased government funding, a new World Bank loan and successful applications to the GFATM. Despite this progress, a funding gap of US\$ 21 million still exists for 2005. This fund-

ing gap reflects faster than expected expansion of DOTS to new areas, greater than anticipated increases in case detection and plans to introduce additional initiatives to increase case detection in 2005 (e.g. tracing of patients reported through the general communicable disease reporting system, an increased number of sputum examinations at subcounty level and more IEC activities). Some of the funding gap may be filled by an increase in local government funding, but the extent to which this will occur is currently unclear. An increasing budget for first-line drugs is planned to meet the increase in treated cases, with the cost per patient treated remaining at about US\$ 20 for the period 2002–2005. If expenditures match budgets in 2004 and 2005, the total cost of TB control activities per patient treated will increase from about US\$ 130 in 2002 to US\$ 190 in 2005.

# Democratic Republic of the Congo

The Democratic Republic of the Congo, despite being among the poorest countries in the world, has made substantial progress in TB control in recent years; by 2004, DOTS services were available to approximately 80% of the population. While there is strong government support for the NTP, the provision of adequate TB services throughout the country has been hampered by a combination of difficulties. The country's health infrastructure has suffered in the past from an underdeveloped primary care system, lack of funds and resources as well as from the destructive effects of civil unrest and natural disasters. In spite of these constraints, TB case detection and cure rates have both improved steadily since the early 1990s, and the NTP hopes to reach the global targets by 2005. The likelihood of achieving these objectives has been greatly boosted by an award from the GFATM, as well as increased government funding, which have transformed the financial basis of TB control services and

will allow for the extension and strengthening of activities. Furthermore, the special problems posed by the epidemic of TB in people infected with HIV are being addressed in an expanding programme of collaborative TB/HIV activities.

## System of TB control

The NTP was officially launched in 1980 (Programme National Antituberculeux Intégré, PATI 1) and consists of a central unit, 20 provincial coordination centres, 777 TB diagnosis and treatment centres and a network of health posts (consisting of a nurse or health-care worker) distributed in 515 health districts. Better health coverage resulted from a health mapping exercise carried out in 2004, following which the number of health districts was increased from 306 to 515. TB services follow the expanded health network to improve access by providing services closer to where the patients live and to promote health-seeking behaviour.

The TB laboratory network consists of one NRL, which was significantly upgraded in preparation for the application to the GLC, 20 provincial laboratories implementing EQA and 800 district laboratories, giving 1 laboratory per 70 000 inhabitants. There are no microscopy services in any of the peripheral health posts.

## Surveillance and monitoring

As a result of progressive expansion of DOTS services, coverage of approximately 80% was reached in 2004. The TB notification rate for both smear-positive and all forms of TB has increased over the past 20 years, partly as a result of improved case-finding and partly as a result of a rise in TB incidence linked to the spread of HIV. For the Democratic Republic of the Congo, as for some other countries in central Africa, the accuracy of the estimated case detection rate (63% in 2003) is uncertain. The treatment success rate was 78% for the 2002 cohort; 7% of patients died and 13% defaulted or were lost to follow-up after transfer to other treatment centres. Both of the latter indicators were high for patients undergoing re-treatment following relapse, failure or default; the relapse re-treatment success rate was 70%. High HIV prevalence, poor health infrastructure and large numbers of displaced persons contribute to this low treatment success rate. However, preliminary data suggest that the treatment success rate for the first quarter of 2003 was 81%. Improvement of the treatment success rate is a high priority for the NTP.

## Improving programme performance

Revised TB control guidelines have been prepared (Programme National Antituberculeux Intégré, PATI 4) and will be published soon. These guidelines, which include the introduction of the 6-month regimen for treatment, have already been used as the basis for training sessions on the progressive introduction of the new regimen.

## PROGRESS IN TB CONTROL IN THE DEMOCRATIC REPUBLIC OF THE CONGO

### Indicators

DOTS treatment success, 2002 cohort	78%
DOTS case detection rate, 2003	63%
NTP budget available, 2004	84%
Government contribution to NTP budget, including loans, 2004	5%
Government contribution to total TB control costs, including loans, 2004	64%
Government health spending used for TB control, 2004	NA

### Major achievements

- Review of the national TB control guidelines (Programme National Antituberculeux Intégré, PATI 4), including introduction of 6-month treatment regimen
- Extensive training at all levels, including initiation of more than 4000 community health workers
- Establishment of a TB/HIV coordinating body to coordinate activities of the National AIDS Control Programme and the NTP
- Improved capacity of laboratories, including provision of 800 microscopes

### Major planned activities

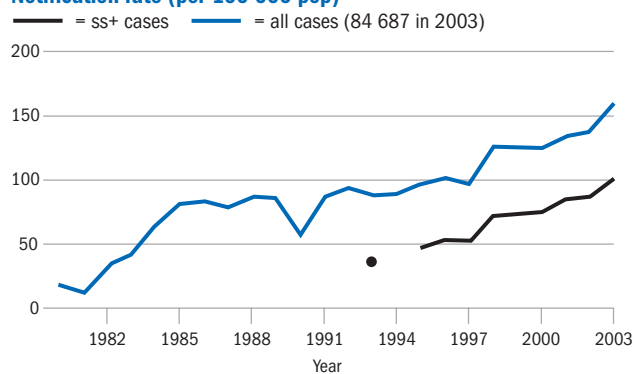
- Host external monitoring mission planned for February 2005
- Prepare five-year strategic plan (2006–2010)
- Implement a national drug resistance survey
- Update and revise NTP technical guidelines
- Expand collaborative TB/HIV activities, following recent award from the President's Emergency Plan for AIDS Relief

NA indicates not available.

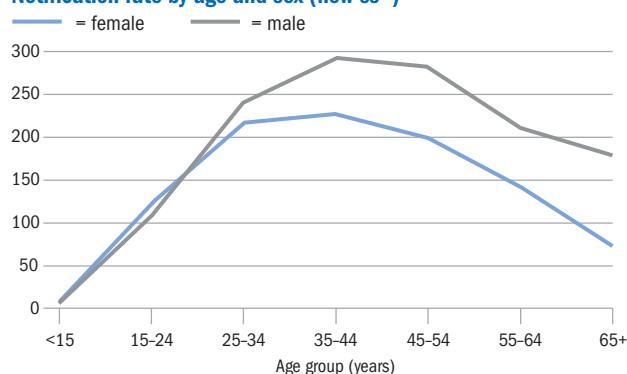
# DEMOCRATIC REPUBLIC OF THE CONGO

LATEST ESTIMATES <sup>a</sup>		TRENDS	2000	2001	2002	2003
<b>Population</b>	<b>52 771 230</b>	DOTS coverage (%)	70	70	70	75
Global rank (by est. number of cases)	11	Notification rate (all cases/100 000 pop)	125	134	138	160
Incidence (all cases/100 000 pop/year)	369	Notification rate (new ss+/100 000 pop)	74	84	87	102
Incidence (new ss+/100 000 pop/year)	160	Detection of all cases (%)	39	40	39	44
Prevalence (all cases/100 000 pop)	564	Case detection rate (new ss+, %)	53	58	57	63
TB mortality (all cases/100 000 pop/year)	81	DOTS case detection rate (new ss+, %)	53	58	57	63
TB cases HIV+ (adults aged 15-49, %)	21	DOTS case detection rate (new ss+)/coverage (%)	76	83	81	84
New cases multidrug resistant (%)	1.5	DOTS treatment success (new ss+, %)	78	77	78	—

