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Global Tuberculosis Control

SURVEILLANCE, PLANNING, FINANCING

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Cover: A primary aim of this report is to assess whether national TB control programmes reached the target of 70% case detection by the end of 2005. The coloured lines on the cover represent the increases in case detection in selected high-burden countries and regions between 1995 and 2005, based on data in Table 11. The countries that met the target are identified in the main text and annexes.

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Abbreviations

ACSM	Advocacy, communication and social mobilization
AFB	Acid-fast bacilli
AFR	WHO African Region
AFRO	WHO Regional Office for Africa
AIDS	Acquired immunodeficiency syndrome
AMR	WHO Region of the Americas
AMRO	WHO Regional Office for the Americas
ART	Antiretroviral therapy
BPHS	Basic package of health-care services
CAREC	Caribbean Epidemiology Centre
CDC	Centers for Disease Control and Prevention
CHW	Community health worker
CIDA	Canadian International Development Agency
CPT	Co-trimoxazole preventive therapy
CTBC	Community-based TB care
DoH	Department of Health
DOT	Directly observed treatment
DOTS	The internationally recommended strategy for TB control
DRS	Drug resistance surveillance or survey
DST	Drug susceptibility testing
EMR	WHO Eastern Mediterranean Region
EMRO	WHO Regional Office for the Eastern Mediterranean
EQA	External quality assurance
EUR	WHO European Region
EURO	WHO Regional Office for Europe
FDC	Fixed-dose combination (or FDC anti-TB drug)
FIDELIS	Fund for Innovative DOTS Expansion, managed by IUATLD
GDF	Global TB Drug Facility
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GLC	Green Light Committee
Global Plan	*The Global Plan to Stop TB, 2006–2015*
GLRA	German Leprosy and TB Relief Association
GNI	Gross national income
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German society for technical co-operation)
HBC	High-burden country of which there are 22 that account for approximately 80% of all new TB cases arising each year
HIV	Human immunodeficiency virus
HRD	Human resources development
ICDDR	International Centre for Diarrhoeal Diseases and Research
IEC	Information, education, communication
IHC	Integrated HIV Care (a programme of the Union)
IPT	Isoniazid preventive therapy
ISAC	Intensified support and action in countries, an emergency initiative to reach targets for DOTS implementation by 2005
JICA	Japan International Cooperation Agency
KAP	Knowledge, attitudes and practices
LACEN	Brazilian public health laboratories
LGA	Local government area
LHW	Lady health workers
MDG	Millennium Development Goal
MDR	Multidrug resistance (resistance to isoniazid and rifampicin)
MDR-TB	Multidrug-resistant tuberculosis
MoH	Ministry of Health
NAP	National AIDS control programme or equivalent
NGO	Nongovernmental organization
NRHM	National Rural Health Mission
NRL	National reference laboratory
NTP	National tuberculosis control programme or equivalent
PAHO	Pan-American Health Organization
PAL	Practical Approach to Lung Health
PATH	Program for Appropriate Technology in Health
PHC	Primary health care
PhilTIPS	Philippine Tuberculosis Initiatives for the Private Sector
PPM	Public–private or public–public mix
RIT/JATA	Research Institute of Tuberculosis, Japanese Anti-tuberculosis Association
SEAR	WHO South-East Asia Region
SEARO	WHO Regional Office for South-East Asia
SILTB	Brazilian laboratory information system
SINAN	Brazilian health information system
SWAp	Sector-wide approach
TB	Tuberculosis
TB CAP	Tuberculosis Control Assistance Program
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNDP	United Nations Development Programme
UNHCR	United Nations High Commission for Refugees
the Union	International Union Against Tuberculosis and Lung Disease
USAID	United States Agency for International Development
VCT	Voluntary counselling and testing for HIV infection
WHO	World Health Organization
WPR	WHO Western Pacific Region
WPRO	WHO Regional Office for the Western Pacific
XDR-TB	TB due to MDR strains that are also resistant to a fluoroquinolone and at least one second-line injectable agent (amikacin, kanamycin and/or capreomycin)

Key findings

The global TB epidemic

TB is still a major cause of death worldwide, but the global epidemic is on the threshold of decline

1. There were an estimated 8.8 million new TB cases in 2005, 7.4 million in Asia and sub-Saharan Africa. A total of 1.6 million people died of TB, including 195 000 patients infected with HIV.

2. TB prevalence and death rates have probably been falling globally for several years. In 2005, the TB incidence rate was stable or in decline in all six WHO regions, and had reached a peak worldwide. However, the total number of new TB cases was still rising slowly, because the case-load continued to grow in the African, Eastern Mediterranean and South-East Asia regions.

DOTS and the Stop TB Strategy

Most government health services now recognize that TB control must go beyond DOTS, but the broader Stop TB Strategy is not yet fully operational in most countries

3. More than 90 million TB patients were reported to WHO between 1980 and 2005; 26.5 million patients were notified by DOTS programmes between 1995 and 2005, and 10.8 million new smear-positive cases were registered for treatment by DOTS programmes between 1994 and 2004.

4. DOTS, which underpins the Stop TB Strategy, was being applied in 187 countries in 2005; 89% of the world's population lived in areas where DOTS had been implemented by public health services.

5. A total of 199 countries/areas reported 5 million episodes of TB in 2005 (new patients and relapses); 2.3 million new pulmonary smear-positive patients were reported by DOTS programmes in 2005, and 2.1 million were registered for treatment in 2004.

6. Skilled and highly-motivated staff are central to any public health programme, and yet the plans for human resource development made by national TB control programmes (NTPs) in 2005–2006 were highly variable in quality. In particular, 7 of the 22 high-burden countries (HBCs), including 5 African countries, had plans that were limited in scope or under development.

7. Prompt diagnosis and effective treatment require fully-functioning laboratories and reliable drug supplies. Despite some improvements, NTPs in all WHO regions reported drug stock-outs, too few laboratories, weak quality control, and limited facilities to carry out culture and drug susceptibility testing. Many NTPs asked for further technical assistance from external agencies.

8. Nearly 5 million TB patients were notified under DOTS in 2005, and the total number diagnosed and treated in 2006 is expected to be roughly in line with the Global Plan to Stop TB (2006–2015). However, smear-positive case detection rates by DOTS programmes varied among WHO regions in 2005, from 35% (Europe) to 76% (Western Pacific), and these variations are likely to persist into 2006.

9. The numbers of HIV-positive and multidrug-resistant TB (MDR-TB) patients diagnosed and treated in 2005, although increasing, were far lower than proposed in the Global Plan for 2006. HIV testing for TB patients is increasing quickly in the African Region, but little effort has yet been made to screen HIV-infected people for TB, though this is a relatively efficient method of case-finding. Facilities to diagnose and treat MDR-TB, including extensively drug-resistant TB (XDR-TB), are not yet widely available; the scale of the XDR-TB problem globally is not yet known.

10. The treatment success rate for MDR-TB patients in projects approved by the Green Light Committee (GLC) was close to 60%, and higher than in non-GLC projects.

11. The Stop TB Strategy is a mechanism for building links between NTPs, health-care providers and communities. The connections being made through community-based TB care, public–private mix DOTS and the Practical Approach to Lung Health have been shown, on a small to medium scale, to improve access to diagnosis and treatment. However, no country has yet succeeded in making all of these activities fully operational at national scale.

12. Few NTPs have an overview of TB research in their countries, and few have the skilled staff and funding needed to carry out essential operational research.

Financing TB control

Although the funds available for TB control have increased enormously since 2002, reaching US$ 2.0 billion in 2007, interventions on the scale required by the Global Plan to Stop TB would cost an extra US$ 1.1 billion in 2007

13. The financial analyses included in this report are based on data from 90 countries that together accounted for 90% of all new TB cases in 2005, including all 22 HBCs and 84 of the countries considered in the Global Plan.

14. For all 90 countries analysed, the NTP budgets reported for 2007 amount to US$ 1.6 billion, with total costs (NTP budgets plus the cost of general health system staff and infrastructure used for anti-TB treatment) of

US$ 2.3 billion, and US$ 2.0 billion available (i.e. a reported funding gap of US$ 0.3 billion).

15. If country plans were in line with the Global Plan, the funding gap would be much larger than reported in 2007. To implement the Global Plan in 84 countries would cost US$ 3.1 billion in 2007, or US$ 1.1 billion more than was available. The difference between the Global Plan and funds available in the 22 HBCs is US$ 0.8 billion.

16. The Global Plan is more costly than country budgets primarily because it anticipates greater activity on TB/HIV management and on advocacy, communication and social mobilization (ACSM), especially in the African and South-East Asia regions. While some of the costs of collaborative TB/HIV activities are covered by HIV/AIDS control programmes (e.g. for antiretroviral therapy), NTPs are proposing to do less than described in the Global Plan. The Global Plan includes a large budget for ACSM but, in the absence of systematic guidance in 2006 (to be published in 2007), NTP budgets were typically small and activities uneven.

17. Budgetary trends over the period 2002–2007 can be assessed for the 22 HBCs. NTP budgets grew from just over US$ 500 million in 2002 to US$ 1.25 billion in 2007. Total costs increased from US$ 644 million in 2002 to US$ 1.65 billion in 2007. Funding has increased from US$ 644 million in 2002 to US$ 1.4 billion in 2007 (US$ 241 million from donors, including US$ 168 million from the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) and US$ 1.2 billion from national governments).

18. In 2007, six countries accounted for three-quarters of the NTP budgets reported by HBCs: Brazil, the Russian Federation, China, South Africa, India and Indonesia.

19. Between 2002 and 2007, there were big increases in domestic funding in China, the Russian Federation and South Africa; in other countries, most of the increased funding came from the GFATM.

20. In 2005, 11 HBCs (of 19 that provided data) spent 90% or more of the funds available, including Brazil, China, India, Myanmar and Viet Nam. Afghanistan and Pakistan spent less than half of the available funds. Kenya, Mozambique and UR Tanzania spent at least two-thirds of their funds in 2005, as compared with less than half in 2004.

21. Greater expenditure was strongly associated with improved case-finding in Bangladesh, China, DR Congo, India, Indonesia, Kenya, Myanmar and Nigeria. But there was no systematic relationship between incremental expenditure and improved case detection across all HBCs. The relationship between spending and case-finding needs to be investigated and understood country by country.

22. Most NTPs in HBCs have medium-term (e.g. five-year) strategic plans for TB control. These are in line with the Global Plan in a few countries, including Brazil, China (with the exception of MDR-TB treatment), Kenya, the Philippines and Viet Nam. Other countries need budgets that are more closely aligned with the Global Plan.

Towards goals and targets

More than 26 million TB patients have been treated under DOTS, but the world's TB control programmes narrowly missed the 2005 targets for case detection and cure, and are not yet on course to meet the Millennium Development Goals by 2015

23. WHO's 2005 targets for DOTS programmes of 70% case detection and 85% cure were narrowly missed globally: case detection was 60% (95%CL 52–69%); treatment success was 84%. However, both targets were achieved in the Western Pacific Region, and treatment success exceeded 85% in the South-East Asia Region.

24. Twenty-six countries achieved both targets, including China, the Philippines and Viet Nam; 67 countries achieved at least 70% case detection in 2005, and 57 countries reported a treatment success of 85% or more in the 2004 cohort.

25. If the global TB incidence rate is indeed falling, Millennium Development Goal 6 (Target 8) has already been satisfied, more than 10 years before the 2015 deadline.

26. Although the TB burden may be falling globally, the decline is not fast enough to meet the impact targets set by the Stop TB Partnership – to halve the 1990 prevalence and death rates by 2015. The Region of the Americas and the South-East Asia and Western Pacific regions are on track to reach these targets; the African, Eastern Mediterranean and European regions are not. Countries and regions are more likely to reach these targets if they can increase budgets and step up activities in line with the Global Plan.

27. Procedures for collecting financial and epidemiological data, and other information about programme performance, must be systematically improved. Comprehensive surveillance and monitoring, and well-designed surveys, are a prerequisite for the accurate evaluation of progress in TB control.

Principales constatations

Épidémie mondiale

La tuberculose reste l'une des principales causes de mortalité dans le monde, mais l'épidémie mondiale est sur le point de décliner.

1. Selon les estimations, il y a eu 8,8 millions de nouveaux cas de la tuberculose dans le monde, dont 7,4 millions en Asie et en Afrique subsaharienne. Au total, 1,6 millions de personnes sont mortes de la tuberculose, dont 195 000 patients infectés par le VIH.

2. La prévalence de la tuberculose et les taux de mortalité ont probablement diminué à l'échelle mondiale pendant plusieurs années. En 2005, l'incidence est restée stable ou a diminué dans les six régions de l'OMS, un pic mondial ayant été atteint. Toutefois, le nombre total de nouveaux cas de tuberculose a continué d'augmenter lentement à cause des chiffres observés dans les régions de l'Afrique, de la Méditerranée orientale et de l'Asie du Sud-Est.

DOTS et la stratégie Halte à la tuberculose

La plupart des services publics de santé reconnaissent désormais que la lutte antituberculeuse doit aller au-delà du DOTS, mais la stratégie Halte à la tuberculose, plus globale, n'est pas encore pleinement opérationnelle dans la plupart des pays.

3. Plus de 90 millions de cas ont été notifiés à l'OMS de 1980 à 2005 ; 26,5 millions ont été notifiés par les programmes DOTS entre 1995 et 2005 ; 10,8 millions de nouveaux cas à frottis positif ont été inscrits pour le traitement dans le cadre de programmes DOTS entre 1994 et 2004.

4. Le DOTS, fondement de la stratégie Halte à la tuberculose, a été appliqué dans 187 pays en 2005 ; 89% de la population mondiale vivait dans des régions où les services publics de santé le mettaient en œuvre.

5. Au total, 199 pays et territoires ont notifiés 5 millions d'épisodes de tuberculose en 2005 (nouveaux cas ou rechutes) ; les programmes DOTS ont signalé 2,3 millions de nouveaux cas de tuberculose pulmonaire à frottis positif en 2005 et 2,1 millions ont été enregistrés pour le traitement en 2004.

6. Disposer de personnel qualifié et très motivé est essentiel dans un programme de santé publique et pourtant, les plans de développement des ressources humaines élaborés par les programmes nationaux de lutte antituberculeuse (PNT) en 2005–2006 étaient de qualité très variable. Sur les 22 pays fortement touchés, 7 (dont 5 pays africains) avaient des plans avec une portée limitée ou en cours d'élaboration.

7. Pour un diagnostic rapide et un traitement efficace, il faut des laboratoires pleinement opérationnels et un approvisionnement fiable en médicaments. Pourtant, malgré certaines améliorations, dans toutes les régions de l'OMS des PNT ont signalé des ruptures de stock, un nombre trop faible de laboratoires, une faiblesse des contrôles de qualité et un nombre limité d'établissements pouvant faire des cultures et des tests de sensibilité aux médicaments. De nombreux programmes ont demandé une assistance technique à des organismes externes.

8. Dans le cadre du DOTS, près de 5 millions de patients ont été notifiés en 2005 et on s'attend à ce que le nombre total de cas diagnostiqués et traités en 2006 soit globalement conforme au Plan mondial « Halte à la tuberculose » 2006–2015. Toutefois, la détection des cas à frottis positif par les programmes DOTS a été variable selon les régions de l'OMS en 2005, de 35% (Europe) à 76% (Pacifique occidental). Ces variations devraient persister en 2006.

9. Bien qu'en augmentation, le nombre de patients VIH positifs et ceux présentant une tuberculose à bacilles multirésistants diagnostiqués et traités en 2005 a été beaucoup plus bas que celui envisagé par le Plan mondial pour 2006. Le dépistage du VIH chez les patients tuberculeux se développe rapidement dans la Région africaine, mais peu d'efforts ont été faits pour dépister la tuberculose chez les personnes infectées par le VIH, bien qu'il s'agisse d'une méthode relativement efficace de détection des cas. Les établissements pour diagnostiquer et traiter les tuberculoses à bacilles multirésistants, y compris les tuberculoses à bacilles ultrarésitants, sont peu nombreux; on ne connaît pas encore la véritable ampleur du problème posé par les tuberculoses à bacilles ultrarésistants.

10. Le taux de réussite des traitements pour les patients atteints de tuberculose à bacilles multirésistants dans les projets approuvés par le Comité Feu Vert (CFV) est près de 60%, ce qui est plus élevé que dans les projets hors de ce cadre.

11. La stratégie Halte à la tuberculose est un dispositif pour établir des liens entre les PNT, les acteurs du secteur de santé et les communautés. Les connexions établies par l'intermédiaire des soins de la tuberculose dans les communautés, par le DOTS associant le public et le privé ou encore par l'approche pratique de la santé respiratoire (APSR) ont réussi, à petite ou moyenne échelle, à améliorer l'accès au diagnostic et au traitement. Pour autant, aucun pays n'est encore parvenu à rendre toutes ces activités pleinement opérationnelles à l'échelle nationale.

12. Peu de PNT ont une vue d'ensemble de la recherche sur la tuberculose dans leur pays et peu ont le personnel qualifié et les financements nécessaires pour mener à bien des travaux essentiels de recherche opérationnelle.

Financement de la lutte antituberculeuse

Bien que les fonds disponibles se soient considérablement accrus depuis 2002 et atteignent US $2 milliards en 2007, il faudra disposer de US $1,1 milliard de plus pour exécuter les interventions de l'ampleur requise par le Plan mondial « Halte à la tuberculose » en 2007.

13. Les analyses financières données dans ce rapport reposent sur les données provenant de 90 pays, cumulant 90% des nouveaux cas en 2005, dont les 22 pays fortement touchés et 84 des pays étudiés dans le Plan mondial.

14. Pour l'ensemble des 90 pays analysés, le total des budgets des PNT indiqués pour 2007 se monte à US $1,6 milliard, avec un coût total de US $2,3 milliards (budgets des PNT plus les coûts des personnels des services de santé généraux et des infrastructures utilisés pour les traitements de la tuberculose), alors que la somme disponible est de US $2,0 milliards (il y a ainsi un déficit de financement de US $0,3 milliards).

15. Si les plans des pays étaient conformes au Plan mondial, le déficit de financement serait encore plus important que le chiffre indiqué pour 2007. La mise en œuvre du Plan mondial dans 84 pays coûterait US $3,1 milliards en 2007, soit 1,1 milliard de plus que ce dont on dispose. Pour les 22 pays fortement touchés, l'écart entre le Plan mondial et les fonds disponibles est de US $0,8 milliard.

16. Le Plan mondial est plus coûteux que les budgets des pays en premier lieu parce qu'il anticipe une activité plus importante pour la prise en charge de la tuberculose et du VIH, et pour le plaidoyer, la communication et la mobilisation sociale, en particulier dans les régions de l'Afrique et de l'Asie du Sud-Est. Si certains des coûts des activités de collaboration pour la lutte contre la tuberculose et le VIH sont couverts par les programmes de lutte contre le VIH/SIDA (par exemple les traitements antirétroviraux), les PNT proposent de faire moins que ce qui est décrit dans le Plan mondial. Ce dernier prévoit un budget important pour les activités de plaidoyer, communication et mobilisation sociale mais, en l'absence d'orientations systématiques en 2006 (devant être publiées en 2007), les budgets des PNT étaient réduits et les activités menées inégales.

17. On peut évaluer les tendances budgétaires sur la période 2006–2007 pour les 22 pays fortement touchés. Les budgets des PNT sont passés d'un peu plus de US $500 millions en 2002 à US $1,25 milliard en 2007, les coûts totaux de US $644 millions en 2002 à US $1,65 milliard en 2007 et les financements de US $644 millions en 2002 à US $1,4 milliard en 2007 (US $241 millions des donateurs, dont US $168 millions du Fonds mondial de lutte contre le SIDA, la tuberculose et le paludisme (Fonds mondial), et US $1,2 milliard des gouvernements nationaux).