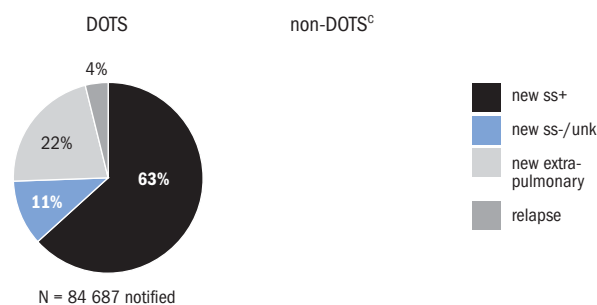
## Notification rate (per 100 000 pop)



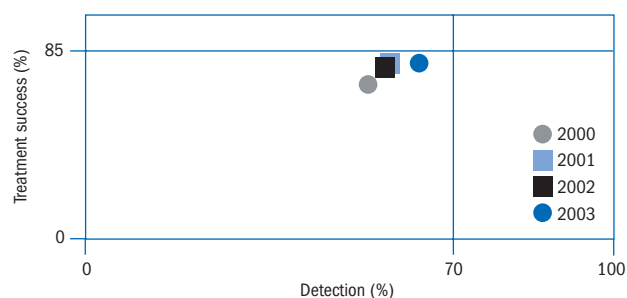
## Notification rate by age and sex (new ss+)<sup>b</sup>



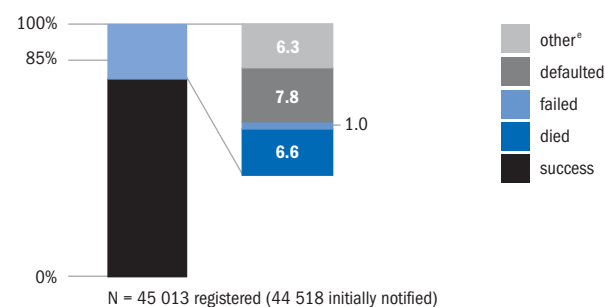
## Case types notified



## DOTS progress towards targets<sup>d</sup>



## DOTS treatment outcomes (new ss+)



## Non-DOTS treatment outcomes (new ss+)

### Notes

ss+ indicates smear-positive; ss-, smear-negative; pop, population; unk, unknown.

Absence of a graph indicates that the data were not available or applicable.

<sup>a</sup> See Methods for data sources. Prevalence and mortality estimates include patients with HIV.

<sup>b</sup> The sum of cases notified by age and sex is less than the number of new smear-positive cases notified for some countries.

<sup>c</sup> Non-DOTS is blank for countries which are 100% DOTS, or where no non-DOTS data were reported.

<sup>d</sup> DOTS case detection rate for given year, DOTS treatment success rate for cohort registered in previous year.

<sup>e</sup> "Other" includes transfer out and not evaluated, still on treatment, and other unknown.

A new strategic plan will be prepared for the period 2006–2010.

The supply of anti-TB drugs is adequate, thanks to a second GDF grant approved in 2004 for another three-year period. However, the country's drug policy and system of drug management need to be revised to ensure sustainable supply and better drug distribution, with regular reporting on drug stocks at every level.

A national drug resistance survey is planned for 2005. The protocol has been finalized and implementation should start soon. A national policy for the diagnosis and treatment of MDR-TB is being developed.

Extensive training activities were carried out in 2003 at all levels, including initiation of more than 4000 community health workers.

Supervision of laboratory, medical, financial and administrative functions is carried out on a regular basis, but the time devoted to each visit is inadequate and only half of the planned visits were carried out in 2003. Nonetheless, supervision has resulted in improvements in the procedures for recording and analysis of observations made during patient visits. There has also been a striking improvement in

the management and flow of funds because of a revision of financial and administrative procedures under the guidance of a newly-recruited finance officer at central level.

Data collection is more reliable than in the past, although delays are experienced and data collection forms remain unnecessarily complicated.

The award of a GFATM grant has greatly increased the funding available for TB control in 2004, making it possible to address the problems of staffing, training, medical supplies and equipment. With improvements in the facilities for diagnosis and patient care, case detection and cure rates should continue to rise in the coming years.

Three areas where programme performance particularly needs to be improved are laboratory services for culture and DST, TB/HIV coordination and links with other health-care providers.

### Diagnostic and laboratory services

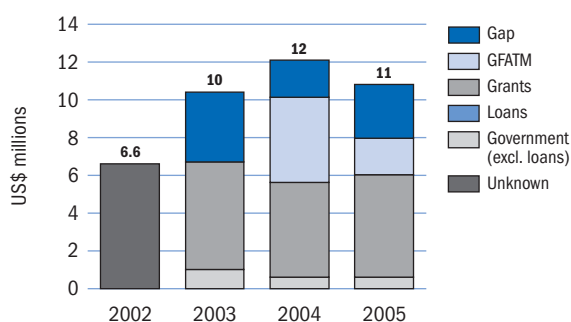
The quality of DOTS implementation relies on an effective laboratory network. New equipment was installed during 2003 and 2004 in most peripheral laboratories, and EQA is imple-

mented in most laboratories. EQA included external laboratory supervision in half of the provinces in 2003. On-the-spot slide reading is carried out in half of the districts visited during the external visits. The link between the NRL and the NTP needs to be strengthened to ensure effective co-ordination. The central laboratory is poorly equipped and the quality of slide reading is poor in laboratories where microscopes are old and need to be replaced.

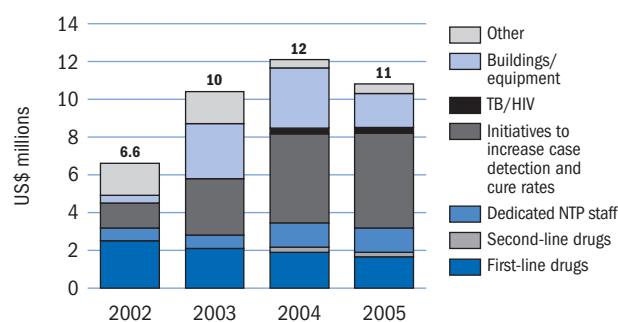
### TB/HIV coordination

More than 20% of adult TB patients are infected with HIV (WHO estimate). The National AIDS Control Programme and the NTP have established a TB/HIV coordinating body in 2003, and one NPO has been recruited to support these activities. Since 2002, several DOTS centres have started collaborative TB/HIV activities in Kinshasa, with financial and technical support from WHO, MSF and the World Bank. Following a recent award from the President's Emergency Plan for AIDS Relief, collaborative TB/HIV activities will be expanded in 2005.

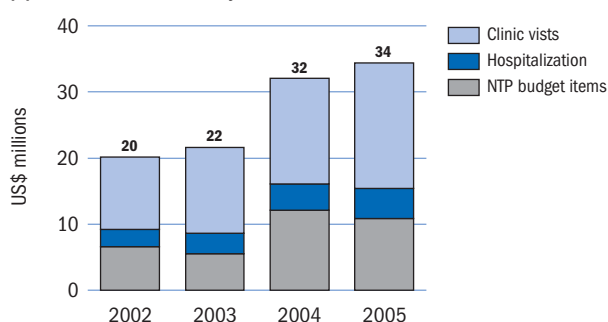
(a) NTP budget by source of funding



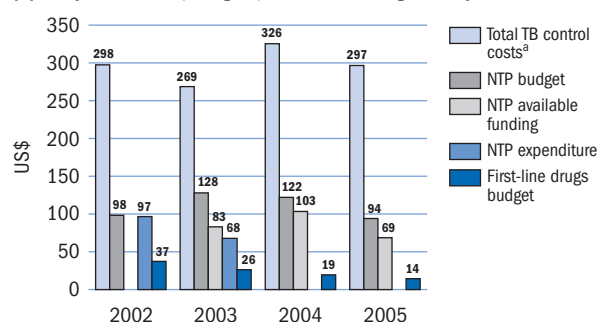
(b) NTP budget by line item



(c) Total TB control costs by line item<sup>a</sup>



(d) Per patient costs, budgets, available funding and expenditures



<sup>a</sup> Total TB control costs for 2002 and 2003 are based on expenditures, whereas those for 2004 and 2005 are based on budgets. Estimates of the costs of clinic visits and hospitalization are WHO estimates based on data provided by the NTP and from other sources. See Methods for further details.

### *Links with other health-care providers*

The NTP is collaborating with general hospitals, medical colleges, and military and police health services; specialist TB hospitals and the prison health-care service do not implement DOTS. Limited formal involvement of the private sector has started with the training of private physicians in DOTS activities. These providers are also represented in some provincial and national task force meetings.

### **Partnerships**

The Democratic Republic of the Congo benefits from several financial and technical partnerships for TB control. The GFATM is a principal source of funds, and the national budget for TB control has increased in 2004. Additional support from the Government of Belgium was agreed in 2004. UNDP, the principal recipient of the GFATM funds, has established four public and private recipients for the TB control proposal (the NTP, La Ligue Nationale

Antituberculeuse et Antilépreuse du Congo, DFB and the National School of Public Health). Through this arrangement, other partners have been included.

### **Budgets and expenditures**

The NTP budget has been between US\$ 10 million and US\$ 12 million for the years 2003–2005, compared with about US\$ 7 million in 2002. Almost all of the available funding for 2003–2005 comes from grants, with the government contributing less than 10% of the NTP budget (no breakdown of the budget by funding source in 2002 has been provided to WHO). This makes the Democratic Republic of the Congo largely dependent on external financing. Despite the approval of the GFATM grant in round 2, and sustained commitment from other donors, an important funding gap remains: US\$ 2.9 million (26% of the NTP budget) in 2005.

The budget for first-line drugs has

decreased from US\$ 2.5 million in 2002 to US\$ 1.7 million in 2005, reducing the first-line drug budget per patient treated from US\$ 37 to US\$ 14. In contrast, the budget for initiatives to increase case detection and cure rates has grown from US\$ 1.3 million in 2002 to US\$ 5 million in 2005 and is now the largest single budget item.

The total cost of TB control, which includes the cost of clinic visits and dedicated TB hospital beds, in addition to the NTP budget, is projected to increase from an estimated US\$ 20 million in 2002 to US\$ 34 million in 2005, in line with anticipated increases in the numbers of patients to be treated (the cost per patient treated is around US\$ 300 per patient in both 2002 and 2005). The government contribution to the total cost of TB control is much larger than to the NTP budget, varying from 60% to 76% of total costs.

# Ethiopia

Ethiopia has given priority to TB, HIV/AIDS and malaria prevention and control for more than a decade. The DOTS strategy is being implemented in most districts, and almost all hospitals and health centres provide DOTS services. However, basic health services are not yet accessible to about 40% of the population, and intensive efforts are being made to ensure better access throughout the country. Health facilities suffer from a high turnover of staff to deliver TB services; this constraint is being addressed through a comprehensive HRD plan and training programmes. Available data suggest that the incidence of TB has risen in recent years, partly as a result of the impact of the HIV/AIDS epidemic. Special efforts are being made to address the needs of TB patients coinfecting with HIV coinfection. Ethiopia has carried out its first national drug resistance survey and found that the rate of MDR-TB is low. The country has successfully maintained an uninterrupted supply of anti-TB drugs for several years. Approval of a grant from the GFATM opened up additional possibilities to expand and improve TB control services in 2004 and 2005.

## System of TB control

The health policy in Ethiopia, dating from 1993, gives priority to the control of communicable diseases, including TB, HIV/AIDS and malaria. The health system is being progressively decentralized under the country's primary health-care strategy. Recently, a four-tier health-care delivery structure was established to implement this policy. The primary health-care unit is the basic level of health care for Ethiopia and consists of a health centre with five satellite health posts, each serving 5000 people. In 2005, this network will be extended by the addition of two health extension workers for each subdistrict (kebele). The health system also includes district (woreda), regional and specialized hospitals, serving 250 000, 1 000 000 and 5 000 000 people, respectively. During the past year, further decentralization to the woredas in major regions of the country has led to an increase in the transfer of health personnel from regions and zones to woredas and a decreasing role of the zone in TB control activities.

In 1994, the NTP (known locally as

the TB and Leprosy Prevention Control Team) was established. Since 2000, it has been part of the Disease Prevention and Control Department of the Federal MoH. In 1996, a Project Development Plan (PDP), designed to support TB control through the NTP for five years, was signed by the Government of Ethiopia, WHO and KNCV. In 2001, this plan was extended for an additional year.

The laboratory services in Ethiopia include one NRL, regional reference laboratories in some regions and peripheral laboratories.

## Surveillance and monitoring

The steady rise in case notifications since 1993 is because of increasing DOTS coverage, improved reporting and the impact of HIV/AIDS. While the relative contributions of these three factors are uncertain, it has been assumed that the national smear-positive case detection rate by the DOTS programme has remained constant at around 36%, while incidence has increased. The case detection rate within DOTS areas was only 38% in 2003, due largely to the important difference between DOTS coverage as defined in this report (95%) and the proportion of the population thought to have access to health services of any kind, including for TB (50%). The proportion of notified cases diagnosed as smear-positive is low in Ethiopia, and has stayed within the range 27–35% during the period 1995–2003.

Despite the moderately high prevalence of HIV infection (4.4% of adults aged 15–49 years in 2003), it remains difficult to explain the extraordinary proportion of cases that are reported as extrapulmonary TB (>34% in 2003, regional variation 29–54%). The vast majority of extrapulmonary cases are reported as lymph node TB; this phenomenon is currently being investigated through a large operational research study in six sites in four regions.