18. En 2007, six pays ont représenté à eux seuls les trois quarts du budget total des PNT indiqués pour les pays fortement touchés : le Brésil, la Fédération de Russie, la Chine, l'Afrique du Sud, l'Inde et l'Indonésie.

19. Entre 2002 et 2007, on a observé une forte augmentation des financements nationaux en Chine, en Fédération de Russie et en Afrique du Sud ; dans les autres pays, la plupart de l'augmentation provenait du Fonds mondial.

20. En 2005, 11 pays fortement touchés (sur les 19 ayant fourni des données) ont dépensé au moins 90% des fonds disponibles, parmi lesquels le Brésil, la Chine, l'Inde, le Myanmar et le Viet Nam. L'Afghanistan et le Pakistan ont dépensé moins de la moitié des fonds disponibles. Le Kenya, le Mozambique et la République-Unie de Tanzanie en ont dépensé au moins les deux tiers, contre moins de la moitié en 2004.

21. Il y a une forte corrélation entre l'augmentation des dépenses et l'amélioration de la détection des cas au Bangladesh, en Chine, en République démocratique du Congo, en Inde, en Indonésie, au Kenya, au Myanmar et au Nigéria. Mais il n'y a pas de relation systématique entre l'augmentation des dépenses et l'amélioration de la détection des cas dans l'ensemble des pays fortement touchés. Cette relation devra être étudiée et comprise pays par pays.

22. La plupart des PNT des pays fortement touchés ont des plans stratégiques de lutte à moyen terme (5 ans par exemple). Dans quelques pays, Brésil, Chine (à l'exception du traitement de la tuberculose MR), Kenya, Philippines et Viet Nam, ils sont conformes au Plan mondial. Les autres pays doivent aligner davantage leur budget sur ce que prévoit le Plan mondial.

Réalisation des buts et des cibles

Plus de 26 millions de patients ont été traités avec le DOTS, mais les programmes de lutte dans le monde ont manqué de peu les cibles fixées pour la détection des cas et la guérison en 2005 et ne sont toujours pas dans les temps pour réaliser les objectifs du Millénaire pour le développement d'ici à 2015.

23. Les cibles fixées par l'OMS aux programmes DOTS pour 2005, soit la détection de 70% des cas et un taux de réussite des traitements de 85%, ont été manquée de peu à l'échelle mondiale : la détection des cas a été 60% (IC 95% : 52–69%) et le taux de réussite des trai-

tements de 84%. Cependant, ces deux cibles ont été atteintes dans la Région du Pacifique occidental et le taux de réussite a dépassé les 85% en Asie du Sud-Est.

24. Vingt-six pays ont atteint les deux cibles, dont la Chine, les Philippines et le Viet Nam ; 67 pays ont atteint au moins 70% de détection des cas en 2005 et 57 pays ont notifiés des taux de réussite des traitements d'au moins 85% pour la cohorte 2004.

25. Si l'incidence mondiale est bien en train de diminuer, alors l'objectif 6 du Millénaire pour le développement (cible 8) a déjà été atteint, plus de 10 ans avant la date butoir de 2015.

26. Bien que la charge de la tuberculose semble diminuer à l'échelle mondiale, cette baisse n'est pas assez rapide pour atteindre les cibles fixées par le partenariat Halte à la tuberculose : réduire de moitié la prévalence et le taux de mortalité d'ici à 2015 par rapport à 1990. Les régions des Amériques, de l'Asie du Sud-Est et du Pacifique occidental sont dans les temps pour y parvenir ; les régions de l'Afrique, de la Méditerranée orientale et de l'Europe ne le sont pas. Les pays et les régions auront de plus grandes chances d'atteindre les cibles s'ils peuvent augmenter les budgets et renforcer les activités, en accord avec le Plan mondial.

27. Les procédures de collecte des données financières, épidémiologiques et des informations sur le fonctionnement des programmes doivent être améliorées. Un système global de surveillance et de suivi, ainsi que des enquêtes bien conçues, sont les conditions indispensables à une évaluation précise des progrès de la lutte antituberculeuse.

Resultados principales

La epidemia mundial de tuberculosis

La tuberculosis (TB) sigue siendo una importante causa de muerte en todo el mundo, pero la epidemia mundial está a punto de empezar a disminuir

1. Se calcula que en 2005 hubo 8,8 millones de nuevos casos de TB, de los cuales 7,4 millones en Asia y África subsahariana. La TB causó la muerte de 1,6 millones de personas, entre ellas 195 000 infectadas por el VIH.
2. Las tasas mundiales de prevalencia y mortalidad de la TB probablemente han estado en descenso durante varios años. En 2005, la tasa de incidencia se mantuvo estable o disminuyó en las seis regiones de la OMS y en todo el mundo. Sin embargo, el número absoluto de nuevos casos siguió aumentando lentamente, debido a su aumento en las regiones de África, Mediterráneo Oriental y Asia Sudoriental.

El DOTS y la estrategia Alto a la Tuberculosis

La mayoría de los servicios de salud estatales reconocen que la lucha contra la TB debe ir más allá del DOTS, pero la estrategia más amplia de Alto a la Tuberculosis todavía no está en pleno funcionamiento en la mayoría de los países

3. Entre 1980 y 2005 se notificaron a la OMS más de 90 millones de casos de TB; entre 1995 y 2005 los programas de DOTS notificaron 26,5 millones de casos, y entre 1994 y 2004 registraron 10,8 millones de nuevos casos bacilíferos en tratamiento.
4. En 2005, el DOTS, sobre el que asienta la estrategia Alto a la Tuberculosis, se estaba aplicando en 187 países; el 89% de la población mundial vivía en zonas donde los servicios de salud públicos habían puesto en práctica el DOTS.
5. En 2005 se notificaron 5 millones de episodios de TB (casos nuevos y recidivas) en 199 países o zonas; los programas de DOTS notificaron 2,3 millones de nuevos casos de TB pulmonar bacilífera, y en 2004 se registraron 2,1 millones de casos en tratamiento.
6. La existencia de personal capacitado y muy motivado es fundamental para todo programa de salud pública, pero los planes de desarrollo de recursos humanos elaborados por los programas nacionales de lucha contra la TB (PNT) en 2005–2006 tuvieron una calidad muy variable. De los 22 países con alta carga de TB (PAC), siete (entre ellos cinco africanos) tenían planes de alcance reducido o que aún estaban en desarrollo.
7. El diagnóstico rápido y el tratamiento eficaz requieren laboratorios que funcionen a pleno rendimiento y un suministro fiable de medicamentos. A pesar de algunas mejoras, hubo en todas las regiones de la OMS PNT que notificaron agotamiento de las existencias de medicamentos, escasez de laboratorios, control deficiente de la calidad y escasez de servicios donde se pudieran realizar cultivos y pruebas de sensibilidad a los antibióticos. Muchos PNT pidieron más asistencia técnica a organismos externos.
8. En 2005 los programas de DOTS notificaron cerca de 5 millones de pacientes con TB, y se espera que el número total de casos diagnosticados y tratados en 2006 se ajuste aproximadamente al Plan Mundial para Detener la Tuberculosis 2006-2015. Sin embargo, la tasa de detección de casos bacilíferos en los programas de DOTS en 2005 osciló en las diferentes regiones de la OMS entre el 35% en Europa y el 76% en el Pacífico Occidental, y es probable que estas variaciones persistan en 2006.
9. El número de pacientes VIH-positivos y de pacientes con TB multirresistente diagnosticados y tratados en 2005 aumentó, pero siguió siendo muy inferior al propuesto en el Plan Mundial para 2006. La realización de pruebas de detección del VIH en pacientes con TB está aumentando rápidamente en la Región de África, pero los esfuerzos realizados para detectar la TB en pacientes infectados por el VIH han sido escasos, a pesar de que se trata de un método relativamente eficiente de identificación de casos. Todavía no existe una amplia disponibilidad de servicios que permitan diagnosticar y tratar la TB multirresistente, incluyendo la TB extremadamente resistente (XDR-TB); tampoco se conoce la magnitud mundial del XDR-TB problema.
10. La tasa de éxito del tratamiento de los pacientes con TB multirresistente en proyectos aprobados por el Comité Luz Verde estuvo cerca al 60%, cifra más elevada que la registrada en proyectos no aprobados por dicho comité.
11. La estrategia Alto a la Tuberculosis es un mecanismo para establecer vínculos entre los PNT, los proveedores de salud y las comunidades. A pequeña o mediana escala, se ha demostrado que las conexiones establecidas a través de la atención antituberculosa en la comunidad (DOTS comunitario), la participación mixta publicoprivada en el DOTS (PPM) y el Enfoque práctico de la salud pulmonar (PAL) han mejorado el acceso al diagnóstico y al tratamiento. Sin embargo, todavía no ha habido ningún país que haya conseguido poner todas estas actividades en pleno funcionamiento a escala nacional.
12. Pocos PNT tienen una visión general de la investigación sobre la TB en sus países, y pocos disponen de la financiación y del personal capacitado necesarios para llevar a cabo investigaciones operativas esenciales.

Financiación de la lucha contra la TB

Aunque los fondos disponibles para la lucha contra la TB han aumentado muchísimo desde 2002 y alcanzado los US$ 2000 millones en 2007, las intervenciones a la escala que requiere el Plan Mundial para Detener la Tuberculosis costarían US$ 1100 millones más en 2007

13. Los análisis financieros que figuran en este informe se basan en los datos de 90 países que representan el 90% de los nuevos casos de TB estimados en 2005, y entre los cuales se encuentran los 22 PAC y 84 de los países considerados en el Plan Mundial.

14. En los 90 países analizados, los presupuestos de los PNT para 2007 ascienden a US$ 1600 millones, y el costo total (presupuestos de los PNT más costos de personal y de infraestructura del sistema de salud general utilizados para el tratamiento de la TB) a US$ 2300 millones. Teniendo en cuenta que los fondos disponibles son US$ 2000 millones, el déficit financiero es de US$ 300 millones.

15. Si los planes de los países coincidieran con el Plan Mundial, el déficit financiero en 2007 sería mucho más elevado. El Plan Mundial en 84 países costaría US$ 3100 millones en 2007, esto es, US$ 1100 millones más que los fondos disponibles. La diferencia entre el Plan Mundial y los fondos disponibles en los 22 PAC es de US$ 800 millones.

16. El costo del Plan Mundial es superior al de los presupuestos de los países, sobre todo porque prevé más actividades en el manejo de TB/VIH y de promoción, comunicación y movilización social (ACSM), especialmente en las regiones de África y Asia Sudoriental. Aunque algunos costos de las actividades colaborativas TB/VIH son cubiertas por los programas de lucha contra el VIH/SIDA (p.ej., el tratamiento antirretrovírico), los PNT se proponen llevar a cabo menos actividades que las previstas en el Plan Mundial. El Plan Mundial prevé un gran presupuesto para actividades de promoción, comunicación y movilización social, pero en ausencia de orientación sistemática en 2006 (se publicará en 2007), los presupuestos de los PNT fueron generalmente pequeños y las actividades desiguales.

17. En los 22 PAC se pueden evaluar las tendencias presupuestarias en el periodo 2002–2007. Los presupuestos de los PNT aumentaron de poco más de US$ 500 millones en 2002 a US$ 1250 millones en 2007. Los costos totales aumentaron de US$ 644 millones en 2002 a US$ 1650 millones en 2007. La financiación aumentó de US$ 644 millones en 2002 a US$ 1400 millones en 2007 (US$ 241 millones de los donantes, incluidos US$ 168 millones del Fondo Mundial de Lucha contra el SIDA, la Tuberculosis y la Malaria, y US$ 1200 millones de los gobiernos nacionales).

18. En 2007, tres cuartos de los presupuestos de los PNT de los PAC correspondieron a seis países: Brasil, China, la Federación de Rusia, la India, Indonesia y Sudáfrica.

19. Entre 2002 y 2007 hubo grandes aumentos de la financiación nacional en China, la Federación de Rusia y Sudáfrica; en otros países, la mayor parte del aumento de la financiación procedió del Fondo Mundial de Lucha contra el SIDA, la Tuberculosis y la Malaria.

20. En 2005, 11 de los 19 PAC que proporcionaron datos, entre ellos Brasil, China, la India, Myanmar y Viet Nam, gastaron el 90% o más de los fondos disponibles. Afganistán y Pakistán gastaron menos de la mitad de esos fondos. Kenya, Mozambique y la República Unida de Tanzanía gastaron al menos dos tercios de sus fondos en 2005, en comparación con menos de la mitad en 2004.

21. El aumento del gasto se asoció estrechamente al aumento de la detección de los casos en Bangladesh, China, la India, Indonesia, Kenya, Myanmar, la República Democrática del Congo y Nigeria. Sin embargo, no hubo una relación sistemática entre el aumento del gasto y la mejora de la detección de los casos en todos los PAC. La relación entre el gasto y la detección de los casos tiene que investigarse y analizarse país por país.

22. Los PNT de la mayoría de los PAC tienen planes estratégicos a plazo medio (p.ej., 5 años) para el control de la TB. En un pequeño número de países, como Brasil, China (con la excepción del tratamiento de la TB multirresistente), Kenya, Filipinas y Viet Nam, esos planes se ajustan al Plan Mundial. Otros países necesitan un mayor acercamiento entre sus presupuestos y el Plan Mundial.

Los progresos hacia los objetivos y metas

Más de 26 millones de pacientes con TB han sido tratados bajo DOTS, pero los programas de lucha contra la TB por poco no han alcanzado las metas mundiales de detección y curación para 2005,y no están en el buen camino para lograr los Objetivos de Desarrollo del Milenio para 2015

23. Las metas mundiales de la OMS para 2005, consistentes en lograr la detección de un 70% de los casos y la curación del 85% en los programas de DOTS, no se alcanzaron por poco: la detección de casos fue del 60% (IC95%: 52%–69%) y el éxito del tratamiento del 84%. No obstante, en la Región del Pacífico Occidental se alcanzaron ambas metas, y en la Región de Asia Sudoriental el éxito del tratamiento superó el 85%.

24. En 26 países, entre ellos China, Filipinas y Viet Nam, se alcanzaron ambas metas; en 67 se logró detectar al menos el 70% de los casos en 2005, y en 57 se logró el éxito del tratamiento en el 85% o más de los casos de la cohorte de 2004.

25. Si la tasa mundial de incidencia de la TB está efectivamente disminuyendo, ya se ha cumplido el Objetivo de Desarrollo del Milenio número 6 (Meta 8), más de 10 años antes de la fecha prevista (2015).

26. Aunque la carga de TB puede estar disminuyendo a nivel mundial, la disminución no es suficientemente rápida como para que se puedan alcanzar las metas de impacto fijadas por la Alianza Alto a la Tuberculosis: reducir las tasas de prevalencia y mortalidad de 1990 a la mitad en 2015. Las regiones de las Américas, Asia Sudoriental y Pacífico Occidental están en el buen camino para alcanzar estas metas, pero no ocurre lo mismo con las de África, Europa y Mediterráneo Oriental. La probabilidad de que los países y regiones alcancen estas metas aumentará si consiguen aumentar los presupuestos y ajustar sus actividades al Plan Mundial.

27. Hay que lograr una mejora sistemática de los procedimientos de recopilación de datos financieros y epidemiológicos, así como de otras informaciones sobre el desempeño de los programas. La vigilancia y monitorización integrales y las encuestas bien diseñadas son requisitos imprescindibles para una evaluación precisa de los progresos realizados en materia de control de la TB.

Introduction

Global Tuberculosis Control 2007, the eleventh annual report in the series, marks a watershed in the epidemiology and control of tuberculosis (TB). With the latest surveillance data (for 2005), we can ask whether national TB control programmes (NTPs) around the world met the 2005 targets of 70% case detection and 85% cure set by the World Health Assembly.[1,2] Looking forward from 2006, we can consider how effectively the Stop TB Strategy[3] was launched in its first year, through implementation of *The Global Plan to Stop TB, 2006–2015*.[4] And, as international debate about TB control focuses more on epidemiological impact (as the consequence of implementation), we can assess whether countries with a high burden of TB, regions of the World Health Organization (WHO) and the world as a whole are on track to meet the United Nations Millennium Development Goals (MDGs) for TB by 2015.

To satisfy these general aims we present, as usual, WHO's assessment of the scale and direction of the epidemic, expressed in terms of incidence, prevalence and deaths for 22 high-burden countries (HBCs), for the six WHO regions, for selected subregions and for the entire world. Within the framework of the MDGs, the principal target for TB control is to ensure that the global incidence rate is falling by 2015.[5] Supplementary targets, endorsed by the Stop TB Partnership, are to halve the 1990 prevalence and death rates by 2015.[6] The tables and annexes in this report therefore give estimates of all three key indicators and their trends, for all countries and regions, in 1990 and 2005.

The principal mechanism for achieving these impact targets is the treatment of patients with active TB, following the Stop TB Strategy. The new strategy embraces the fundamentals of TB control originally framed as DOTS, but extends the reach of control activities into other key areas. These include the well-known problems of multidrug-resistant TB, or MDR-TB (and now also extensively drug-resistant TB[7]) and of TB associated with the human immunodeficiency virus (HIV). But the strategy also broadens the remit of NTPs by placing the task of TB control in the context of health system performance, by encouraging the participation of all health-care providers (not just those working for government health institutions), by empowering TB patients and communities who suffer from TB and by promoting research. This report therefore presents, in addition to case notifications and treatment outcomes, an overview of the progress being made by NTPs on all components of the Stop TB Strategy, linking the activities in countries with funding sources, costs, budgets and expenditures.

Between 1980 and 2005, 90 million TB patients were registered in national surveillance systems and reported to WHO, and more than 26 million were notified by DOTS programmes since 1995. This vast body of surveillance data suggests that the global TB incidence rate peaked sometime between 2000 and 2005, although the total number of new cases is still rising each year. If that assessment is correct, the global TB epidemic is now on the threshold of decline.

To establish and verify key observations on the TB epidemic, WHO compiles and analyses more information each year. With each annual round of data collection, our epidemiological assessments are based on better surveillance and survey data. Planning for TB control, and reports on the process of planning and implementation, are more comprehensive and better targeted to the needs of national control programmes. The financial monitoring system accounts, with increasing accuracy, for the money raised and spent on TB control each year. In short, *Global Tuberculosis Control 2007* presents the best possible overview of progress in reducing the immense burden of TB worldwide.

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1 Resolution WHA44.8. Tuberculosis control programme. In: *Handbook of resolutions and decisions of the World Health Assembly and the Executive Board*. Volume III, 3rd ed. (1985–1992). Geneva, World Health Organization, 1993 (WHA44/1991/REC/1).

2 *Stop Tuberculosis Initiative. Report by the Director-General*. Fifty-third World Health Assembly. Geneva, 15–20 May 2000 (A53/5, 5 May 2000; available at www.who.int/gb/ebwha/pdf_files/WHA53/ea5.pdf).

3 Raviglione MC, Uplekar MW. WHO's new Stop TB Strategy. *Lancet*, 2006, 367:952–955.

4 *The Global Plan to Stop TB, 2006–2015* was launched by the Stop TB Partnership in January 2006. It describes how the Stop TB Strategy should be implemented over the next decade, including associated costs, and the expected epidemiological impact in seven regions of the world.

5 The Millennium Development Goals are described in full at unstats.un.org/unsd

6 Dye C et al. Targets for global tuberculosis control. *International Journal of Tuberculosis and Lung Disease*, 2006, 10:460–462.