Treatment success among new patients was only 76% in the 2002

## PROGRESS IN TB CONTROL IN ETHIOPIA

### Indicators

DOTS treatment success, 2002 cohort	76%
DOTS case detection rate, 2003	36%
NTP budget available, 2004	100%
Government contribution to NTP budget, including loans, 2004	8%
Government contribution to total TB control costs, including loans, 2004	31%
Government health spending used for TB control, 2004	10%

### Major achievements

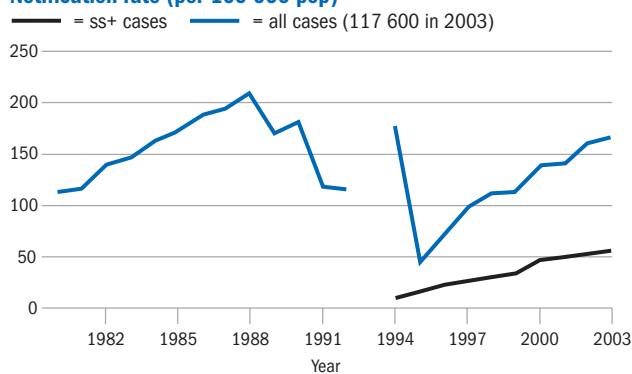
- Provision of DOTS services by 98% of hospitals and health centres
- Uninterrupted drug supply for several years
- Strong HRD plan with up-to-date training material and methodology
- Drug resistance survey completed with relatively low MDR-TB rate reported

### Major planned activities

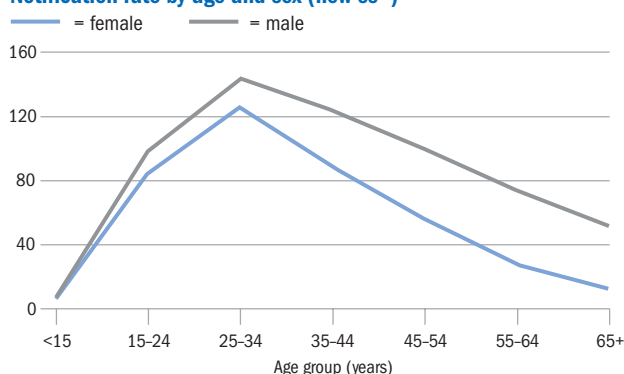
- Commence collaborative TB/HIV activities in pilot sites as well as in hospitals scheduled to provide ART
- Involve communities and private providers in TB control
- Conduct major training activities in all regions and woredas following the recent HRD plan

LATEST ESTIMATES <sup>a</sup>		TRENDS	2000	2001	2002	2003
<b>Population</b>	<b>70 678 002</b>	DOTS coverage (%)	85	70	95	95
Global rank (by est. number of cases)	7	Notification rate (all cases/100 000 pop)	139	141	160	166
Incidence (all cases/100 000 pop/year)	356	Notification rate (new ss+/100 000 pop)	47	49	53	56
Incidence (new ss+/100 000 pop/year)	155	Detection of all cases (%)	45	43	47	47
Prevalence (all cases/100 000 pop)	533	Case detection rate (new ss+, %)	35	35	36	36
TB mortality (all cases/100 000 pop/year)	79	DOTS case detection rate (new ss+, %)	35	35	36	36
TB cases HIV+ (adults aged 15-49, %)	21	DOTS case detection rate (new ss+)/coverage (%)	41	50	38	38
New cases multidrug resistant (%)	2.3	DOTS treatment success (new ss+, %)	80	76	76	—

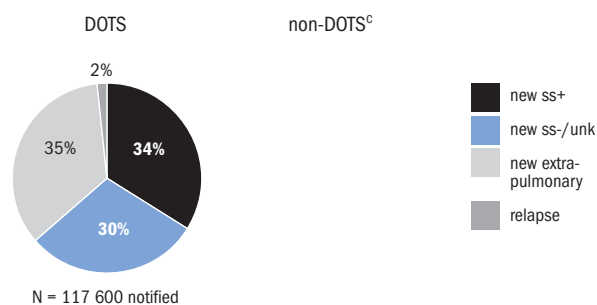
### Notification rate (per 100 000 pop)



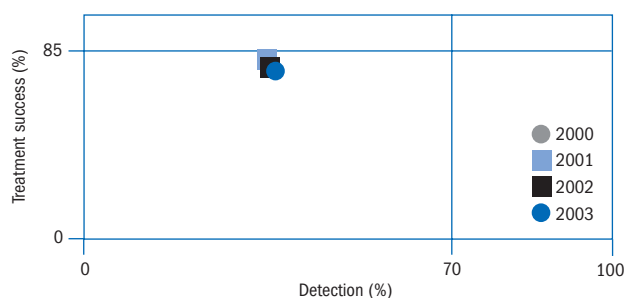
### Notification rate by age and sex (new ss+)<sup>b</sup>



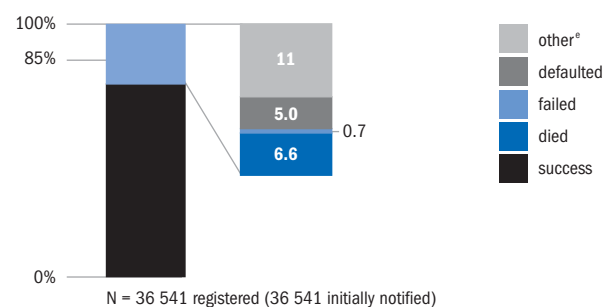
### Case types notified



### DOTS progress towards targets<sup>d</sup>



### DOTS treatment outcomes (new ss+)



### Non-DOTS treatment outcomes (new ss+)

#### Notes

ss+ indicates smear-positive; ss-, smear-negative; pop, population; unk, unknown.

Absence of a graph indicates that the data were not available or applicable.

<sup>a</sup> See Methods for data sources. Prevalence and mortality estimates include patients with HIV.

<sup>b</sup> The sum of cases notified by age and sex is less than the number of new smear-positive cases notified for some countries.

<sup>c</sup> Non-DOTS is blank for countries which are 100% DOTS, or where no non-DOTS data were reported.

<sup>d</sup> DOTS case detection rate for given year, DOTS treatment success rate for cohort registered in previous year.

<sup>e</sup> "Other" includes transfer out and not evaluated, still on treatment, and other unknown.

cohort, considerably lower than Ethiopia's maximum of 80% reported for 2000. However, this decrease is explained by the fact that the NTP now includes all notified cases in the analysis. Among new patients who were registered for treatment in 2002, the outcome of treatment is not known for 10% following transfer between treatment units; 7% died and 17% completed treatment without evidence of smear conversion.

### Improving programme performance

In recent years, the high turnover of staff involved in TB control and the effects of decentralization have resulted in a workforce that is not well trained in the principles of TB control. HRD in the NTP therefore received special emphasis in 2003, with the completion of a comprehensive HRD plan, production of a first edition of TB/leprosy training modules and associated materials for all levels of staff involved in TB control, and the creation of a pool of 53 competent TB and leprosy trainers distributed over all regions. Detailed regional training plans for 2005 have been drafted and funding for their implementation secured. The first phase of the plans focuses on in-service training; the second phase will also involve incorporation of TB control principles in the pre-service curricula.

Anti-TB drugs and laboratory supplies are procured by the Pharmaceutical Administration and Supplies Services of the Federal MoH using international competitive bidding, with funding from the GFATM. Despite delays in the procurement process, there has not been any interruption to the availability of drugs, mainly because of the continued maintenance of a one-year buffer stock. NTP training increasingly includes pharmacy staff. Four-drug FDCs have been introduced for the intensive phase of treatment for new patients.

Although almost 95% of the woredas have at least one health facility providing DOTS services, more than half of the smaller health stations/posts do not provide directly observed TB treatment. Covering all

these units is one of the main objectives of the NTP, but implementation has been constrained by a shortage of staff for monitoring and supervision as well as a delay in HRD.

Ethiopia's first drug resistance survey is close to completion, with preliminary results indicating 1.7% MDR among new cases, somewhat lower than the WHO estimate of 2.3%.

Three other areas in which programme performance needs to be improved are diagnostic and laboratory services, TB/HIV coordination and links with other health-care providers and the community.

#### *Diagnostic and laboratory services*

All laboratories are supplied with microscopes and reagents by the NTP, and staff are included in TB-related training activities. A system of quality assurance is in place, but implementation is weak. The NTP developed and issued a national laboratory manual for smear microscopy in 2002, which will be revised and re-edited in 2005.

#### *TB/HIV coordination*

A national TB/HIV coordinating body has been established and specific terms of reference developed. The committee includes the Federal MoH, academia, bilateral donors and the technical partners of the TB and HIV programmes. Nine pilot sites have been selected to pilot collaborative TB/HIV activities under the guidance of the committee. A national TB/HIV surveillance plan is being finalized. TB/HIV activities are managed by a national TB/HIV coordinator (WHO) based at the Federal MoH.

A national TB/HIV orientation workshop and various training courses have been conducted for the staff of pilot sites, in management of TB and other opportunistic infections in PLWHA and in VCT. Guidelines have been developed for the use of isoniazid preventive therapy in PLWHA infected with *M. tuberculosis* and for the use of co-trimoxazole preventive therapy in HIV-infected TB patients. Isoniazid (through the GDF), co-trimoxazole and HIV test kits (both through the Federal MoH) have been distributed. Ethiopia hosted, facili-

tated and participated in three major international activities: the meeting of the TB/HIV Global Working Group, TB/HIV Surveillance International Workshop (CDC/WHO) and two global TB/HIV managers training courses (WHO/GLRA).

#### *Links with other health-care providers*

Observations during monitoring and supervision as well as a small scale study in Addis Ababa have shown that many patients are managed in private clinics. Patient management is generally limited to diagnosis since, officially, anti-TB drugs in Ethiopia are available only in government health facilities. Most patients in whom TB is diagnosed in the private sector are referred to public health centres for registration and treatment. However, anti-TB drugs have been shown to circulate illegally, and treatment of an unknown number of patients is initiated in the private sector, disregarding national treatment guidelines. A pilot project is planned in Addis Ababa so that private providers will be increasingly involved in training activities as well as laboratory quality assurance activities.

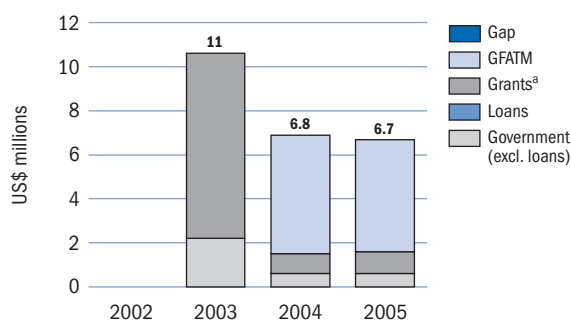
#### *Links with the community*

Given the sparse distribution of health facilities, and the consequent limited access to DOTS services in Ethiopia, plans are under way to involve the community in TB control. With GFATM funding, pilot projects will start in four districts of four regions. National guidelines for community involvement in DOTS and training modules and materials have been developed and distributed.

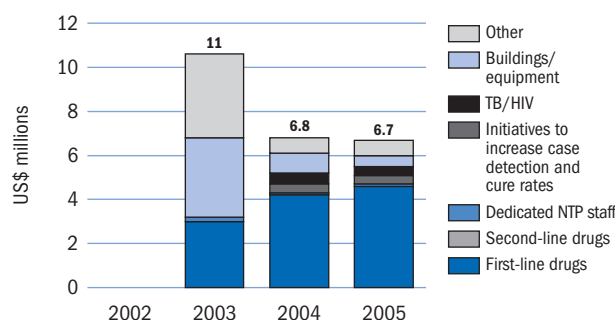
### Partnerships

For many years, the NTP has been consistently supported by the Royal Netherlands Embassy, GLRA and WHO. More recently, support has been received from the GFATM, with a large grant approved in the first round of applications. Other partners are CDC and USAID. MSF Belgium is providing support in the Somali Region, but this will be discontinued in 2005 when the regional health bureau assumes responsibility for the region.

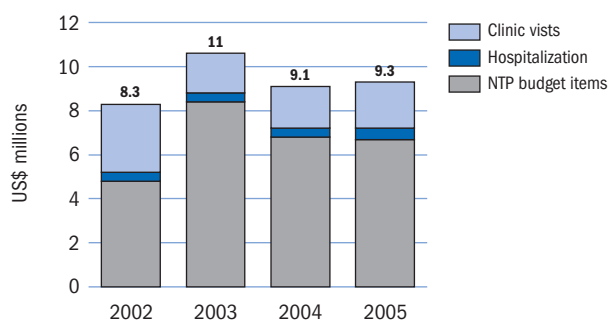
(a) NTP budget by source of funding



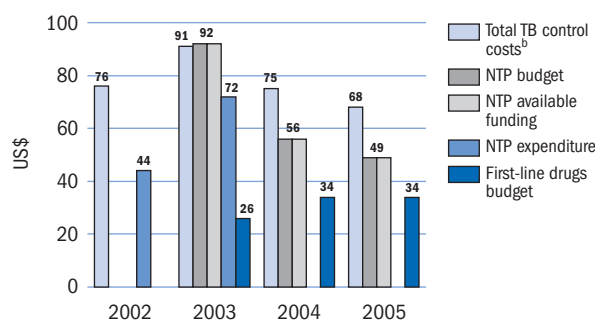
(b) NTP budget by line item



(c) Total TB control costs by line item<sup>b</sup>



(d) Per patient costs, budgets, available funding and expenditures



<sup>a</sup> The 2003 budget data provided to WHO did not separate the GFATM contribution from other grants.

<sup>b</sup> Total TB control costs for 2002 and 2003 are based on expenditures, whereas those for 2004 and 2005 are based on budgets. Estimates of the costs of clinic visits and hospitalization are WHO estimates based on data provided by the NTP and from other sources. See Methods for further details.

### Budgets and expenditures

The total NTP budget was US\$ 11 million in 2003, and lower at around US\$ 7 million in both 2004 and 2005 (US\$ 92 and US\$ 49 per patient in 2003 and 2005, respectively). The relatively high total in 2003 was a result of a large budget for capital investments (included in the “buildings and equipment” category) as well as a large budget in the “other” line item category. In practice, only 53% and 34%, respectively, of these budgets were spent. Following approval of a

GFATM grant in round 1 of US\$ 11 million for the first two years, Ethiopia has not reported any funding gaps for 2003–2005. Grants, including from the GFATM, represent more than 90% of the NTP budget in 2004 and 2005, making the NTP highly dependent on external funding. Programme sustainability is a concern, as grants support key areas such as first-line anti-TB drugs. In addition, continuous funding from the GFATM will depend on NTP performance during the first two years of the grant.