7 See: XDR-TB, extensively drug-resistant tuberculosis, at www.who.int/tb/xdr/en/index.html

Methods

Monitoring progress in TB control (1995–2005)

Goals, targets and indicators for TB control

The target and indicators for TB control, defined within the framework of the MDGs, have been supplemented and endorsed by the Stop TB Partnership (Table 1).[1] These will be used to measure progress made under the Stop TB Strategy,[2] which extends and enhances the DOTS strategy (Tables 2, 3). The Global Plan to Stop TB[3] describes how the Stop TB Strategy should be implemented over the decade 2006–2015.

This report focuses on the five principal indicators that are used to measure the implementation and impact of TB control: case detection and treatment success, and incidence, prevalence and deaths. The objective of reducing incidence is made explicit by MDG Target 8; the targets of 70% case detection and 85% treatment success were set by WHO's World Health Assembly;[4] the targets for prevalence and deaths are based on a resolution of the year 2000 meeting of the Group of Eight (G8) industrialized countries, held in Okinawa, Japan. The targets for case detection and treatment success should have been reached by the end of 2005. This report presents the best possible assessment, based on case reports to the end of 2005, of whether the targets were reached in the world as a whole, and in each WHO region and country.

Data collection and verification

Every year, WHO requests information from NTPs or relevant public health authorities in 212 countries or territories[5] via a standard data collection form.[6] The latest form was distributed in mid-2006. The section dealing with monitoring and surveillance asked for data including the following: whether the elements of DOTS and the Stop TB Strategy were being implemented during 2005; DOTS population coverage in 2005; TB case notifications in 2005 (from DOTS and non-DOTS areas, each with 12 categories; new pulmonary smear-positive cases by age and sex); TB patients tested for HIV and MDR-TB in 2005; and treatment outcomes for TB patients registered during 2004 (DOTS, non-DOTS, HIV-infected, each with 7 categories) and MDR-TB patients registered during 2002

[1] Dye C et al. Targets for global tuberculosis control. *International Journal of Tuberculosis and Lung Disease*, 2006, 10:460–462.

[2] Raviglione MC, Uplekar MW. WHO's new Stop TB Strategy. *Lancet*, 2006, 367:952–955.

[3] *The Global Plan to Stop TB, 2006–2015*. Geneva, Stop TB Partnership and World Health Organization, 2006 (WHO/HTM/STB/2006.35).

[4] Resolution WHA44.8. Tuberculosis control programme. In: *Handbook of resolutions and decisions of the World Health Assembly and the Executive Board*. Volume III, 3rd ed. (1985–1992). Geneva, World Health Organization, 1993 (WHA44/1991/REC/1).

[5] Serbia and Montenegro were treated as separate countries from 2005 onwards, increasing the 2004 total by one.

[6] Posted at www.who.int/tb/country/en/

TABLE 1

Goals, targets and indicators for TB control

MILLENNIUM DEVELOPMENT GOAL 6	
Combat HIV/AIDS, malaria and other diseases	
Target 8:	Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases
Indicator 23:	Prevalence and death rates associated with tuberculosis
Indicator 24:	Proportion of tuberculosis cases detected and cured under DOTS (the internationally recommended strategy for TB control)
STOP TB PARTNERSHIP TARGETS	
By 2005:	At least 70% of people with sputum smear-positive TB will be diagnosed (i.e. under the DOTS strategy), and at least 85% cured. These are targets set by the World Health Assembly of WHO.
By 2015:	The global burden of TB (per capita prevalence and death rates) will be reduced by 50% relative to 1990 levels.
By 2050:	The global incidence of active TB will be less than 1 case per million population per year.

TABLE 2

Components of the Stop TB Strategy

1. **Pursuing high-quality DOTS expansion and enhancement**
   a. Political commitment with increased and sustained financing
   b. Case detection through quality-assured bacteriology
   c. Standardized treatment with supervision and patient support
   d. An effective drug supply and management system
   e. Monitoring and evaluation system, and impact measurement
2. **Addressing TB/HIV, MDR-TB and other challenges**
   — Implement collaborative TB/HIV activities
   — Prevent and control MDR-TB
   — Address prisoners, refugees, other high-risk groups and special situations
3. **Contributing to health system strengthening**
   — Actively participate in efforts to improve system-wide policy, human resources, financing, management, service delivery and information systems
   — Share innovations that strengthen health systems, including the Practical Approach to Lung Health (PAL)
   — Adapt innovations from other fields
4. **Engaging all care providers**
   — Public–Public and Public–Private Mix (PPM) approaches
   — Implement International Standards for Tuberculosis Care
5. **Empowering people with TB, and communities**
   — Advocacy, communication and social mobilization
   — Community participation in TB care
   — Patients' Charter for Tuberculosis Care
6. **Enabling and promoting research**
   — Programme-based operational research
   — Research to develop new diagnostics, drugs and vaccines

TABLE 3

Technical elements of the DOTS strategy

Case detection through quality-assured bacteriology Case detection among symptomatic patients self-reporting to health services, using sputum smear microscopy. Sputum culture is also used for diagnosis in some countries, but direct sputum smear microscopy should still be performed for all suspected cases.
Standardized treatment with supervision and patient support Standardized short-course chemotherapy using regimens of 6–8 months for at least all confirmed smear-positive cases. Good case management includes directly observed treatment (DOT) during the intensive phase for all new smear-positive cases, during the continuation phase of regimens containing rifampicin and during the entirety of a re-treatment regimen. In countries that have consistently documented high rates of treatment success, DOT may be reserved for a subset of patients, as long as cohort analysis of treatment results is provided to document the outcome of all cases.
An effective drug supply and management system Establishment and maintenance of a system to supply all essential anti-TB drugs and to ensure no interruption in their availability.
Monitoring and evaluation system, and impact measurement Establishment and maintenance of a standardized recording and reporting system, allowing assessment of treatment results (see Tables 4, 5).

(GLC-approved and other, each with 3 categories). The main case definitions are given in Table 5.

The data collection form used in the WHO European Region asked for additional data, including a breakdown of all TB cases by age, geographical origin (e.g. born outside country/non-citizen) and mycobacterial culture result; all TB cases by HIV serostatus and age; and HIV-positive TB cases by sex and age. For NTPs in the 63 countries that account for 98% of all HIV-infected TB patients, the data collection form was extended to obtain further information about TB linked to HIV infection (see **Collaborative TB/HIV activities**).

As NTPs respond to WHO, they are also asked to update information for earlier years if they are able to do so. As a result of such revisions, the data (case notifications, treatment outcomes, etc.) presented in this report for years preceding 2004 and 2005 may differ from those published in previous reports.

The standard data collection form is used to compile aggregated national data. The process of national and international reporting is distinct from WHO's recommendations about procedures for recording and reporting data by NTPs within countries, from district level upwards.[1]

Completed forms are collected and reviewed at all levels of WHO, by country offices, regional offices and at headquarters. An acknowledgement form that tabulates all submitted data is sent back to the NTP correspondent in order to complete any missing responses and to resolve any inconsistencies. Then, using the complete set of data for each country, we construct a profile that tabulates all key indicators, including epidemiological and financial data and estimates, and this too is returned to each NTP for review. In the WHO European Region only, data collection and verification are performed jointly by the regional office and a WHO collaborating centre, EuroTB (Paris). EuroTB subsequently publishes an annual report with additional analyses, using more detailed data for the European Region (www.eurotb.org).

High-burden countries, WHO regions and other subregions of the world

Much of the data submitted to WHO is shown, country by country, in the annexes of this report. The analysis and interpretation that precede these annexes focus on 22 HBCs and the six WHO regions. The 22 HBCs account for approximately 80% of the estimated number of new TB cases (all forms) arising worldwide each year. These countries are the focus of intensified efforts in DOTS expansion (Annex 1). The HBCs are not necessarily those with the highest incidence rates per capita; many of the latter are medium-sized African countries with high rates of TB/HIV coinfection. The WHO regions are the African Region, the Region of the Americas, the Eastern Mediterranean Region, the European Region, the South-East Asia Region and the Western Pacific Region. All essential statistics are summarized for each of these regions and globally. However, to make clear the differences in epidemiological trends within regions, we divide the African Region into countries with low and high rates of HIV infection ("high" is an infection rate of ≥4% in adults aged 15–49 years, as estimated by UNAIDS in 2004). We also distinguish central from eastern Europe (countries of the former Soviet Union plus Bulgaria and Romania), and combine western European countries with the other established market economies. The countries within each of the resulting nine subregions are listed in the legend to Figure 5.

Implementation of DOTS and the Stop TB Strategy

DOTS remains central to the public health approach to TB control, which is now presented as the Stop TB Strategy (Table 2). Before the launch of the strategy during 2006, NTPs reporting to WHO were classified as either DOTS or non-DOTS, based on the elements listed in Tables 2 and 3. To be classified as DOTS in this report, a country must have officially accepted and adopted the strategy in 2005, and must have implemented the four technical components of DOTS in at least part of the country (Annex 2). Based on NTP responses to standard questions about policy – and usually on further discussion with the NTP – we have accepted or revised each country's own determination of its DOTS status.

[1] Revised procedures for recording and reporting at district level are described at www.who.int/tb/publications/recording_and_reporting_draft/en/index.html

DOTS coverage

Coverage is defined as the percentage of the national population living in areas where health services have adopted DOTS. "Areas" are the lowest administrative or basic management units[1] in the country (townships, districts, counties, etc.). If an area (with its one or more health facilities) is considered by the NTP to have been a DOTS area in 2005, then all the cases registered and reported by the NTP in that area are considered DOTS cases, and the population living within the boundaries of that area counts towards the national DOTS coverage. In some cases, treatment providers that are not following DOTS guidelines (e.g. private practitioners, or public health services outside the NTP such as those within prisons) notify cases to the NTP. These cases are considered non-DOTS cases, even if they are notified from within DOTS areas. However, when certain groups of patients treated by DOTS services receive special regimens or management (e.g. nomads placed on longer courses of treatment), these are considered DOTS cases. Where possible, additional information about these special groups of patients is provided in the country notes in Annex 2. Ideally, the DOTS coverage in any one year should be calculated by evaluating the number of person-years covered in each quarter, and then summing across the four quarters of the year (although some countries simply report the population coverage achieved by the end of the year).

DOTS coverage calculated as described above is a crude indicator of the actual proportion of people who have access to DOTS services, but it is easy to calculate and is most useful during the early stages of DOTS expansion. As a measure of patient access to diagnosis and treatment under DOTS, coverage is an approximation, and usually an overestimate. Where countries are able to provide more precise information about access to DOTS services, this information is reported in the country notes of Annex 2. The case detection rate (defined below) is a more precise measure of DOTS implementation but is also more demanding of data.

Estimating TB incidence, prevalence and death rates

Estimates of TB incidence, prevalence and deaths are based on a consultative and analytical process. They are revised annually to reflect new information gathered through surveillance (case notifications and death registrations) and from special studies (including surveys of the prevalence of infection and disease). The details of estimation are described elsewhere.[2,3,4] In brief, estimates of incidence (number of new cases arising each year) for each country are derived using one or more of four approaches, depending on the available data:

$$\text{incidence} = \frac{\text{case notifications}}{\text{proportion of cases detected}} \quad (1)$$

$$\text{incidence} = \frac{\text{prevalence}}{\text{duration of condition}} \quad (2)$$

$$\text{incidence} = \text{annual risk of infection} \times \text{Stýblo coefficient} \quad (3)$$

$$\text{incidence} = \frac{\text{deaths}}{\text{proportion of incident cases who die}} \quad (4)$$

The Stýblo coefficient in equation (3) is taken to be a constant, with an empirically derived value in the range 40–60, relating risk of infection (% per year) to the incidence of sputum smear-positive cases (per 100 000 per year). Given two of the quantities in any of these equations, we can calculate the third, and these formulae can be rearranged to estimate incidence, prevalence and death rates. The available data differ from country to country, and not all methods can be applied in every country.

Among all new, HIV-negative TB patients, 45% are assumed to be smear-positive (ranging uniformly between 40% and 50% in uncertainty analysis). Among HIV-positive TB patients, the fraction is smaller (35%, range 30–40%). Because most NTPs still do not routinely test TB patients for HIV infection, we have used, for all countries, an indirect estimate of the prevalence of HIV among new TB patients, calculated from:

$$\text{prevalence of HIV in new TB patients} = \frac{p_{HIV} \times \text{IRR}}{1 + p_{HIV}(\text{IRR} - 1)} \quad (5)$$

where p_{HIV} is HIV prevalence in the adult population (15–49 years) and IRR is the incidence rate ratio, i.e. the TB incidence rate in HIV-infected adults divided by the TB incidence rate in HIV-uninfected adults. IRR takes values of 30 (range 21–39, with a triangular distribution in uncertainty analysis) for the established market economies and 6.0 (range 3.5–8.0) for all other countries.[5]

1 The basic management unit is defined in terms of management, supervision, and monitoring responsibility. It may have several treatment facilities, one or more laboratories, and one or more hospitals. The defining aspect is the presence of a manager or coordinator who oversees TB control activities for the unit and who maintains a master register of all TB patients being treated, which is used to monitor the programme and report on indicators to higher levels.

2 Dye C et al. Global burden of tuberculosis: estimated incidence, prevalence and mortality by country. *Journal of the American Medical Association*, 1999, 282:677–686.

3 Corbett EL et al. The growing burden of tuberculosis: global trends and interactions with the HIV epidemic. *Archives of Internal Medicine*, 2003, 163:1009–1021.

4 Dye C et al. Evolution of tuberculosis control and prospects for reducing tuberculosis incidence, prevalence, and deaths globally. *Journal of the American Medical Association*, 2005, 293:2767–2775.

5 Corbett EL et al. The growing burden of tuberculosis: global trends and interactions with the HIV epidemic. *Archives of Internal Medicine*, 2003, 163:1009–1021. The estimated IRR of 30 for the established market economies was reduced from the original estimate of 60 based on 2001 data published by the United States Centers for Disease Control and Prevention. The estimate of 6 for all other countries was reviewed with a new compilation of data, made in January 2007, from approximately 200 studies. The new analysis gave a point estimate of IRR close to 6, on which basis we retained the original estimate used by Corbett et al. Further details are available from tbdocs@who.int

For each country, estimates of incidence for each year during the period 1995–2005 were made as follows. We first selected a reference year for which we have a best estimate of incidence; this may be the year in which a survey was carried out, or the year for which incidence was first estimated. We then use the series of case notifications (all new and relapse cases) to determine how incidence changed before and after that reference year. The time series of estimated incidence rates is constructed from the notification series in one of two ways: if the rate of change of case notifications is roughly constant through time, we fitted exponential trends to the notification series (subregions Africa low-HIV, Latin America, South-East Asia, Western Pacific); if the rate varies through time (subregions Africa high-HIV, Central Europe, Eastern Europe, Eastern Mediterranean, Established Market Economies), we used a three-year moving average of the notification rates. If the notifications for any country are considered to be an unreliable guide to trend (e.g. because reporting effort is known to have changed; or because reports are clearly erratic, changing in a way that cannot be attributed to TB epidemiology), we applied the aggregated trend for all other countries from the same epidemiological region that have reliable data. For some countries, we used an assessment of the trend in incidence based on risk of infection derived from other sources (tuberculin surveys for China and Nepal). For those countries that have no reliable data from which to assess trends in incidence (e.g. for countries such as Iraq and Pakistan, for which data are hard to interpret, and which are atypical within their own regions), we assumed that incidence is stable.

Estimates of incidence form the denominator of the case detection rate. Trends in incidence are governed by underlying epidemiological processes, modified by control programmes. The impact of control on prevalence is determined by the trend in incidence and by the estimated reduction in the duration of the condition, e.g. smear-positive disease.

The prevalence of TB is calculated from the product of incidence and duration of disease (rearranging equation 2), and the TB mortality rate from the product of incidence and case fatality (proportion of incident cases who ever die from TB; equation 4). The duration of disease and the case fatality are estimated, country by country, for patients treated within or outside DOTS programmes and for patients who receive no recognized anti-TB treatment. Because the duration of disease and case fatality are typically shorter for patients treated under DOTS than for patients who are treated elsewhere or untreated, the average duration of disease and average case fatality decrease as the proportion of patients treated under DOTS increases.[1,2,3]

Where population sizes are needed to calculate TB indicators, we use the latest revision of estimates provided by the United Nations Population Division.[4] These estimates sometimes differ from those made by the countries themselves, some of which are based on more recent census data. The estimates of some TB indicators, such as the case detection rate, are derived from data and calculations that use only rates per capita, and discrepancies in population sizes do not affect these indicators. Where rates per capita are used as a basis for calculating numbers of TB cases, these discrepancies sometimes make a difference. Some examples of important differences are given in the country notes in Annex 2.

Because accurate measurement is crucial in the evaluation of epidemic trends, Table 4 provides some methodological guidance, based on a review by a WHO panel of experts in June 2006. Table 4 can be read in conjunction with the list of countries that have done, or are planning, infection (tuberculin) and disease prevalence surveys, and with the set of countries that now register deaths by cause and provide these data to WHO (including TB; Annex 3).

Case notification and case detection

Sputum smear-positive cases are the focus of DOTS programmes because they are the principal sources of infection to others, because sputum smear microscopy is a highly specific (if somewhat insensitive) method of diagnosis, and because patients with smear-positive disease typically suffer higher rates of morbidity and mortality than smear-negative patients. As a measure of the quality of diagnosis, we calculate the proportion of new smear-positive cases out of all new pulmonary cases, which has an expected value of at least 65% in areas with negligible HIV prevalence.[5]

The term "case notification", as used here, means that TB is diagnosed in a patient and is reported within the national surveillance system, and then to WHO. While the emphasis is on new smear-positive cases, we also present the numbers of all TB cases reported – smear-positive and smear-negative pulmonary cases – in addition to those in whom extrapulmonary disease is diagnosed. The number of cases notified in any year is the sum of new and relapse cases. Case reports that represent a second registration of the same patient/episode (i.e. re-treatment after failure or default) are presented separately.

The case detection rate is calculated as the number of cases notified divided by the number of cases estimated for that year, expressed as a percentage. Detection is presented in four main ways: (a) for new smear-positive cases

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1. Dye C et al. Global burden of tuberculosis: estimated incidence, prevalence and mortality by country. *Journal of the American Medical Association*, 1999, 282:677–686.
2. Corbett EL et al. The growing burden of tuberculosis: global trends and interactions with the HIV epidemic. *Archives of Internal Medicine*, 2003, 163:1009–1021.
3. Dye C et al. Evolution of tuberculosis control and prospects for reducing tuberculosis incidence, prevalence, and deaths globally. *Journal of the American Medical Association*, 2005, 293:2767–2775.
4. *World population prospects – the 2002 revision*. New York, United Nations Population Division, 2003.
5. *Tuberculosis handbook*. Geneva, World Health Organization, 1998 (WHO/TB/98.253).

TABLE 4

Methods to measure progress in TB control: recommendations of a WHO task force (June 2006)[a]

Routine TB surveillance and monitoring

- Routine surveillance (all reported cases) and monitoring (treatment outcomes) should be considered the ultimate method of evaluating TB epidemiology and control.
- All national TB control programmes (NTPs) should strengthen and evaluate the performance of systems for reporting TB cases so that the data reflect, to a close approximation, the true incidence of TB and its time trend. The process of evaluation should be supported by appropriate operational research studies.
- The analysis of disaggregated surveillance data should be encouraged (e.g. clinic, district, province; by age, sex, etc.) so as to draw out the maximum information on the TB epidemic and the impact of control measures.
- Appropriate computer software should be developed and implemented to improve routine recording and reporting.

Surveys of disease prevalence

- Countries with high and intermediate TB burdens are encouraged to carry out one or a series of disease prevalence surveys if these are likely to be beneficial in assessing prevalence and trends, and/or optimizing planning for TB control. The decision to carry out a prevalence survey in any country should be guided by criteria (to be further defined), which will include:
  - Poor information on burden and trends of TB disease
  - Functional TB control programme that can utilize survey results to guide implementation of control activities
  - High HIV burden
  - Weak or poorly informative surveillance system
  - Available experience and expertise (national and/or international)
  - Willingness of the NTP to support national prevalence surveys
  - Full participation of population to be surveyed
  - Logistic feasibility and security for field staff

Surveys of infection prevalence

- Acknowledging the importance of measuring infection, but understanding the limitations of the tuberculin technique, tuberculin skin test surveys (TSTs) are recommended only in settings where they are likely to be informative about the prevalence and risk of infection and its trend. A TST is not guaranteed to give interpretable results in any setting, but is more likely to be useful for measuring trends, and where there is:
  - data on infection prevalence from previous surveys
  - a firm plan to repeat surveys
  - a high risk of infection
  - capacity to ensure strict adherence to standardized methodology
- In view of the evidence provided by tuberculin surveys conducted in the past decade, it is no longer generally advisable to estimate the incidence of TB (smear-positive cases) from the annual risk of infection by applying the Stýblo rule (incidence of ss+ TB increases by 50/100 000 population for every 1% increase in annual risk of infection). However, the rule appears still to apply in some countries, notably India, and WHO estimates for some countries have, in the absence of better information, been derived by this method.

Evaluating TB mortality

- The accuracy of the current cohort monitoring system in correctly capturing deaths among TB patients should be reviewed and optimized.
- The study of TB mortality in the general population (i.e. outside treatment cohorts) should be undertaken in the context of studies of all causes of death.
  - Vital registration. NTPs should ensure linkages and cross-referencing of data from cohort monitoring with data from available and developing death registration systems, thereby improving vital statistics.
  - Verbal autopsy. Further evaluations are needed to establish the reliability and validity of verbal autopsies as a way of evaluating TB deaths in the general population, and their feasibility within general cause-of-death surveys.

[a] The full set of recommendations is available at www.who.int/tb/country/en/

(excluding relapses); (b) for all new cases (all clinical forms of TB, excluding relapses); (c) for DOTS programmes only; or (d) for cases notified from all sources (DOTS and non-DOTS areas). For new smear-positive cases aggregated as in (c) and (d):

$$\text{DOTS case detection rate} = \frac{\text{annual new smear-positive notifications (DOTS)}}{\text{estimated annual new smear-positive incidence (country)}} \quad (6)$$

$$\text{Case detection rate} = \frac{\text{annual new smear-positive notifications (country)}}{\text{estimated annual new smear-positive incidence (country)}} \quad (7)$$

The target of 70% case detection applies to the DOTS case detection rate in formula (6). Even when a country is not 100% DOTS, we use the incidence estimated for the whole country as the denominator of the case detection rate, as in equation (6). The DOTS detection rate and the case detection rate for the whole country are identical when a country reports only from DOTS areas. This generally happens when DOTS coverage is 100%, but in some countries where DOTS is implemented in only part of the country, no TB notifications are received from the non-DOTS areas. Furthermore, in some countries where DOTS coverage is 100%, patients may seek treatment from non-DOTS providers that, in some cases, notify TB cases to the national authorities.

Although these indices are termed "rates", they are actually ratios. The number of cases notified is usually smaller than the estimated incidence because of incomplete coverage by health services, under-diagnosis, or deficient recording and reporting. However, the calculated detection rate can exceed 100% if case-finding has been intense in an area that has a backlog of existing cases, if there has been over-reporting (e.g. double-counting) or over-diagnosis, or if estimates of incidence are too low. If the expected number of cases per year is very low (e.g. less than one), the case detection rate can vary markedly from year to year because of chance. Whenever this index comes close to or exceeds 100%, we attempt to investigate, as part of the joint planning and evaluation process with NTPs, which of these explanations is correct.

The ratio of the DOTS case detection rate to coverage is an estimate of the case detection rate within DOTS areas (as distinct from the case detection rate nationwide), assuming that the TB incidence rate is homogeneous across counties, districts, provinces or other administrative units. The detection rate within DOTS areas should exceed 70% as DOTS coverage increases within any country. The value of this indicator is low when the DOTS programme has been poorly imple-

mented, when access to DOTS is limited, or when TB incidence in DOTS areas has been overestimated. Changes in the value of this ratio through time are a measure of changes in the quality of TB control, after the DOTS programme has been established.

Outcomes of treatment

Treatment success in DOTS programmes is the percentage of new smear-positive patients who are cured (negative on sputum smear examination), plus the percentage who complete a course of treatment, without bacteriological confirmation of cure (Table 5). Cure and completion are among the six mutually exclusive treatment outcomes.[1] The sum of cases assigned to these outcomes, plus any additional cases registered but not assigned to an outcome, adds up to 100% of cases registered (i.e. the treatment cohort).

We also compare the number of new smear-positive cases registered for treatment (for this report, in 2004) with the number of cases notified as smear-positive (also in 2004). All notified cases should be registered for treatment, and the numbers notified and registered should therefore be the same (discrepancies arise, for example, when subnational reports are not received at national level). If the number registered for treatment is not provided, we take as the denominator for treatment outcomes the number notified for that cohort year. If the sum of the six outcome categories is greater than the number registered (or the number notified), we use this sum as the denominator.

The number of patients presenting for a second or subsequent course of treatment, and the outcome of further treatment, are indicative of NTP performance and levels of drug resistance. We present in this report, where data are available, the numbers of patients registered for re-treatment, and the outcomes of re-treatment, for each of four registration categories: smear-positive re-treatment after relapse; failure; default; and other re-treatment (including pulmonary smear-negative and extrapulmonary).

The assessment of treatment outcomes for a given calendar year always lags case notifications by one year, to ensure that all patients registered during that calendar year have completed treatment. For MDR-TB patients, who have longer treatment regimens, the lag is three years. A DOTS country must report treatment outcomes, unless

[1] *Treatment of tuberculosis: guidelines for national programmes*. 3rd ed. Geneva, World Health Organization, 2003 (WHO/CDS/TB/2003.313).

TABLE 5

Definitions of tuberculosis cases and treatment outcomes

A. DEFINITIONS OF TUBERCULOSIS CASES

CASE OF TUBERCULOSIS A patient in whom tuberculosis has been confirmed by bacteriology or diagnosed by a clinician.

DEFINITE CASE A patient with positive culture for the *Mycobacterium tuberculosis* complex. In countries where culture is not routinely available, a patient with two sputum smears positive for acid-fast bacilli (AFB+) is also considered a definite case.

PULMONARY CASE A patient with tuberculosis disease involving the lung parenchyma.

SMEAR-POSITIVE PULMONARY CASE A patient with at least two initial sputum smear examinations (direct smear microscopy) AFB+; or one sputum examination AFB+ and radiographic abnormalities consistent with active pulmonary tuberculosis as determined by a clinician; or one sputum specimen AFB+ and culture positive for *M. tuberculosis*.

SMEAR-NEGATIVE PULMONARY CASE A patient with pulmonary tuberculosis not meeting the above criteria for smear-positive disease. Diagnostic criteria should include: at least three sputum smear examinations negative for AFB; and radiographic abnormalities consistent with active pulmonary tuberculosis; and no response to a course of broad-spectrum antibiotics; and a decision by a clinician to treat with a full course of antituberculosis chemotherapy; or positive culture but negative AFB sputum examinations.

EXTRAPULMONARY CASE A patient with tuberculosis of organs other than the lungs (e.g. pleura, lymph nodes, abdomen, genitourinary tract, skin, joints and bones, meninges). Diagnosis should be based on one culture-positive specimen, or histological or strong clinical evidence consistent with active extrapulmonary disease, followed by a decision by a clinician to treat with a full course of antituberculosis chemotherapy. A patient in whom both pulmonary and extrapulmonary tuberculosis has been diagnosed should be classified as a pulmonary case.

NEW CASE A patient who has never had treatment for tuberculosis or who has taken antituberculosis drugs for less than one month.

RELAPSE CASE A patient previously declared cured but with a new episode of bacteriologically positive (sputum smear or culture) tuberculosis.

RE-TREATMENT CASE A patient previously treated for tuberculosis, undergoing treatment for a new episode, usually of bacteriologically-positive tuberculosis.

B. DEFINITIONS OF TREATMENT OUTCOMES

(expressed as a percentage of the number registered in the cohort)

CURED A patient who was initially smear-positive and who was smear-negative in the last month of treatment and on at least one previous occasion.

COMPLETED TREATMENT A patient who completed treatment but did not meet the criteria for cure or failure. This definition applies to pulmonary smear-positive and smear-negative patients and to patients with extrapulmonary disease.

DIED A patient who died from any cause during treatment.

FAILED A patient who was initially smear-positive and who remained smear-positive at month 5 or later during treatment.

DEFAULTED A patient whose treatment was interrupted for 2 consecutive months or more.

TRANSFERRED OUT A patient who transferred to another reporting unit and for whom the treatment outcome is not known.

SUCCESSFULLY TREATED A patient who was cured or who completed treatment.

COHORT A group of patients in whom TB has been diagnosed, and who were registered for treatment during a specified time period (e.g. the cohort of new smear-positive cases registered in the calendar year 2004). This group forms the denominator for calculating treatment outcomes. The sum of the above treatment outcomes, plus any cases for whom no outcome is recorded (e.g. "still on treatment" in the European Region) should equal the number of cases registered. Some countries monitor outcomes among cohorts defined by smear and/or culture, and define cure and failure according to the best laboratory evidence available for each patient.

it is newly-classified as DOTS, in which case it would take an additional year to report outcomes from the first cohort of patients treated.

NTPs should ensure high treatment success before expanding case detection. The reason is that a proportion of patients given less than a fully-curative course of treatment remain chronically infectious and continue to spread TB. Thus DOTS programmes must be shown to achieve high cure rates in pilot projects before attempting countrywide coverage.

Stop TB Strategy: implementation and planning (2005–2007)

The information on implementing and planning the Stop TB Strategy presented and analysed in this report reflects activities mostly carried out in the 2005–2006 fiscal year and planned for the 2006–2007 fiscal year (see also **Financing TB control**). For this report, HBC activities and plans were monitored mainly through a questionnaire on Stop TB Strategy implementation sent by WHO to NTP managers of the 22 HBCs in May 2006. The questionnaire[1] was structured around the components of the Stop TB Strategy and included questions on: DOTS expansion and enhancement; laboratory and diagnostic services; human resource development; drug management; monitoring and evaluation system, and impact measurement; collaborative TB/HIV activities; drug-resistant TB; special populations and other high-risk groups; health system strengthening and TB control; Practical Approach to Lung Health (PAL); public–public and public–private mix (PPM) approaches; International Standards for Tuberculosis Care;[2] advocacy, communication and social mobilization (ACSM); community TB care; Patients' Charter for Tuberculosis Care;[3] operational research; Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM); and technical and financial partners.

Other mechanisms were used to clarify or complement responses provided in the questionnaire. These mechanisms included direct discussion with NTP managers, e-mail and telephone communication with NTPs, consultation with international technical agencies, monitoring missions, comprehensive programme reviews, applications to the GFATM, regional NTP managers' meetings, and the annual meeting of the DOTS Expansion, TB/HIV and MDR-TB working groups of the Stop TB Partnership.

Implementation of the Stop TB Strategy in non-HBCs was monitored through analysis of the responses to the Stop TB Strategy questions in the standard data collection form (see **Monitoring progress in TB control**) sent by WHO to all countries. Each component of the Stop TB Strategy was covered in the data collection form but in less detail than the questionnaire.

In developing the country profiles (Annex 1), WHO staff worked closely with NTP managers of the 22 HBCs to:

- assess the main national TB control activities carried out and planned, focusing on improving political commitment, expanding access to DOTS, strengthening laboratory and diagnostic services, ensuring human resource development, strengthening drug management, and improving programme monitoring and supervision;
- summarize progress made by the end of 2006 in implementing, or scaling up, national plans for DOTS expansion;
- identify challenges to reaching the targets for case detection and treatment success;
- determine the status of collaborative TB/HIV activities;
- assess levels of drug resistance and activities planned to address MDR-TB, including mechanisms of drug-resistance surveillance, MDR-TB diagnosis and treatment policies, and the availability of second-line anti-TB drugs;
- identify action plans of the NTP for high-risk groups and special populations;
- describe the contribution of TB control activities to the strengthening of health systems;
- determine the status of additional strategies to expand DOTS, including community participation in TB care, ACSM strategies, and PPM approaches;
- describe the level of operational research carried out and reported;
- review and revise the list of partners supporting DOTS implementation and expansion.

Addressing TB/HIV, MDR-TB and other challenges

Collaborative TB/HIV activities

The WHO policy on collaborative TB/HIV activities[4] emphasizes three areas. First, organizational structures should be put in place to plan and manage collaborative TB/HIV activities. Second, people should be screened for TB when they test positive for HIV and again whenever they attend the health services. If they have active TB they should be treated; if they have latent infection but not active TB they should be given isoniazid preventive therapy (IPT). Third, all TB patients should be given counselling about HIV and encouraged to have an HIV test; if they are HIV-positive they should be offered co-trimoxazole preventive therapy (CPT) and should be assessed for, and started on, antiretroviral therapy (ART) as soon as possible.

In order to assess the extent to which collaborative TB/HIV activities are being implemented, NTP managers were asked if they had a national policy of testing TB

1 Posted at www.who.int/tb/country/en/
2 Hopewell PC et al. International standards for tuberculosis care. *Lancet Infectious Diseases*, 2006, 6:710–725.
3 Posted at www.who.int/tb/publications/2006/istc/en/index.html
4 *Interim policy on collaborative TB/HIV activities*. Geneva, World Health Organization, 2004 (WHO/HTM/TB/2004.330; WHO/HTM/HIV/2004.1; available at whqlibdoc.who.int/hq/2004/WHO_HTM_TB_2004.330. pdf).

patients for HIV in 2005 and to report on the number who were tested for HIV, the number who tested positive, the number who started CPT and ART in 2004 and 2005, as well as the number who are expected to be started on ART in 2006 and 2007. In the 63 countries that account for 98% of the total number of HIV-infected TB cases, NTP managers were also asked for information about their policy on TB/HIV management, and for data on screening for TB and the provision of IPT to people with HIV in 2005. These countries included 58 for which the estimated HIV prevalence in adults aged 15–49 years was greater than 1% in 2004,[1] plus Brazil, India, Indonesia, the Russian Federation and Viet Nam, which are among the 41 countries with the highest numbers of HIV-infected TB patients.[2]

The data were reviewed at WHO regional offices and at headquarters, and an attempt was made to resolve inconsistencies and to obtain missing data in discussions with NTP managers. Because data have now been collected since 2002, time trends in TB/HIV activities are also discussed. Indicators for monitoring and evaluating collaborative TB/HIV activities are available from WHO.[3]

MDR-TB surveillance and control

In 2006, the standard data collection form asked for the following information on MDR-TB surveillance and control:

- whether the management of MDR-TB patients is among the activities of the NTP;
- if practice follows WHO guidelines on the management of drug-resistant TB and, if not, whether the NTP plans to start treating MDR-TB patients in the next two years;
- the number of new and re-treatment patients registered in 2005 who received drug susceptibility testing (DST) at the start of treatment;
- the number of laboratory-confirmed cases of MDR-TB identified among new and re-treatment patients in whom TB was diagnosed in 2005;
- the number of MDR-TB patients expected to be treated in 2006 and 2007;
- treatment outcomes among new, re-treatment and other MDR-TB patients registered in 2002 in GLC-approved and non-GLC approved countries or areas.

In addition to the standard data collection form, the questionnaire on implementation of the Stop TB Strategy sent to HBCs provided further information on plans for drug resistance surveillance (DRS) and MDR-TB diagnosis and treatment, and identified the principal obstacles to implementing these activities.

Besides this information, this report includes data on the prevalence of drug resistance among TB patients collected through the WHO/IUATLD Global Project on Antituberculosis Drug Resistance Surveillance (Global DRS Project), which began in 1994.[4] The project carries out surveys of drug resistance, using established and agreed methods, among patients who present to clinics, hospitals and other health institutions. The fourth report on the global magnitude and trends of drug resistant TB will be published by mid-2007. The profiles of the 22 HBCs (Annex 1) contain estimates of the national prevalence of MDR-TB among both new and previously treated TB patients, based on survey data for those countries participating in the Global DRS Project and for which data are considered reliable. For those countries that have not carried out surveys, or that do not have representative data on new or previously-treated cases, the figures given in the country profiles are estimates based on a regression model described in detail elsewhere.[5]

This report also summarizes the projects approved by the Green Light Committee (GLC) in 2006 for access to quality-assured, second-line anti-TB drugs at reduced prices and independent external monitoring.

Financing TB control (2002–2007)

Financial analysis was introduced into the annual WHO report on global TB control in 2002. The main developments in the 2007 report are that (a) financial data are presented according to the six components of the Stop TB Strategy and/or the (related) cost categories used in the Global Plan, and (b) there is more detailed analysis of how funding needs reported by countries compare with the funding needs set out in the Global Plan. The report has seven objectives:

- for each HBC, and for all HBCs combined, to present and assess total NTP budgets and expenditures for the period 2002–2007, with breakdowns by funding source and line item;
- for each HBC and for all HBCs combined, to present and assess the total cost of TB control to government health services[6] for the period 2002–2007, with breakdowns by funding source and line item;
- for each HBC, to estimate and compare per patient costs, budgets and available funding for the period 2002–2007 and per patient expenditures for 2002–2005;
- for each HBC, to assess whether increased spending on TB control is resulting in an increase in the number of cases detected and treated in DOTS programmes;

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1 HIV prevalence estimates for 2004 (unpublished data). Geneva, UNAIDS.

2 Questionnaires are available at www.who.int/tb/country/en/

3 *A guide to monitoring and evaluation for collaborative TB/HIV activities*. Geneva, World Health Organization, 2004 (WHO/HTM/TB/2004.342 and WHO/HIV/2004.09; available at whqlibdoc.who.int/hq/2004/WHO_ HTM_TB_2004.342.pdf).

4 The WHO/IUATLD Global Project on Anti-tuberculosis Drug Resistance Surveillance. *Anti-tuberculosis drug resistance in the world. Third global report*. Geneva, World Health Organization, 2003 (WHO/HTM/TB/2004.343; more information about the project can be found at: www.who.int/tb/dots/dotsplus/surveillance/en/index.html).

5 Zignol M et al. Global incidence of multidrug-resistant tuberculosis. *Journal of Infectious Diseases*, 2006, 194:479–485.

6 i.e. including costs not reflected in NTP budget data.

- to assess the contribution of the GFATM to funding for TB control;
- for countries other than the HBCs, to quantify NTP budgets and total TB control costs in 2007, with breakdowns by funding source and line item;
- for the HBCs and other countries, to compare funding requirements reported by countries with the funding needs for 2006 and 2007 set out in the Global Plan.

Data collection

We collected data from five main sources: NTPs, the WHO-CHOICE team,[1] GFATM proposals and databases, previous WHO reports in this series, and epidemiological and financial analyses carried out for the Global Plan.[2] In 2006, data were collected directly from countries using a two-page questionnaire included in the standard WHO data collection form. NTP managers were asked to complete three tables. The first two tables required a summary of the NTP budget for fiscal years 2006 and 2007, in US$, by line item and source of funding (including a column for funding gaps). The third table requested NTP expenditure data for 2005, by line item and source of funding. The form also requested information about infrastructure dedicated to TB control and the ways in which general health infrastructure is used for TB control (e.g. the number of dedicated TB beds available, the number of outpatient visits that patients need to make to a health facility during treatment and the average length of stay when patients are admitted to hospital). We also asked for an estimate of the number of patients who would be treated in 2006 and 2007, for (a) smear-positive and (b) smear-negative and extrapulmonary cases combined.