As the expected number of TB patients to be treated is increasing, the first-line drug budget is steadily expanding to reach US\$ 4.6 million in 2005, and remains the largest budget item.

The total TB control cost per patient (including the estimated costs of bed-days and clinic visits as well as the costs reflected in NTP budgets and expenditures) has remained relatively low, varying from US\$ 68 to US\$ 91 between 2002 and 2005.

# India

India, the country with the greatest burden of TB, is also the country where the most dramatic advances are being made in DOTS expansion. Thanks to a massive recent scale-up, TB services were available to some 67% of the population by 2003, and full nationwide DOTS coverage is planned for 2005. During 2003 alone, some 250 million additional people were included and treatment provided to more than 900 000 TB patients. At the same time, there has been a considerable improvement in the level of case detection, with India making a greater contribution than any other country to the global increase in case-finding since 2000. Mobilizing all public sector health-care providers, especially medical colleges, as well as many private and other health-care providers outside the government service, has been important to achieving such swift progress, and successful efforts continue to increase their involvement. Maintaining quality during rapid growth is a priority, while addressing the urgent need for addi-

tional staff and laboratory support for the expanded services. The Indian TB control programme is outstanding not only because of the recent progress but also because it has been made at a lower than predicted cost.

### System of TB control

India's Revised National TB Control Programme (locally RNTCP, hereafter NTP) was introduced on a pilot scale in 1993 and, after a period of pilot testing, was formally launched by the government in 1997. By mid-1998, the programme had expanded to serve some 20 million people. There followed a phase of rapid expansion from late 1998 so that, by 2003, the areas covered by the DOTS strategy included 778 million people (around 67% of the population).

The laboratory network currently comprises 3 national reference laboratories (these are the LRS Institute of TB and Respiratory Diseases, Delhi; the National TB Institute, Bangalore and the TB Research Centre, Chennai), 15 state laboratories, 522 district

laboratories and nearly 9000 peripheral NTP-designated microscopy centres. The national reference laboratories train state-level laboratory staff, and monitor and oversee the state laboratories. The state laboratories train district laboratory and supervisory staff, and monitor and oversee the peripheral microscopy centres; some of them perform culture and drug susceptibility testing. Sputum smear microscopy services are provided by the district and peripheral level microscopy centres.

### Surveillance and monitoring

Coverage was extended by 250 million people during 2003, with more than 900 000 patients placed on DOTS treatment during that year. Based on this remarkable progress, it is planned to cover a total of 850 million people by the end of 2004 and to reach 100% coverage by October 2005. The estimated smear-positive incidence was revised on the basis of a three-year national tuberculin survey that was completed during 2003. There was a striking improvement in the DOTS case detection rate in 2003, with an estimated 47% of all new smear-positive cases in the country detected by the NTP compared with 31% in 2002, and 69% detected in the areas already covered by the DOTS programme. This increase in case detection represents 39% of the increase in cases detected by DOTS programmes worldwide, and India has made a larger contribution than any other country to the acceleration in global case-finding observed since 2000. The reported treatment success has also increased over the past three years (to 87% for 2002), despite the rapid growth of the national DOTS cohort (to more than 37 000 new smear-positive patients in 2003).

In contrast to the upward trend in case notifications seen in the NTP, the notification rate of all TB cases, from all sources in India, has been falling gradually since 1992. It remains unclear whether this downward trend

## PROGRESS IN TB CONTROL IN INDIA

### Indicators

DOTS treatment success, 2002 cohort	87%
DOTS case detection rate, 2003	47%
NTP budget available, 2004	100%
Government contribution to NTP budget, including loans, 2004	74%
Government contribution to total TB control costs, including loans, 2004	86%
Government health spending used for TB control, 2004	2%

### Major achievements

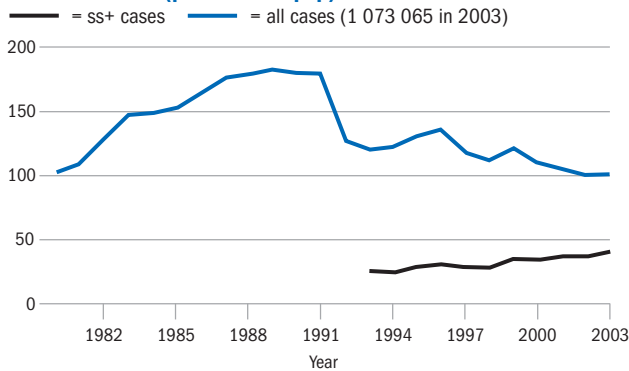
- Expansion of DOTS to cover an additional 250 million population during 2003
- Scaling up of PPM DOTS project in 12 sites
- GFATM round 1 activities started and round 2 agreement signed
- Involvement of medical colleges through national, subnational and state task forces
- Involvement of health facilities under other ministries
- Publication of new guidelines on EQA and development of a DRS protocol for two states
- Development of guidelines for management of paediatric TB

### Major planned activities

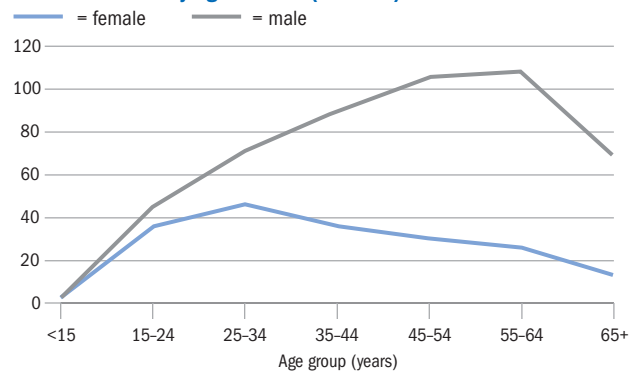
- Prepare for DOTS expansion in remaining states (laboratories, human resource, procurement) – entire country to be covered by October 2005
- Sustain quality of existing DOTS services by implementing a revised supervision and monitoring strategy
- Continue human resource capacity building through revision of all training material

LATEST ESTIMATES <sup>a</sup>		TRENDS	2000	2001	2002	2003
Population	1 065 462 272	DOTS coverage (%)	30	45	52	67
Global rank (by est. number of cases)	1	Notification rate (all cases/100 000 pop)	110	105	101	101
Incidence (all cases/100 000 pop/year)	168	Notification rate (new ss+/100 000 pop)	34	37	38	41
Incidence (new ss+/100 000 pop/year)	75	Detection of all cases (%)	65	63	60	60
Prevalence (all cases/100 000 pop)	290	Case detection rate (new ss+, %)	46	50	50	54
TB mortality (all cases/100 000 pop/year)	33	DOTS case detection rate (new ss+, %)	12	24	31	47
TB cases HIV+ (adults aged 15-49, %)	5.2	DOTS case detection rate (new ss+)/coverage (%)	42	53	60	69
New cases multidrug resistant (%)	3.4	DOTS treatment success (new ss+, %)	84	85	87	—