Line items for the budget tables were revised from those used in previous years, to bring reporting of financial data in line with the Stop TB Strategy and to allow for comparisons with the cost categories used in the Global Plan. A total of 10 line items were defined: first-line drugs; dedicated NTP staff; routine programme management and supervision activities; laboratory supplies and equipment; second-line drugs for MDR-TB; management of MDR-TB (budget excluding second-line drugs); collaborative TB/HIV activities; ACSM, and community-based care; operational research; and all other budget lines for TB (e.g. technical assistance). The relationship of these items to the Stop TB Strategy and the Global Plan and the categories used for presentation of financial analyses in this report are shown in Table 6.

Data entry and analysis

High-burden countries

Data entry and analysis focused on the 22 HBCs. We created a standardized Microsoft Excel workbook, with one worksheet for each country. Additional worksheets were included for summary analyses and for the data required as inputs to the country-specific analyses (e.g. notification data, unit costs for bed-days and outpatient clinic visits). For each country worksheet, 10 tables and related figures were created:

- NTP budget line items in 2006 and 2007, according to the 10 categories used in the 2006 round of data collection;
- NTP budget by line item for each year 2002–2007. Line items were grouped to allow for comparisons with the Global Plan and the Stop TB Strategy. This grouping, both for the budget categories used in 2006 and for those used in 2002–2005, is explained in Table 6. This was supplemented by an additional table for the NTP budget 2002–2005, according to the detailed line items used in 2002–2005;
- NTP budget by source of funding for each year 2002–2007, with the funding sources defined according to the 2006 data collection form, i.e. government (excluding loans), loans, GFATM, grants (excluding GFATM) and budget gap;
- NTP expenditures by source of funding for 2002–2005, with funding sources as defined for NTP budgets;
- NTP expenditures by line item for 2002–2005, with line items defined according to the budget categories used for reporting in the 2005 round of data collection, i.e. first-line drugs, second-line drugs, dedicated NTP staff, initiatives to increase case detection and cure rates, collaborative TB/HIV activities, buildings/equipment/vehicles, and other. These categories were retained for expenditure data to allow direct comparison with budget data reported for 2005;
- total TB control costs by funding source for each year 2002–2007, with funding sources as defined for NTP budgets;
- total TB control costs by line item for each year 2002–2007, with line items defined as NTP budget items, hospitalization and clinic visits;
- per patient costs, NTP budget, available funding, expenditures and budget for first-line drugs;
- comparison of total costs based on the country report, with total costs implied by the Global Plan;
- comparison of NTP budget, available funding and expenditure for 2003–2005 by line item.[3]

Budget data for 2006 and 2007 were taken from the 2006 data collection form. Budget data for 2005 were taken from the 2005 data collection form. Budget data for 2002–2004 were taken from the 2005 annual report. Expenditure data for 2002, 2003, 2004 and 2005 were based on the 2003, 2004, 2005 and 2006 data collection forms, respectively.

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1 The WHO-CHOICE (CHOosing Interventions that are Cost-Effective) team conducts work on the costs and effects of a wide range of health interventions.

2 *The Global Plan to Stop TB, 2006–2015: methods used to assess costs, funding and funding gaps*. Geneva, Stop TB Partnership and World Health Organization, 2006 (WHO/HTM/STB/2006.38).

3 Expenditure data are available for a larger set of countries in 2003 compared with 2002. For this reason, comparisons are with 2003.

TABLE 6

Categories used for presentation of financial analyses in this report and their relationship to the Stop TB Strategy, the Global Plan, budget lines used on the WHO data collection form and budget lines used in previous WHO reports

CATEGORIES USED FOR FINANCIAL ANALYSES IN THIS REPORT THAT COVER THE PERIOD 2002–2007	STOP TB STRATEGY	GLOBAL PLAN	BUDGET LINES IN 2006 DATA COLLECTION FORM	BUDGET LINES PRIOR TO 2006
DOTS	Component 1	DOTS	First-line drugs; NTP staff; routine programme management and supervision activities; laboratory supplies and equipment	First-line drugs; NTP staff; buildings, vehicles, equipment; all other budget lines for TB
MDR-TB	Component 2	MDR-TB/ DOTS-Plus	Second-line drugs for MDR-TB; management of MDR-TB (excluding second-line drugs)	Second-line drugs
TB/HIV		TB/HIV	Collaborative TB/HIV activities	Collaborative TB/HIV activities
New approaches: PPM/PAL/ community TB care/ACSM	Components 3–5	New approaches to DOTS ACSM	PPM and PAL; ACSM and community TB care	New initiatives to increase case detection and cure rates
Operational research	Component 6	Not included as specific categories	Operational research	Not included as specific category
Other	Not applicable		All other budget lines for TB (e.g. technical assistance)	"Other" category existed; for this report it is included under DOTS

Total TB control costs were estimated by adding costs for hospitalization and outpatient clinic visits to either NTP expenditures (for 2002–2005) or NTP budgets (for 2006–2007). Expenditures were used in preference to budgets for 2002–2005 because they reflect actual costs, whereas budgets can be higher than actual expenditures (for example, when large budgetary funding gaps exist or when the NTP does not spend all the available funding). When expenditures are known for 2006 and 2007, they will be used instead of budget data to calculate, retrospectively, the total cost of TB control in these years. For some HBCs, expenditures were not available for 2002–2005. When this was the case, we generally estimated expenditures based on available funding, which was calculated as the total budget minus the funding gap. The exception was South Africa, which reported budget and expenditure data for the first time in 2006. In previous annual reports, costs in South Africa were based on costing studies undertaken in the mid to late 1990s. Given the availability of new information from the 2006 round of data collection, we revised previous cost estimates for 2002–2004 by assuming that per patient costs in these years would be as for 2006. Total costs were then estimated by multiplying total notifications in each year by the estimated cost per patient treated. This produces lower estimates of total costs for South Africa, and explains differences in the total costs figures previously reported for the 22 HBCs during the period 2002–2006.

The total cost of outpatient clinic visits was estimated in two steps. First, the unit cost (in US$)[1] of a visit was multiplied by the average number of visits required per patient (estimated on the WHO data collection form), to give the cost per patient treated. This was done separately for (a) new smear-positive cases and (b) new smear-negative and extrapulmonary cases. Second, we multiplied the cost per patient treated by the number of patients notified (for 2002–2005) or the number of patients whom the NTP expects to treat (for 2006–2007). The total costs for the two categories of patient were then summed. The cost of hospitalization was generally calculated in the same way, replacing the unit cost of a clinic visit with the unit cost of a bed-day. The procedure differed for eight countries that have dedicated TB beds, and where the total cost of these beds is higher than when the total cost is estimated by multiplying bed-days per patient by the number of patients treated (this applied to Bangladesh, Brazil, Cambodia, India, Myanmar, the Russian Federation, UR Tanzania and Zimbabwe). We assumed that all clinic visits and hospitalization are funded by the government, because staff and facility infrastructure are the major inputs included in the unit cost estimates, and these are typically not funded by donors.

Per patient costs, budgets, available funding and expenditures were calculated by dividing the relevant total by the number of cases notified (for 2002–2005) and the number of patients whom the NTP expects to treat (for 2006–2007). Since the total costs of TB control for 2002–2005 were based on expenditure data, it is possible for the total TB control cost per patient treated to be less than the NTP budget per patient treated when the funding gap

[1] Average costs in the WHO-CHOICE database are reported in local currency units. These were converted into US$ using exchange rate data provided in the IMF *International financial statistics yearbook*. Washington, DC, International Monetary Fund, 2003.

is large or there is a significant budgetary under-spend. In addition, for 2002–2005, expenditures per patient were sometimes higher than the available funding per patient. This can occur when the NTP budget funding gap is reduced after the reporting of budget data to WHO (since available funding is estimated as the total budget minus the funding gap). To try to eliminate this problem, the data collection form has allowed countries to update budget data reported in the previous round of data collection since 2005 (for example in the 2005 round of data collection, countries were able to update 2005 budget data originally reported in 2004; in the 2006 round of data collection, countries were able to update 2006 budget data originally reported in 2005).

Costs based on country reports reflect actual country plans for TB control. To address the question of whether these costs are in line with the Global Plan, we converted the regional costs that appear in the Global Plan into estimates for individual countries. While these costs should be seen as approximations only, they can be used to identify important similarities and differences between country reports and the Global Plan. Differences may occur if the intervention coverage and rates of scale-up (e.g. number of TB patients to be treated or number of HIV-positive TB patients to be enrolled on ART) planned by countries in 2006 and 2007 are more or less ambitious than the projections included in the Global Plan, and/or if country-specific budget development is based on input prices that are more or less than the average regional prices used in the Global Plan. A further reason for discrepancies is that, while the Global Plan includes the full cost of collaborative TB/HIV activities, the budget for these activities that is reported by NTPs includes only the budget managed by the NTP, and not the budget for such activities that is managed by the national AIDS programme. Table 7 summarizes the methods used to convert regional costs as they appear in the Global Plan into estimates for individual countries.

All budget and expenditure data are reported in nominal prices (i.e. not adjusted for inflation) rather than constant prices (i.e. all prices adjusted to a common year) for two reasons. First, this means that values given for individual countries in *Global tuberculosis control* reports for the years 2002–2006 do not have to be adjusted, which makes it easier for country staff to review the data for previous years. Second, the adjustment makes only a small difference to the numbers reported (about 11% to 2002 values for total costs and less for other years).

Once the data were entered, any queries were discussed with NTP staff and the appropriate WHO regional and country office, and a final set of charts was produced. Six of these charts appear in the profiles for each country at Annex 1: NTP budget by line item 2002–2007, with line items as defined in the first column of Table 6; NTP budget line items in 2007, according to the line items used in the 2006 round of data collection; NTP budget by funding source 2002–2007; total TB control costs by line item 2002–2007; per patient costs, budgets, available funding, expenditures and budget for first-line drugs 2002–2007; and costs according to country reports compared with costs implied by the Global Plan for 2006 and 2007.[1] In some instances, the review process led to revisions to data included in previous annual reports. For this reason, figures sometimes differ from those published in the 2002–2006 reports.

To assess whether increased spending on TB control has resulted in an increase in the number of cases detected and treated in DOTS programmes, we compared the change in total NTP expenditures between 2003 and 2005 with the change between 2003 and 2005 in (a) the total number of TB cases treated in DOTS programmes and (b) the total number of new smear-positive cases treated in DOTS programmes. This was done for all HBCs for which the necessary data existed (not all countries have reported expenditure data for both years).

Finally, we compared the total costs of TB control with total government health expenditure.[2] We also examined the association between GNI (gross national income) per capita in 2005 and government contributions to total NTP budgets and TB control costs. Data on GNI per capita were taken from *World development indicators 2005*.[3]

Other countries

For countries other than the HBCs, we used the data provided on the 2006 data collection form to assess NTP budgets by region in 2007, and compared these data with the budgets reported by the HBCs. Only countries that submitted complete data of sufficient quality (e.g. data whose subtotals and totals were consistent by both line item and funding source) were used.

We also made estimates of the costs implied by the Global Plan for the 172 countries in the regions covered by the plan, as described above for the 22 HBCs. We then aggregated these values for each WHO region for the subset of countries that (a) provided a complete budget report to WHO and (b) were included in the Global Plan. The total number of countries meeting both criteria was 62. We then compared these aggregated values to costs according to country reports.

GFATM contribution to TB control

We evaluated GFATM funding for both HBCs and other countries, as announced after the first six rounds of funding. We assessed total approved funding at the end of 2006, disbursements to the end of 2006, the time taken between approval of a proposal and the signature of grant agreements, and the time taken between the signing of the grant agreement and the first disbursement of funds.

[1] A full set of charts and data is available upon request to tbdocs@who.int

[2] See www.who.int/nha/country/en

[3] Accessed in December 2006: devdata.worldbank.org/data-query

TABLE 7

Methods used to allocate regional costs in the Global Plan to individual countries

<table>
<tr><th rowspan="2">COUNTRY</th><th colspan="3">NUMBERS OF PATIENTS</th><th colspan="6">COSTS</th></tr>
<tr><th>NUMBER OF SS+ AND SS–/EP PATIENTS TREATED IN DOTS PROGRAMMES</th><th>NUMBER OF MDR-TB PATIENTS TREATED IN "DOTS-PLUS" PROGRAMMES</th><th>NUMBER OF HIV+ TB PATIENTS ENROLLED ON ART</th><th>NTP BUDGET FOR DOTS, EXCLUDING NEW APPROACHES</th><th>NTP BUDGET FOR NEW APPROACHES TO DOTS IMPLEMENTATION</th><th>BUDGET FOR ACSM</th><th>BUDGET FOR ART FOR HIV+ TB PATIENTS, AND OTHER TB/HIV COLLABORATIVE ACTIVITIES</th><th>NTP BUDGET FOR MDR-TB TREATMENT</th><th>COSTS ASSOCIATED WITH UTILIZATION OF GENERAL HEALTH SERVICES, FINANCED FROM GENERAL HEALTH FACILITY BUDGETS</th></tr>
<tr><td>Afghanistan
Bangladesh
Cambodia
China
India
Indonesia
Myanmar
Pakistan
Philippines
Thailand
Viet Nam</td><td>Global Plan regional numbers allocated to each country according to its share of the regional burden of TB (in 2004).</td><td rowspan="3">Global Plan regional numbers allocated to each country according to its estimated share of the regional burden of MDR-TB cases in 2003 (source: DOTS-Plus Working Group).</td><td rowspan="3">Estimates were made for each country as a joint effort by the Stop TB Partnership and UNAIDS for the Global Plan. Country-specific numbers were therefore already available and no allocation process was required.</td><td rowspan="3">The NTP budget per patient in each country in 2005 was used in the Global Plan to estimate a budget per patient for the region as a whole, with each country weighted according to its share of regional cases. To return to country-specific estimates, we used the NTP budget per patient in each country that was used in the Global Plan. This is the NTP budget reported in the 2005 WHO TB control report, excluding second-line drugs and collaborative TB/HIV activities. The NTP budget for each country that underpinned the Global Plan regional calculations was then multiplied by the number of cases to be treated (estimated as explained in column 2).</td><td rowspan="3" colspan="2">Global Plan cost estimates were first made for a standard population of 500 000, or in the case of culture and DST laboratories for a population of 5 million, based on regional unit prices. These unit costs were then multiplied by a factor according to the size of the regional population to be covered (e.g. if the population to be covered was 100 million, the unit cost was multiplied by 200, or by 20 in the case of culture and DST laboratories). To estimate costs for each country, Global Plan costs for each region were allocated to each country according to its share of the regional population.</td><td rowspan="3">The number of TB/HIV patients on ART was multiplied by the unit cost of providing ART, estimated by UNAIDS for each country as part of the development of the Global Plan. For other activities, the number of patients was allocated to a country according to its share of the regional TB/HIV burden and then multiplied by the country-specific unit cost used in the Global Plan.</td><td rowspan="3">Calculated as the number of MDR-TB cases to be treated multiplied by a country-specific unit cost. Country-specific unit costs estimated by adjusting the regional cost used in the Global Plan according to GNI per capita (except for the cost of drugs, which were assumed to be the same in all countries).</td><td rowspan="3">Calculated on a per patient basis for each country according to the inputs reported in the 2006 WHO data collection form. Unit costs for hospitalization and outpatient visits are WHO country-specific estimates as opposed to the DCPP regional estimates used in the Global Plan. Costs for diagnostic tests among TB suspects were included in the Global Plan, but were not included in the country-specific estimates because there are no comparative data from countries (the number of such tests is not requested on the WHO data collection form).</td></tr>
<tr><td>Brazil
Russian Federation</td><td>Global Plan regional numbers allocated to each country according to its share of the regional burden of TB (in 2004), then adjusted according to target level of DOTS population coverage set out in the Global Plan.</td></tr>
<tr><td>DR Congo
Ethiopia
Kenya
Mozambique
Nigeria
South Africa
Uganda
UR Tanzania
Zimbabwe</td><td>Global Plan regional numbers allocated to each country according to its share of regional cases treated under DOTS (in 2004).</td></tr>
</table>

ART indicates antiretroviral therapy; DOTS-Plus, the term used for the management of MDR-TB patients according to international guidelines at the time of the development of the Global Plan; DST, drug susceptibility testing; HIV+, HIV-positive; NTP, national tuberculosis control programme; ss+, sputum smear-positive; ss–, sputum smear-negative; EP, extrapulmonary.

We also assessed how the total value of grants awarded for TB control has evolved between rounds 1 and 6, and the approval rate. The approval rate was calculated as the number of proposals considered by the GFATM Technical Review Panel in each round, divided by the number of proposals approved in each round (including proposals approved after appeal). This approval rate was compared with applications for malaria and HIV/AIDS.

Results

Monitoring progress in TB control

Countries reporting to WHO

By the end of 2006, 199 of 212 countries and territories reported case notifications for 2005 and/or treatment outcomes for patients registered in 2004 (Annex 2). These countries include 99.9% of the world's population. Reports were submitted by all 22 HBCs. The countries that did not report included 10 Caribbean islands, Equatorial Guinea, Monaco and San Marino.

Case notifications and incidence estimates

The 199 countries reporting to WHO notified 5.1 million new and relapse cases, of which 2.4 million (47%) were new smear-positive cases (Table 8; Figure 1). Of these notifications, 4.9 million were from DOTS areas, including 2.3 million new smear-positive cases. A total of 26.5 million new and relapse cases, and 13.0 million new smear-positive cases, were notified by DOTS programmes between 1995 and 2005. Based on surveillance and survey data, we estimate that there were 8.8 million new cases of TB in 2004 (136 per 100 000), including 3.9 million (60 per 100 000) new smear-positive cases (Table 9; Figures 2, 3).

Comparing different parts of the world, the African Region (23%), South-East Asia Region (35%) and Western Pacific Region (25%) together accounted for 83% of all notified new and relapse cases and similar proportions of new smear-positive cases in 2005. Because DOTS has emphasized diagnosis by sputum smear microscopy, 48% of all new and relapse cases were new smear-positive (approximately 45% expected) in DOTS areas, compared with 36% elsewhere. Among new pulmonary cases reported by DOTS programmes, 59% were new smear-positive (a minimum of 65% expected), compared with 46% elsewhere (Table 8). The proportion of smear-positive cases among pulmonary cases reported under DOTS conforms with expectations and so, therefore, does the proportion of smear-negative cases.

In ranking countries by the estimated number of incident cases, 22 countries have been given special attention (Table 8). The magnitude of the TB burden within countries can also be expressed as the incidence rate per 100 000 population. Among the 15 countries with the highest estimated TB incidence rates, 12 are in Africa (Figure 4). The high incidence rates estimated for the African countries in this list are partly explained by the relatively high rates of HIV coinfection. Where HIV infection rates are higher in adult populations, they are also estimated to be higher among new TB patients. Figure 5 maps the distribution of HIV among TB patients,

FIGURE 1

Tuberculosis notification rates, 2005

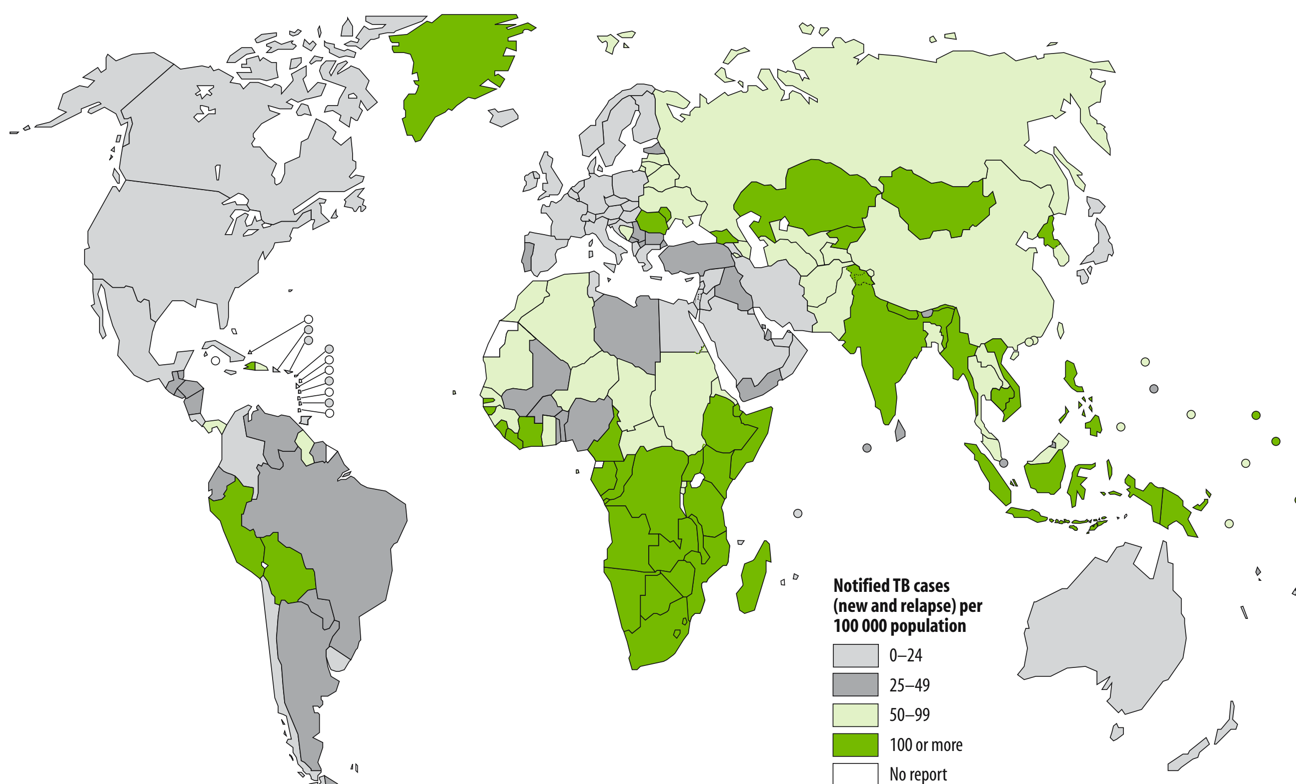


TABLE 8

Case notifications, 2005

		NEW AND RELAPSE CASES		NEW CASES						RE-TREATMENT CASES EXCLUDING RELAPSE		OTHER[a]		% OF NEW PULMONARY CASES SMEAR-POSITIVE[b]	
				SMEAR-POSITIVE		SMEAR-NEGATIVE/ UNKNOWN		EXTRAPULMONARY							
		DOTS	WHOLE COUNTRY	DOTS	WHOLE COUNTRY	DOTS	WHOLE COUNTRY	DOTS	WHOLE COUNTRY	DOTS	WHOLE COUNTRY	DOTS	WHOLE COUNTRY	DOTS	WHOLE COUNTRY
1	India	1 146 599	1 156 248	506 852	508 890	392 390	399 066	170 948	171 838	148 495	148 580	–	–	56	56
2	China	894 428	–	472 719	–	329 157	–	42 845	–	90 780	–	5 301	–	59	–
3	Indonesia	254 601	–	158 640	–	85 373	–	6 142	–	4 446	–	–	–	65	–
4	Nigeria	62 598	–	35 048	–	22 705	–	2 836	–	2 858	–	1 392	–	61	–
5	Bangladesh	123 118	–	84 848	–	23 076	–	11 318	–	–	–	–	–	79	–
6	Pakistan	137 574	–	47 154	–	65 392	–	22 411	–	2 640	–	–	–	42	–
7	South Africa	260 162	270 178	119 906	125 460	73 551	76 680	38 786	39 739	31 559	32 289	–	–	62	62
8	Ethiopia	124 262	–	38 525	–	39 816	–	43 675	–	873	–	–	–	49	–
9	Philippines	137 100	–	81 647	–	50 347	–	1 149	–	–	–	–	–	62	–
10	Kenya	102 680	–	40 389	–	43 772	–	15 265	–	5 721	–	–	–	48	–
11	DR Congo	97 075	–	65 040	–	9 959	–	18 494	–	1 909	–	574	–	87	–
12	Russian Federation	82 643	127 930	22 690	32 605	47 151	74 301	6 776	12 320	6 433	28 617	–	–	32	30
13	Viet Nam	94 994	–	55 570	–	16 429	–	16 670	–	976	–	–	–	77	–
14	UR Tanzania	61 022	–	25 264	–	20 810	–	13 094	–	3 178	–	–	–	55	–
15	Brazil	51 452	80 209	26 224	42 093	15 898	23 990	7 229	11 037	3 159	6 548	–	466	62	64
16	Uganda	41 040	–	20 559	–	15 040	–	3 780	–	769	–	–	–	58	–
17	Thailand	57 895	–	29 762	–	18 837	–	7 501	–	–	–	–	–	61	–
18	Mozambique	33 231	–	17 877	–	9 184	–	4 771	–	487	–	–	–	66	–
19	Myanmar	107 009	–	36 541	–	35 601	–	30 252	–	982	–	–	–	51	–
20	Zimbabwe	50 454	–	13 155	–	29 074	–	6 721	–	4 437	–	–	–	31	–
21	Cambodia	35 535	–	21 001	–	7 057	–	6 759	–	588	–	–	–	75	–
22	Afghanistan	21 844	–	9 949	–	6 085	–	4 954	–	–	–	–	–	62	–
High-burden countries		**3 977 316**	**4 071 025**	**1 929 360**	**1 962 736**	**1 356 704**	**1 401 751**	**482 376**	**493 571**	**310 290**	**336 678**	**7 267**	**7 733**	**59**	**58**
	AFR	1 168 502	1 186 800	538 816	550 001	359 987	364 789	207 438	208 979	64 805	65 883	–	2 649	60	60
	AMR	187 380	227 616	101 786	124 788	45 154	55 740	28 083	33 298	8 725	12 442	1 640	2 106	69	69
	EMR	276 707	282 945	112 617	112 804	97 664	99 392	62 974	63 282	5 252	–	–	53	54	
	EUR	270 290	365 346	70 229	96 101	111 802	157 334	29 792	49 831	33 935	60 719	194	413	39	38
	SEAR	1 779 496	1 789 186	855 306	857 371	587 502	594 185	241 438	242 332	162 573	162 661	189	202	59	59
	WPR	1 238 180	1 274 266	661 390	671 719	431 865	447 749	80 958	87 584	95 742	99 053	6 511	10 125	60	60
Global		**4 923 555**	**5 126 159**	**2 340 214**	**2 412 784**	**1 633 974**	**1 719 189**	**650 683**	**686 306**	**371 032**	**406 010**	**11 183**	**15 495**	**59**	**58**

– Indicates all cases notified as DOTS, no additional cases notified as non-DOTS.

[a] Cases not included elsewhere in table.

[b] Expected percentage of new pulmonary cases that are smear-positive is 65–80%.

FIGURE 2

Estimated numbers of new TB cases, 2005

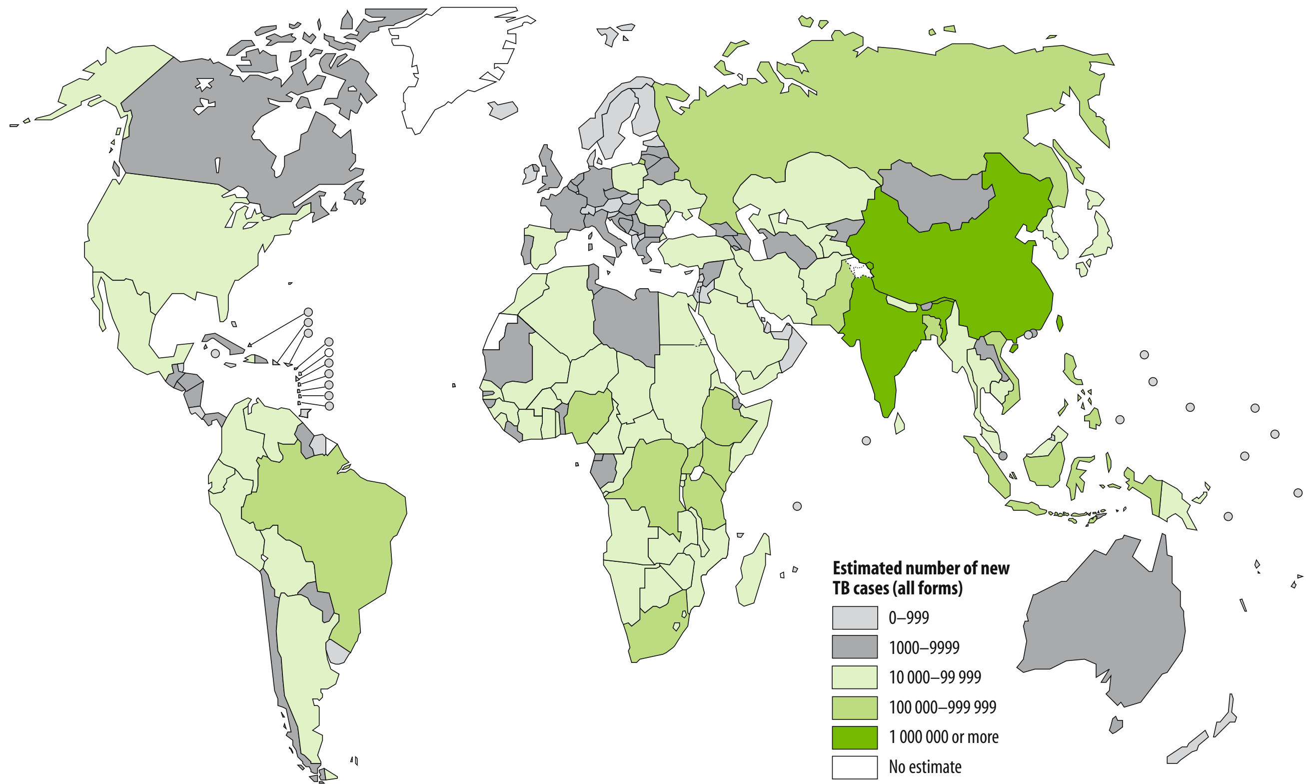


FIGURE 3

Estimated TB incidence rates, 2005

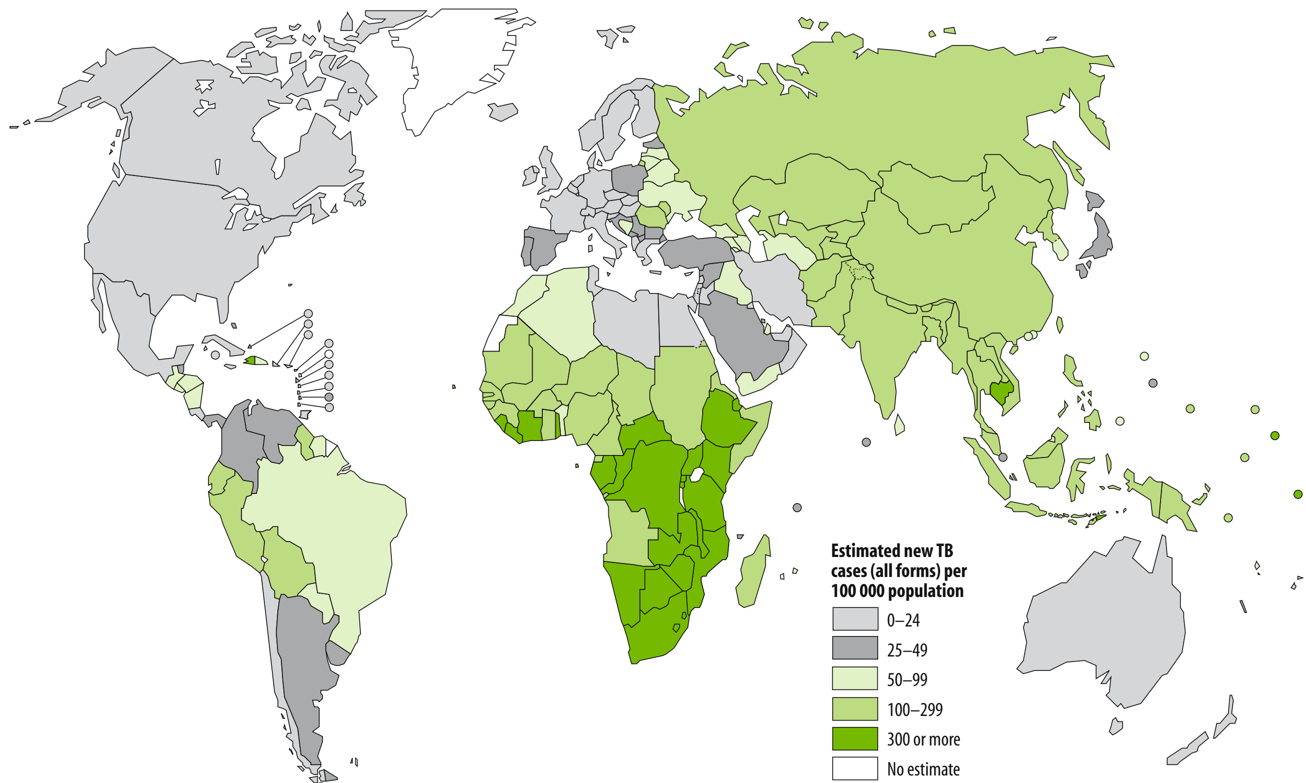


TABLE 9

Estimated TB burden, 2005

			INCIDENCE[a]				PREVALENCE		MORTALITY		HIV PREV. IN INCIDENT TB CASES[b]
			ALL FORMS		SMEAR-POSITIVE		ALL FORMS		ALL FORMS		
		POPULATION 1000s	NUMBER 1000s	PER 100 000 POP PER YEAR	NUMBER 1000s	PER 100 000 POP PER YEAR	NUMBER 1000s	PER 100 000 POP	NUMBER 1000s	PER 100 000 POP PER YEAR	%
1	India	1 103 371	1 852	168	827	75	3 299	299	322	29	5.2
2	China	1 315 844	1 319	100	593	45	2 737	208	205	16	0.5
3	Indonesia	222 781	533	239	240	108	584	262	92	41	0.8
4	Nigeria	131 530	372	283	162	123	704	536	100	76	19
5	Bangladesh	141 822	322	227	145	102	575	406	66	47	0.1
6	Pakistan	157 935	286	181	129	82	468	297	59	37	0.6
7	South Africa	47 432	285	600	116	245	242	511	34	71	58
8	Ethiopia	77 431	266	344	118	152	423	546	56	73	11
9	Philippines	83 054	242	291	109	131	374	450	39	47	0.1
10	Kenya	34 256	220	641	94	276	321	936	48	140	28
11	DR Congo	57 549	205	356	90	156	311	541	42	73	17
12	Russian Federation	143 202	170	119	76	53	214	150	28	20	6.2
13	Viet Nam	84 238	148	175	66	79	198	235	19	23	3.0
14	UR Tanzania	38 329	131	342	56	147	190	496	29	75	29
15	Brazil	186 405	111	60	49	26	142	76	15	7.5	14
16	Uganda	28 816	106	369	46	158	161	559	26	91	30
17	Thailand	64 233	91	142	41	63	131	204	12	19	7.6
18	Mozambique	19 792	89	447	37	185	118	597	24	124	50
19	Myanmar	50 519	86	171	38	76	86	170	8	15	7.1
20	Zimbabwe	13 010	78	601	32	245	82	631	17	130	60
21	Cambodia	14 071	71	506	32	226	99	703	12	87	6.0
22	Afghanistan	29 863	50	168	23	76	86	288	10	35	0.0
High-burden countries		**4 045 482**	**7 033**	**174**	**3 117**	**77**	**11 546**	**285**	**1 265**	**31**	**10**
	AFR	738 083	2 529	343	1 088	147	3 773	511	544	74	28
	AMR	890 757	352	39	157	18	448	50	49	5.5	7.9
	EMR	541 704	565	104	253	47	881	163	112	21	2.1
	EUR	882 395	445	50	199	23	525	60	66	7.4	4.6
	SEAR	1 656 529	2 993	181	1 339	81	4 809	290	512	31	3.9
	WPR	1 752 283	1 927	110	866	49	3 616	206	295	17	1.0
Global		**6 461 751**	**8 811**	**136**	**3 902**	**60**	**14 052**	**217**	**1 577**	**24**	**11**

[a] All estimates include TB in people with HIV.
[b] Prevalence of HIV in incident TB cases in adults aged 15–49 years.