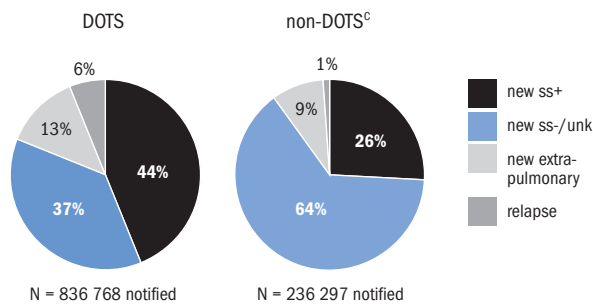
**Notification rate (per 100 000 pop)**



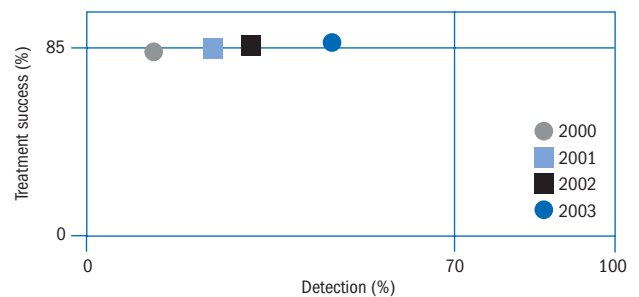
**Notification rate by age and sex (new ss+)<sup>b</sup>**



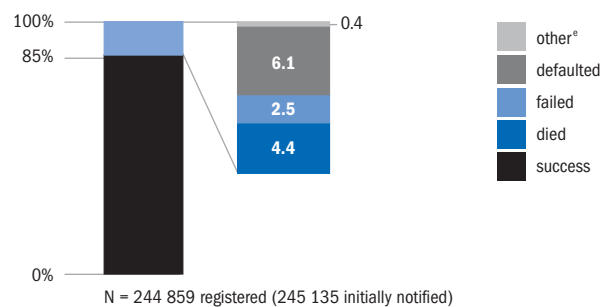
**Case types notified**



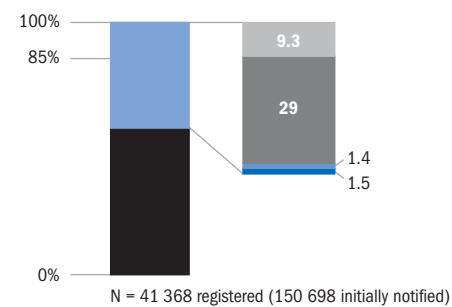
**DOTS progress towards targets<sup>d</sup>**



**DOTS treatment outcomes (new ss+)**



**Non-DOTS treatment outcomes (new ss+)**



**Notes**

ss+ indicates smear-positive; ss-, smear-negative; pop, population; unk, unknown.

Absence of a graph indicates that the data were not available or applicable.

<sup>a</sup> See Methods for data sources. Prevalence and mortality estimates include patients with HIV.

<sup>b</sup> The sum of cases notified by age and sex is less than the number of new smear-positive cases notified for some countries.

<sup>c</sup> Non-DOTS is blank for countries which are 100% DOTS, or where no non-DOTS data were reported.

<sup>d</sup> DOTS case detection rate for given year, DOTS treatment success rate for cohort registered in previous year.

<sup>e</sup> "Other" includes transfer out and not evaluated, still on treatment, and other unknown.

reflects a real decrease in incidence, or improvements in diagnosis (eliminating false-positives). National data for the years up to 2003 do not yet provide evidence that the NTP has reduced incidence and prevalence, although it is clear that there are significantly fewer deaths among cases notified (18 deaths averted per 100 patients treated are reported at [www.tbcindia.org](http://www.tbcindia.org)). The epidemiological evidence for impact is most likely to come from areas where the programme has been operating for longest and where the implementation of DOTS has been studied most intensively, notably in the "model DOTS project" being carried out by the Tuberculosis Research Centre in Chennai.

### Improving programme performance

Maintaining the quality of TB services is crucial as the programme moves towards full coverage, and this will be a major challenge in the coming years. To address it, several activities are under way, including the development of guidelines for the management of paediatric TB and the introduction of a revised supervision and monitoring strategy with detailed indicators for activities at all levels.

The most important constraint to the extension of quality TB services is the shortage of staff to manage the rapidly expanding programme, particularly at central and state levels. To improve this situation, additional technical staff have been recruited to assist the NTP manager, the limits on hiring contractual laboratory technicians have been relaxed and efforts are being made to achieve an adequate distribution of laboratory technicians to states where laboratories are understaffed. Subdistrict contracted laboratory supervisors have greatly contributed to the success of the programme, and efforts will be made to sustain capacity over the next few years. Further political commitment at the state level is needed to ensure that the programme is fully staffed with stable management. The capacity of current staff will be increased through training programmes run in part by expert consultants.

It is estimated that 3.4% of previously untreated TB cases are multidrug resistant. Currently, the NTP does not supply second-line drugs for MDR-TB patients. There are plans to build capacity at the state level for DRS and DOTS-Plus. Although MDR-TB patients are not treated under the NTP, second-line drugs are widely available and used by many practitioners, both public and private.

During 2005, priority will be given to preparing the remaining districts for DOTS implementation. The preparatory activities include the improvement of laboratories and stores, recruitment, relocation and training of staff, and procurement of equipment and supplies. Some of the districts are in areas where operations are difficult to access and where intensive monitoring will be required. Funds secured through the GFATM will be used to expand the programme to cover 56 million population in all 47 districts of the three newly-created states of Chhattisgarh, Jharkhand and Uttaranchal (round 1), and 110 million population in 56 districts of the states of Bihar and Uttar Pradesh (round 2). In addition, GFATM funds will be used to maintain DOTS coverage in 110 million population in the states of Andhra Pradesh and Orissa (round 4).

Diagnostic and laboratory services, TB/HIV coordination and links with other health-care providers and the community are three priority areas to improve programme performance.

### Diagnostic and laboratory services

The TB laboratory network is being strengthened to meet the needs of the expanding programme, by upgrading existing laboratories, creating new microscopy centres and establishing EQA. Based on new international guidelines, an EQA system for sputum microscopy was adopted at the beginning of 2004 for the NTP smear microscopy laboratory network, and includes a random blinded cross-check of routine slides each month. Panel testing at the district level is done by the state laboratories once a year. Currently, only NTI Bangalore and TRC Chennai are quality assured for both culture and drug susceptibility testing. The national reference labo-

ratories participate in annual proficiency testing coordinated by the Antwerp and Chennai supranational laboratories. Building capacity for DST at the intermediate laboratory level has started in two state-level laboratories in 2004 and is planned for two others by the end of the 2004; a national plan has also been developed to systematically perform DRS surveys in large states of the country.

### TB/HIV coordination

An estimated 5.1 million people are infected with HIV in India. HIV is likely to have a significant impact on the TB epidemic in the six states where the prevalence of HIV is greater than 1%, namely Andhra Pradesh, Karnataka, Maharashtra, Manipur, Nagaland and Tamil Nadu. The prevalence of HIV in TB patients has been measured in a number of tertiary care hospital settings, reaching 25% in one such hospital in Pune, Maharashtra, in 2001. However, the results from such studies are not representative of the HIV levels in TB patients in India as a whole. In 2004, HIV surveillance in TB patients has started in four districts in the six high-prevalence states, using a more representative sampling methodology.