FIGURE 4

Fifteen countries with the highest estimated TB incidence rates per capita (all ages, all forms; grey bars) and corresponding incidence rates of HIV-infected TB in adults aged 15–49 years (green bars), 2005

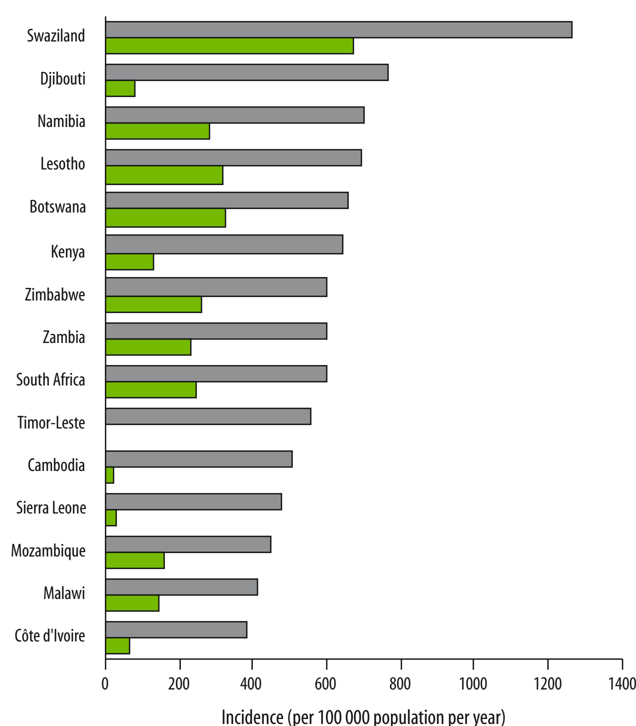
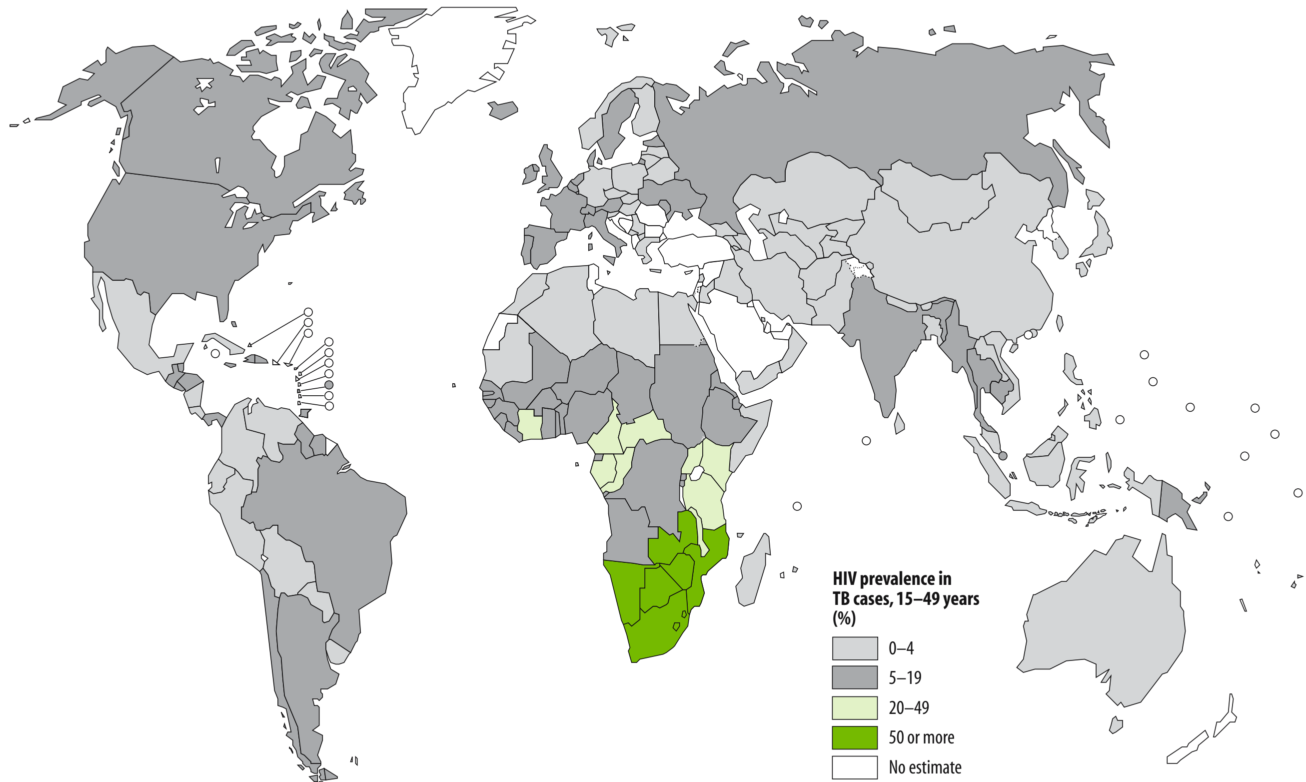


FIGURE 5

Estimated HIV prevalence in new adult TB cases, 2005



showing the relatively high rates in countries of eastern and southern Africa (subregion African – high HIV). Some countries have small populations but high rates of HIV infection; in Swaziland, for example, 75% of TB patients were estimated to be HIV-positive in 2005. Figure 6 shows how the number of HIV-infected TB patients varies among countries and regions. South Africa, with 0.7% of the world's population, had 19% of all cases of TB in adult HIV-positive people in 2005, while 10% of cases lived in India. The rest of the African Region accounted for a further 61% of HIV-infected TB cases in 2005.

Using the time series of notifications of all TB cases from countries thought to have reliable data, and scaling by the estimated rates of case detection, we have estimated the trends in TB incidence (all forms of TB) for nine epidemiologically different subregions of the world (subdivisions of the six WHO regions) for the period 1990 to 2005 (Figure 7). In six of the nine subregions the incidence rate was stable or falling for most of this period. In subregions Africa – high HIV and Eastern Europe, incidence rates increased for most of the period since 1990 but now appear to have stabilized or begun to fall.

In subregion Africa – high HIV, the annual change in TB incidence runs almost parallel to the change in HIV prevalence. Since 1990, both HIV prevalence and TB incidence have been increasing more slowly each year and, by 2005, both indicators were falling (rates of change negative; Figure 8). The time series of estimates for some

FIGURE 6

Geographical distribution of HIV-positive TB cases, 2005.
For each country or region, the number of incident TB cases arising in people with HIV is shown as a percentage of the global total of such cases. AFR* is all countries in the WHO African Region except those shown separately; AMR* excludes Brazil; EUR* excludes the Russian Federation; SEAR* excludes India.

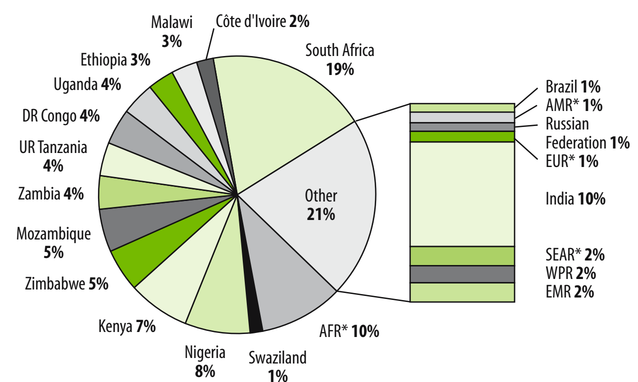


FIGURE 7

Trends in estimated TB incidence rates (per 100 000 per year, all forms, black lines), and the estimated annual change in incidence rates (green lines), for nine subregions and the world, 1990–2005. For each subregion, series are constructed with data from countries (shown in bold, facing page) whose surveillance systems are reliable enough to determine the national and sub-regional trends in incidence.

FIGURE 7

AFRICA – COUNTRIES WITH HIGH HIV PREVALENCE: **Botswana**, **Burkina Faso**, **Burundi**, **Cameroon**, Central African Rep, Chad, Congo, Côte d'Ivoire, DR Congo, Equatorial Guinea, Ethiopia, **Gabon**, **Kenya**, **Lesotho**, Liberia, **Malawi**, Mozambique, Namibia, Nigeria, Rwanda, South Africa, **Swaziland**, **Uganda**, **UR Tanzania**, **Zambia**, **Zimbabwe**.

AFRICA – COUNTRIES WITH LOW HIV PREVALENCE: Algeria, Angola, Benin, Cape Verde, Comoros, Eritrea, Gambia, Ghana, Guinea, Guinea-Bissau, **Madagascar**, **Mali**, Mauritania, Mauritius, Niger, Sao Tome & Principe, Senegal, Seychelles, **Sierra Leone**, **Togo**.

CENTRAL EUROPE: **Albania**, Bosnia & Herzegovina, Croatia, Cyprus, **Hungary**, Montenegro, **Poland**, Serbia, **Slovakia**, **Slovenia**, TFYR Macedonia, **Turkey**.

EASTERN EUROPE: **Armenia**, Azerbaijan, **Belarus**, **Bulgaria**, **Estonia**, Georgia, **Kazakhstan**, **Kyrgyzstan**, **Latvia**, **Lithuania**, Rep Moldova, **Romania**, **Russian Federation**, **Tajikistan**, **Turkmenistan**, **Ukraine**, **Uzbekistan**.

EASTERN MEDITERRANEAN: Afghanistan, Bahrain, Djibouti, Egypt, **Iran (Islamic Republic of)**, Iraq, **Jordan**, Kuwait, **Lebanon**, Libyan Arab Jamahiriya, **Morocco**, **Oman**, Pakistan, **Qatar**, **Saudi Arabia**, Somalia, Sudan, **Syrian Arab Rep**, **Tunisia**, United Arab Emirates, West Bank & Gaza Strip, Yemen.

ESTABLISHED MARKET ECONOMIES: Andorra, **Australia**, Austria, **Belgium**, Canada, **Czech Rep**, Denmark, **Finland**, France, **Germany**, Greece, **Iceland**, **Ireland**, Israel, Italy, Japan, Luxembourg, Malta, Monaco, Netherlands, **New Zealand**, Norway, **Portugal**, San Marino, **Singapore**, Spain, **Sweden**, **Switzerland**, **United Kingdom**, **United States**.

LATIN AMERICA: Anguilla, **Antigua & Barbuda**, **Argentina**, Bahamas, Barbados, Belize, **Bermuda**, **Bolivia**, Brazil, British Virgin Is, Cayman Is, **Chile**, **Colombia**, Costa Rica, **Cuba**, **Dominica**, Dominican Republic, Ecuador, **El Salvador**, **Grenada**, **Guatemala**, Guyana, Haiti, **Honduras**, **Jamaica**, **Mexico**, Montserrat, Netherlands Antilles, **Nicaragua**, Panama, **Paraguay**, **Peru**, **Puerto Rico**, **St Kitts & Nevis**, **St Lucia**, **St Vincent & the Grenadines**, Suriname, Trinidad & Tobago, Turks & Caicos Is, **Uruguay**, US Virgin Is, **Venezuela**.

SOUTH-EAST ASIA: Bangladesh, **Bhutan**, DPR Korea, **India**, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand, Timor-Leste.

WESTERN PACIFIC: American Samoa, Brunei Darussalam, Cambodia, **China**, **China Hong Kong SAR**, China Macao SAR, Cook Is, Fiji, French Polynesia, Guam, Kiribati, Lao PDR, **Malaysia**, Marshall Is, Micronesia, Mongolia, Nauru, New Caledonia, Niue, N Mariana Is, Palau, Papua New Guinea, Philippines, **Rep Korea**, Samoa, Solomon Is, Tokelau, Tonga, Vanuatu, Viet Nam, Wallis & Futuna Is.

FIGURE 8

Annual changes (%) in estimated HIV prevalence rate (15–49 years old, green line) and the TB case notification rate (black line, see figure 7) for sub-region Africa high-HIV.
Changes are to the year marked from the preceding year, 1990–1 et seq. Estimates of HIV prevalence are from UNAIDS (personal communication).

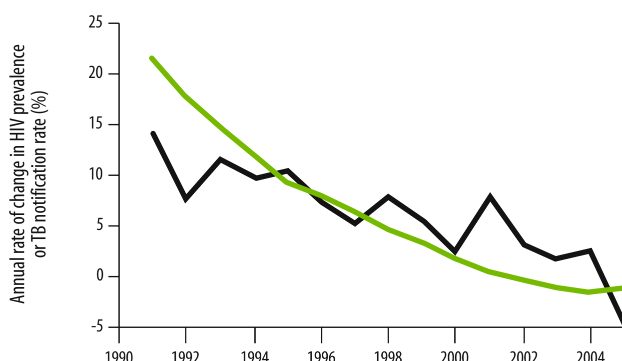
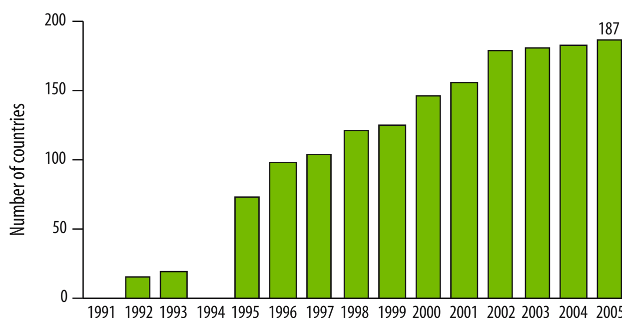


FIGURE 9

Number of countries implementing DOTS (out of a total of 212 countries), 1991–2005



African countries show the expected lag between peak HIV prevalence and peak TB incidence rate. In Zimbabwe, for example, estimated HIV prevalence reached a maximum in 1997, while the TB case notification rate was highest in 2002.

In subregion Africa – low HIV, the TB incidence rate was evidently still increasing in 2005. In eastern Europe, the annual increase in the incidence rate reached nearly 20% in 1995 but had stabilized by year 2000.

The global incidence rate of TB peaked around 2002 and appears now to have stabilized or begun to decline (Figure 7). The incidence rate is now stable or falling in all six WHO regions. However, the slow decline in incidence rates per capita is offset by population growth. Consequently, the number of new cases arising each year is still increasing globally and in the WHO regions of Africa, the Eastern Mediterranean and South-East Asia.

DOTS coverage

The total number of countries implementing DOTS increased steadily from 1995 but had stabilized at about 180 by 2002, rising a little closer to the maximum in 2005 (187 out of 212; Figure 9). All 22 HBCs have had DOTS programmes since 2000; many of which have been established for much longer. DOTS coverage within countries has steadily increased since 1995 (Figure 10; Table 10). By the end of 2005, 89% of the world's population lived in counties, districts, oblasts and provinces of countries that had adopted DOTS. Geographical coverage was reported to be more than 80% in all regions except Europe (Figure 11).

All but four HBCs had at least 90% of the population living in areas where DOTS has been implemented. Population coverage in the remaining four – Afghanistan, Brazil, Nigeria, and the Russian Federation – was 81%, 68%, 65%, and 83% respectively.

Case notification and case detection

A total of 4.8 million new cases of TB were notified from all sources in 2005. This represents 55% of the 8.8 million estimated new cases; the 2.4 million new smear-positive cases notified account for 62% of the 3.9 million estimated (Tables 8, 9; Annex 2).

The detection rate of new smear-positive cases from all

FIGURE 10

DOTS coverage, 1995–2005

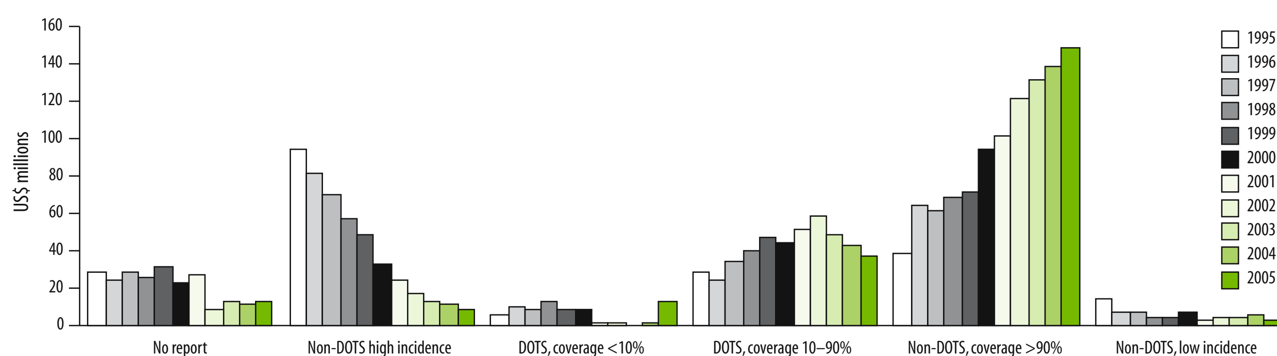


TABLE 10

Progress in DOTS implementation, 1995–2005

	PERCENT OF POPULATION COVERED BY DOTS										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
1 India	1.5	2	2.3	9	13.5	30	45	51.6	67.2	84.0	91.0
2 China	49	60.4	64.2	63.9	64	68	68	77.6	91	96	100
3 Indonesia	6	13.7	28.3	80	90	98	98	98	98	98	98
4 Nigeria	47	30	40	45	45	47	55	55	60	65	65
5 Bangladesh	40.5	65	80	90	90	92	95	95	99	99	99
6 Pakistan	2.0	8	–	8	8	9	24	45	63	79	100
7 South Africa	–	0	13	22	66	77	77	98	99.5	93	94
8 Ethiopia	39	39	48	64.4	63	85	70	95	95	70	90
9 Philippines	4.3	2	15	16.9	43	89.6	95	98	100	100	100
10 Kenya	15	100	100	100	100	100	100	100	100	100	100
11 DR Congo	47	51.4	60	60	62	70	70	70	75	75	100
12 Russian Federation	–	2.3	2.3	5	5	12	16	25	25	45	83
13 Viet Nam	50	95	93	96	98.5	99.8	99.8	99.9	100	100	99.9
14 UR Tanzania	98	100	100	100	100	100	100	100	100	100	100
15 Brazil	–	0	0	3	7	7	32	25	33.6	52	68
16 Uganda	–	0	100	100	100	100	100	100	100	100	100
17 Thailand	–	1.1	4	32	59	70	82	100	100	100	100
18 Mozambique	97	100	84	95	–	100	100	100	100	100	100
19 Myanmar	–	59	60	60.3	64	77	84	88.3	95	95	95
20 Zimbabwe	–	0	0	100	11.6	100	100	100	100	100	100
21 Cambodia	60	80	88	100	100	99	100	100	100	100	100
22 Afghanistan	–	–	12	11	13.5	15	12	38	53	68	81
High-burden countries	**24**	**32**	**36**	**43**	**46**	**55**	**61**	**68**	**79**	**87**	**94**
AFR	43	46	56	61	56	71	69	81	85	84	89
AMR	12	48	50	55	65	68	73	73	78	83	88
EMR	16	12	18	33	51	65	71	78	86	90	97
EUR	5.4	8.2	17	22	23	26	32	40	42	47	60
SEAR	6.6	12	16	29	36	49	60	66	77	89	93
WPR	43	55	57	58	57	67	68	77	90	94	98
Global	**22**	**32**	**37**	**43**	**47**	**57**	**62**	**69**	**77**	**83**	**89**

Zero indicates that a report was received, but the country had not implemented DOTS. – indicates that no report was received.

FIGURE 11

DOTS coverage by WHO region, 2005. The shaded portion of each bar shows the DOTS coverage as a percent of the population. The numbers in each bar show the population (in millions) within (green portion) or outside (grey portion) DOTS areas.

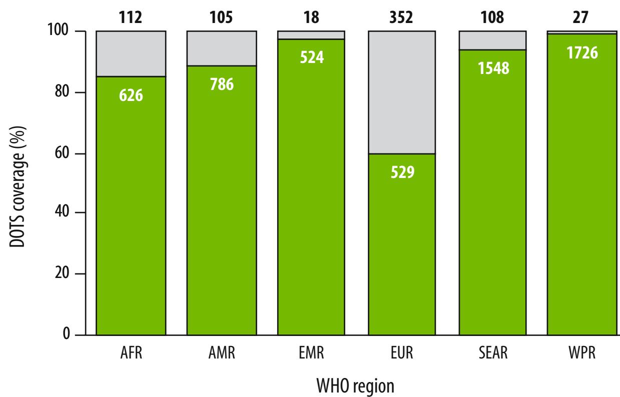
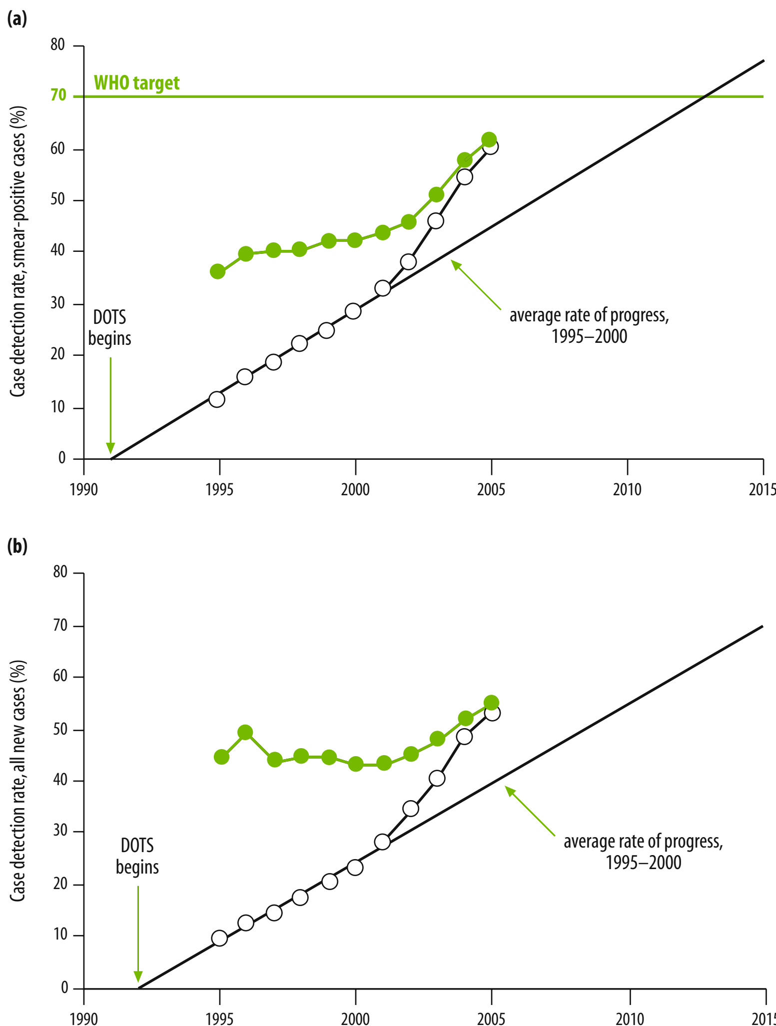


FIGURE 12

Progress towards the 70% case detection target. (a) Open circles mark the number of new smear-positive cases notified under DOTS 1995–2004, expressed as a percentage of estimated new cases in each year. The solid line through these points indicates the average annual increment from 1995 to 2000 of about 134 000 new cases, compared to the increment from 2004 to 2005 of about 242 000 cases. Closed circles show the total number of smear-positive cases notified (DOTS and non-DOTS) as a percentage of estimated cases. (b) As (a), but for all new cases (excluding relapses).



sources increased slowly and linearly from 1995 to 2001 and then more quickly from 2002 to 2005 (Figure 12a). The increase from 2002 to 2005 is attributable mostly to increases in the numbers of new smear-positive cases reported in the South-East Asia and Western Pacific regions. The detection rate of all new TB cases, from DOTS and non-DOTS programmes, remained approximately stable from 1995 to 2001 but increased between 2002 and 2005 (Figure 12b).