Coordination of HIV and TB services has been prioritized in the six states with the highest HIV prevalence. HIV and TB staff have been cross-trained, referral linkages between the district VCT centres of the HIV programme and microscopy centres of the DOTS programme established and a surveillance system to document cross-referrals is currently in the pilot phase. Joint HIV/TB coordination committees will be established at the national and state levels with support from GFATM, and a referral system will be created at the sub-district level between the existing NTP infrastructure and the VCT centres.

### Links with other health-care providers

Private and other health-care providers, including NGOs and medical colleges, play an extremely important role in DOTS implementation in India. The Government of India has formulated and published schemes to promote participation of NGOs (2001) and pri-

vate practitioners (2002) in implementing DOTS. During the past few years, several local initiatives have emerged in both urban and rural settings; the NTP has provided drugs free of charge and has taken responsibility for supervision and monitoring of laboratory and treatment services. The evaluated initiatives have shown an increase in case notification between 3% and 30%. Most projects have also achieved treatment success greater than the programme target of 85%. Encouraged by the success of these early experiments, the NTP, in collaboration with WHO, has embarked on scaling up PPM DOTS in 14 cities across the country. The strategy is to offer technical support to the city TB control programmes to facilitate partnership development through a full-time PPM consultant assisted by two field supervisors. Future expansion of PPM DOTS will link all public, corporate, voluntary and private individual and institutional providers to the NTP. The programme has adapted the existing recording and reporting system in order to evaluate the PPM-DOTS activities. Monitoring during the two initial quarters showed that PPM-DOTS

providers other than those under the DoH contributed 39% of the cases detected under DOTS in the pilot cities. Public and private medical colleges alone accounted for 18%.

**Links with the community**

Community volunteers are used as DOT providers all over the country. In some parts, there has been effective involvement of the community through patient-provider-community meetings. IEC campaigns also involve the community at large, especially during events such as World TB Day.

**Partnerships**

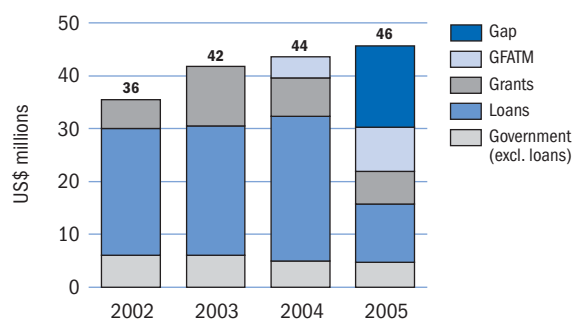
WHO has helped to establish a network of more than 85 field consultants and provides technical support for all aspects of the programme. These field consultants work with the programme managers at state and district level and report directly to the central unit of the NTP. India receives anti-TB drugs for 240 million of its population through the GDF. Financial partners include CIDA, DANIDA, DFID, GFATM, USAID and the World Bank.

**Budgets and expenditures**

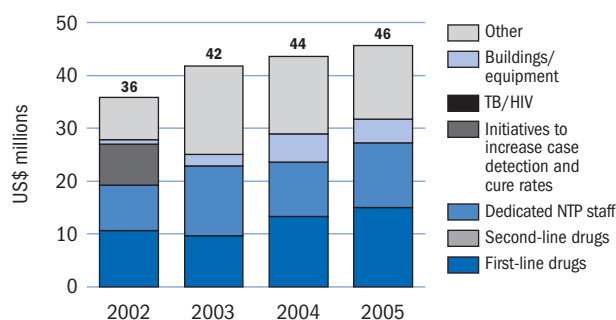
In line with the rapid DOTS expansion taking place in India, the NTP budget has increased from US\$ 36 million in 2002 to a projected US\$ 46 million in 2005. Most funding is provided by the government, through a World Bank credit and domestic government revenue. With an increase in funding from the GFATM, grants will provide about 30% of the budget in 2005. No budget gaps were reported for 2002–2004; although there is currently a funding gap of US\$ 15 million for 2005, it is expected that this will be filled by a combination of additional grants and a new World Bank credit.

The largest budget items are first-line drugs and dedicated staff, which together account for more than 50% of the total budget in each year 2002–2005. The budget per patient treated has remained stable as DOTS has expanded, at about US\$ 35–40. The same is true of total TB control costs (which include visits to health facilities and expenditures on dedicated TB hospital beds in addition to items covered by the NTP budget). The total TB control cost per patient treated has consistently remained at about

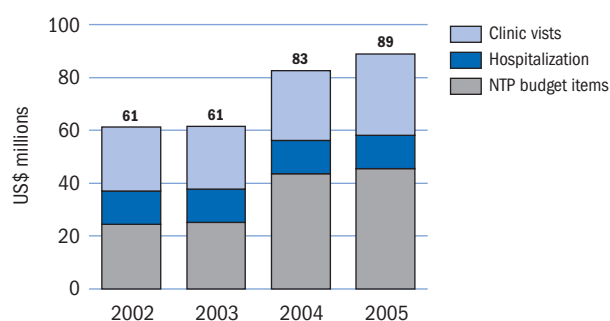
(a) NTP budget by source of funding



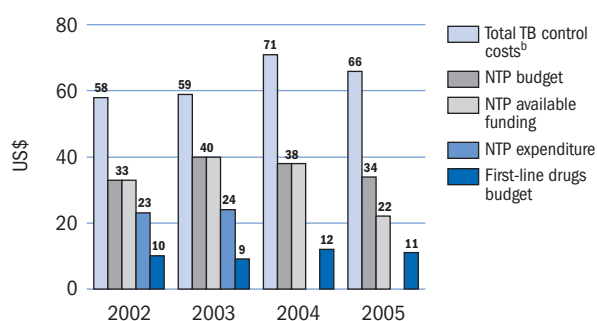
(b) NTP budget by line item<sup>a</sup>



(c) Total TB control costs by line item<sup>b</sup>



(d) Per patient costs, budgets, available funding and expenditures



<sup>a</sup> TB/HIV collaborative activities and initiatives to increase case detection and cure rates are not budgeted separately, and are thus included under other budget lines.

<sup>b</sup> Total TB control costs for 2002 and 2003 are based on expenditures, whereas those for 2004 and 2005 are based on budgets. Estimates of the costs of clinic visits and hospitalization are WHO estimates based on data provided by the NTP and from other sources. See Methods for further details.

US\$ 60–70, as total TB control costs have increased from about US\$ 60 million in 2002 to a projected US\$ 89 million in 2005; these figures may be overestimates because they assume that 75% of all DOT is undertaken at health facilities and that about 10 000 dedicated hospital beds are still being used for TB patients. In practice, community workers or volunteers may provide DOT to more than 25% of patients, at no cost to the health system, and increasing numbers of hospital beds previously dedicated to TB patients are being reallocated to other uses. A costing study will be undertaken in 2005 to further refine these estimates. While progress has been made at the planned rate, actual expenditures were lower than budgets in both 2002 and 2003, so the cost of DOTS expansion has been lower than anticipated.