DOTS programmes detected an estimated 53% of all new cases and 60% of new smear-positive cases in 2005. The detection rate achieved by DOTS programmes, of both smear-positive and all new TB cases, has accelerated sharply since 2000, rising more quickly than the overall (DOTS and non-DOTS) case detection rate (Figure 12). However, the increase in the smear-positive case detection rate under DOTS is slowing: the increment between 2004 (54%) and 2005 (60%) was 6%, which is less than in the two preceding yearly intervals (Table 11, Figure 12).

The point estimate of 60% smear-positive case detection rate by DOTS programmes in 2005 is below the 70% target. There is, however, much uncertainty surrounding this estimate: 95% confidence limits range from 52% to 69%, with a small chance (0.7%) of the true estimate lying at ≥70%.

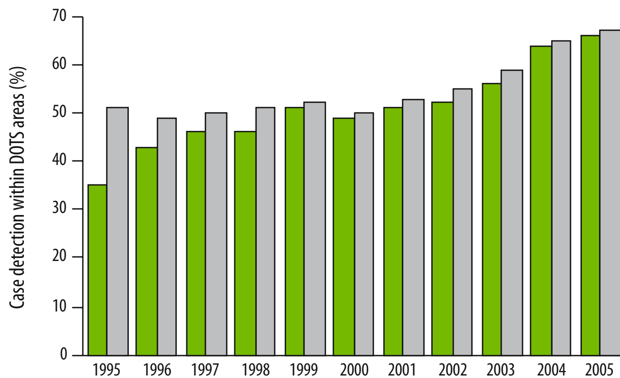
Since case detection under DOTS has increased faster than the overall rate of case detection, the proportion of all notified new smear-positive cases that were notified by DOTS programmes has increased, reaching 97% in 2005. Almost all TB cases (96%) reported to WHO in 2005 were reported by DOTS programmes (Table 8).

The case detection rate within DOTS areas (measured by the ratio of case detection to population coverage) changed little between 1995 and 2001, averaging 51% worldwide, but had increased to 67% by 2005 (Figure 13). Data from the 22 HBCs show the same pattern of change, where recent increases since 2000 have been driven mainly, but not exclusively, by improvements in Asia: Bangladesh, China, India, Indonesia, Myanmar and the Philippines (Tables 10, 11; Figure 13; Annex 1).

Comparing the WHO regions, new smear-positive case detection rates by DOTS programmes in 2005 were lowest in the European (35%) and Eastern Mediterranean regions (44%) and highest in the Region of the Americas (65%), the South-East Asia Region (64%) and the Western Pacific Region (76%; Table 11, Figure 14). Only the Western Pacific Region met the 2005 target.

FIGURE 13

Smear-positive case detection rate within DOTS areas[a] for high-burden countries (green) and the world (grey), 1995–2005



[a] Calculated as DOTS case detection rate of new smear-positive cases divided by DOTS coverage

FIGURE 14

Smear-positive case detection rate by DOTS programmes, by WHO region, 1995–2005. Heavy line shows global DOTS case detection rate.

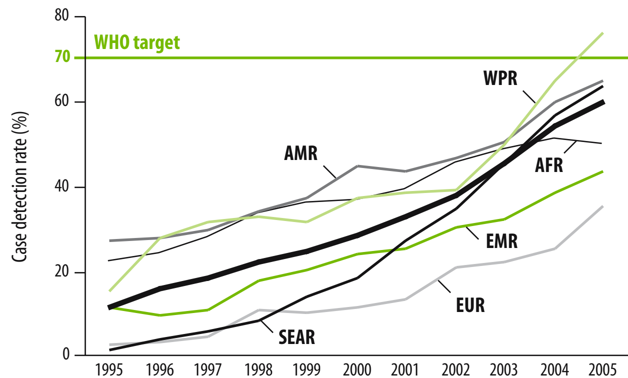


TABLE 11

Case detection rate of new smear-positive cases (%), 1995–2005

	DOTS PROGRAMMES										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
1 India	0.3	0.9	1.1	1.7	7.0	12	24	31	45	57	61
2 China	15	28	32	32	29	31	31	30	43	63	80
3 Indonesia	1.3	4.4	7.4	12	19	20	22	31	38	53	66
4 Nigeria	11	11	11	12	13	13	14	13	18	21	22
5 Bangladesh	7.0	15	19	24	25	26	28	32	38	44	59
6 Pakistan	1.0	1.8	–	3.7	2.0	2.8	5.3	13	17	27	37
7 South Africa	–	–	5.0	18	57	62	67	88	101	104	103
8 Ethiopia	15	20	22	24	25	33	33	34	35	36	33
9 Philippines	0.4	0.5	3.2	10	20	48	56	61	68	72	75
10 Kenya	55	57	53	56	55	46	49	48	48	47	43
11 DR Congo	41	47	44	55	54	52	56	55	63	71	72
12 Russian Federation	–	0.4	0.9	0.9	1.6	4.4	5.0	6.6	8.3	13	30
13 Viet Nam	30	59	78	83	83	82	83	87	85	89	84
14 UR Tanzania	56	55	52	53	51	47	46	43	45	46	45
15 Brazil	–	–	–	4.1	3.9	7.5	7.8	9.4	18	45	53
16 Uganda	–	–	58	58	57	49	45	45	45	46	45
17 Thailand	–	0.3	5.0	21	39	46	72	65	71	70	73
18 Mozambique	52	47	46	47	46	44	44	45	46	47	49
19 Myanmar	–	26	26	29	32	48	56	65	73	83	95
20 Zimbabwe	–	–	–	50	47	44	44	45	41	43	41
21 Cambodia	40	34	44	47	53	49	47	56	61	60	66
22 Afghanistan	–	–	2.7	8.2	7.5	13	21	29	28	36	44
High-burden countries	**8.4**	**14**	**17**	**20**	**23**	**27**	**31**	**36**	**44**	**55**	**62**
AFR	22	24	28	33	36	37	39	45	49	51	50
AMR	27	28	30	34	37	45	44	47	51	60	65
EMR	11	9.6	11	18	20	24	26	30	32	39	44
EUR	2.5	3.3	4.4	11	10	11	14	21	22	25	35
SEAR	1.5	4.1	5.6	8.2	14	19	27	34	45	57	64
WPR	15	28	31	33	31	37	38	39	50	65	76
Global	**11**	**16**	**18**	**22**	**25**	**28**	**33**	**38**	**45**	**54**	**60**

	WHOLE COUNTRY										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
1 India	38	41	38	38	46	46	49	50	54	60	62
2 China	22	34	39	33	33	34	34	32	45	65	80
3 Indonesia	12	4.4	7.4	12	19	21	*	31	*	53	66
4 Nigeria	*	11	*	*	13	13	17	15	*	21	22
5 Bangladesh	16	22	25	28	28	28	29	33	38	44	*
6 Pakistan	2.5	*	–	13	5.5	*	9.2	13	*	*	*
7 South Africa	33	55	65	74	76	75	79	89	101	109	108
8 Ethiopia	*	*	*	*	*	*	*	34	35	36	33
9 Philippines	96	87	80	68	71	64	56	61	68	72	75
10 Kenya	55	57	53	*	*	50	*	*	*	*	*
11 DR Congo	46	*	44	55	*	*	56	*	*	*	*
12 Russian Federation	68	66	60	56	27	33	32	35	38	41	43
13 Viet Nam	59	77	*	85	83	*	*	87	*	*	84
14 UR Tanzania	*	55	*	53	*	*	46	43	*	*	*
15 Brazil	80	79	79	80	77	78	74	81	79	86	86
16 Uganda	49	54	*	*	57	*	*	*	*	*	45
17 Thailand	55	46	35	*	*	*	*	*	*	70	73
18 Mozambique	*	*	46	47	46	*	44	*	46	47	*
19 Myanmar	26	28	28	*	*	*	58	*	73	83	95
20 Zimbabwe	48	52	55	50	*	44	44	*	41	*	*
21 Cambodia	*	42	*	47	*	49	*	56	61	*	*
22 Afghanistan	–	–	*	*	7.5	*	*	*	28	*	*
High-burden countries	**32**	**36**	**37**	**37**	**39**	**39**	**41**	**43**	**49**	**58**	**63**
AFR	36	41	39	43	43	41	43	46	49	52	51
AMR	71	72	77	77	76	76	76	77	77	79	80
EMR	21	26	25	32	29	25	28	31	33	39	45
EUR	61	61	56	56	43	45	41	41	50	46	48
SEAR	29	30	30	30	38	40	43	47	51	59	64
WPR	36	45	48	44	44	43	43	43	52	67	78
Global	**36**	**40**	**40**	**40**	**42**	**42**	**44**	**46**	**51**	**58**	**62**

– Indicates not available.
* No additional data beyond DOTS report, either because country is 100% DOTS, or because no non-DOTS report was received.

FIGURE 15

Proportion of estimated new smear-positive (a) and of all new cases (b) notified under DOTS (grey portion of bars) and non-DOTS (green portion of bars), 2005. Figures indicate the number of cases (in thousands) represented by each portion of each bar.

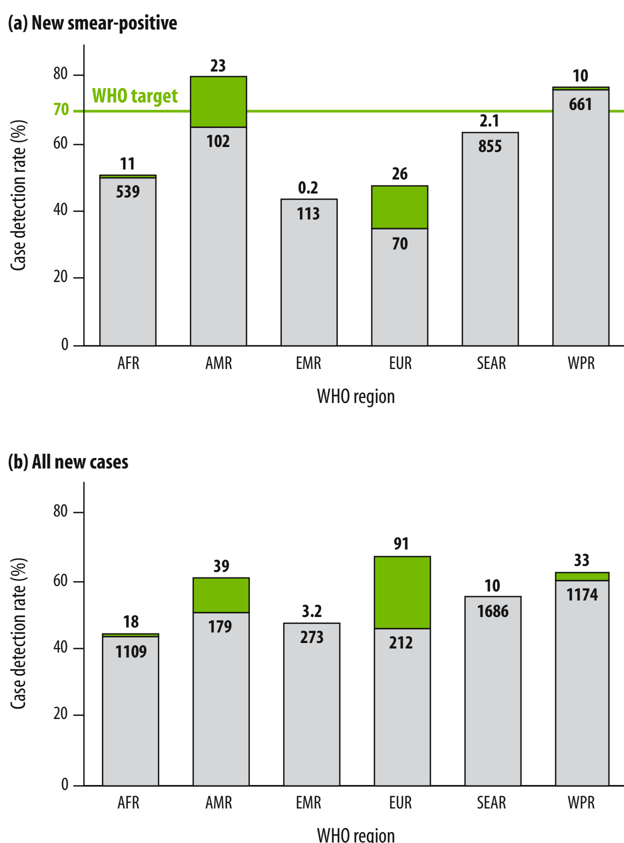
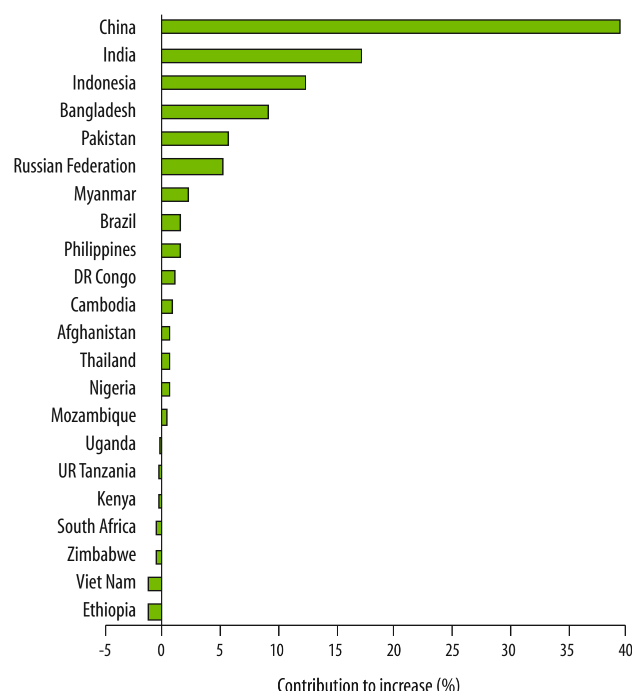


FIGURE 16

Contributions to the global increase in the number of new smear-positive cases notified under DOTS made by high-burden countries, 2004–2005



In the three regions with the highest rates of case detection – South-East Asia, the Americas and the Western Pacific – the increment between 2004 and 2005 was smaller than in the preceding year. Among the HBCs, the deceleration in case detection was most conspicuous in India.

The Region of the Americas and the European Region reported the largest numbers of cases from outside DOTS programmes. Counting all smear-positive cases, the case detection rate in the Region of the Americas exceeded 70% (Table 11, Figure 15a). Counting all new cases, the overall case detection rate in Europe was 68% (Figure 15b).

Estimates of the case detection rates for individual countries suggest that 67 countries met the 70% target by the end of 2005. Of the additional new smear-positive cases reported by DOTS programmes in 2005 (compared with 2004), 39% were in China and 17% were in India (Figure 16). China and India have made big improvements in case detection in recent years, but these two countries still accounted for an estimated 28% of all undetected new smear-positive cases in 2005. However, in 2005, Nigeria had succeeded China as the second largest reservoir of undetected cases. These three countries are among eight that together accounted for 59% of all cases not detected by DOTS programmes in 2005 (Figure 17).

Outcomes of treatment

More than two million new smear-positive cases were registered for treatment in DOTS programmes in 2004, approximately the same number that were notified that year (Table 12). Discrepancies between the numbers of cases notified and registered for treatment were small globally, by region and for most HBCs. The largest proportional difference between notified and registered cases was reported by the Russian Federation.

The cure rate among cases registered under DOTS worldwide was 77%, and a further 7% completed treatment (no laboratory confirmation of cure), giving a reported, overall treatment success rate of 84%, i.e. 1% below the 85% target set for the 2004 cohort (evaluated by

FIGURE 17

Smear-positive TB cases undetected by DOTS programmes in eight high-burden countries, 2005. Numbers above the bars indicate the proportion of all missed cases which were missed by each country.

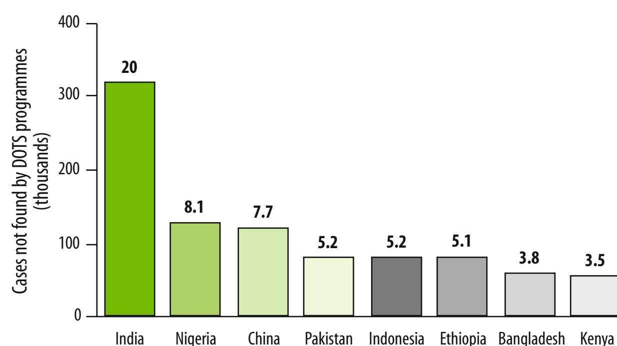


TABLE 12

Treatment outcomes for new smear-positive cases, DOTS strategy, 2004 cohort

	NOTIFIED	REGISTERED[a]	REGST'D (%)	TREATMENT OUTCOMES (%)[a] CURED	COMPLETED TREATMENT[a]	DIED	FAILED	DEFAULTED	TRANS-FERRED	NOT EVAL'D	TREATMENT SUCCESS (%)	% EST[a] CASES SUCCESSFULLY TREATED UNDER DOTS
1 India	465 518	465 518	100	84	2.3	4.4	2.4	6.6	0.4	0.0	86†	49
2 China	377 546	377 546	100	91	2.5	1.7	1.0	1.0	0.9	1.6	94†	59
3 Indonesia	128 981	128 981	100	81	8.2	2.5	1.1	5.0	1.7	0.0	90†	48
4 Nigeria	33 755	33 755	100	62	12	6.3	2.4	12	1.9	4.3	73	16
5 Bangladesh	62 694	62 694	100	88	1.2	3.8	0.7	2.8	2.4	0.6	90†	39
6 Pakistan	33 746	33 152	98	70	12	2.8	0.8	11	3.8	0.2	82	22
7 South Africa	120 977	120 977	100	54	15	7.4	1.5	11	6.2	4.5	70	73
8 Ethiopia	41 430	41 430	100	64	15	6.2	0.7	4.7	5.0	4.0	79	29
9 Philippines	78 163	78 163	100	79	7.7	2.3	1.0	4.7	2.5	2.8	87†	63
10 Kenya	41 167	41 167	100	69	11	5.0	0.2	7.0	5.1	2.3	80	38
11 DR Congo	62 192	62 192	100	79	5.5	5.9	1.1	4.8	2.9	0.5	85	60
12 Russian Federation	9 926	7 108	72	55	3.7	14	14	9.8	4.4	0.0	59	5.5
13 Viet Nam	58 394	58 370	100	91	2.1	3.3	0.9	1.4	1.7	0.0	93†	82
14 UR Tanzania	25 823	25 823	100	78	3.1	10	0.3	3.6	4.7	0.1	81	37
15 Brazil	22 532	22 532	100	46	35	5.4	0.6	7.9	4.6	0.5	81	37
16 Uganda	20 986	20 986	100	31	39	6.6	0.5	17	5.5	0.3	70	33
17 Thailand	28 421	28 421	100	70	3.9	8.6	1.7	6.1	3.8	5.4	74	52
18 Mozambique	17 058	17 058	100	75	1.3	13	1.1	7.2	2.3	0.1	77	36
19 Myanmar	31 408	31 413	100	75	8.3	5.5	2.2	6.2	2.5	0.0	84	69
20 Zimbabwe	14 581	14 581	100	50	4.6	12	1.7	7.6	9.4	15	54	24
21 Cambodia	18 978	18 978	100	89	2.6	4.0	0.2	2.3	2.0	0.0	91†	55
22 Afghanistan	8 273	9 976	121	79	10	3.0	1.8	2.7	3.4	0.0	89†	39
High-burden countries	**1 702 549**	**1 700 821**	**100**	**80**	**6.1**	**4.2**	**1.5**	**5.3**	**2.1**	**1.3**	**86†**	**47**
AFR	537 591	538 641	100	62	12	7.0	1.3	9.4	4.9	3.1	74	38
AMR	99 991	96 613	97	60	19	5.0	1.1	6.1	3.2	5.0	80	48
EMR	96 769	98 426	102	72	11	2.9	1.2	7.7	2.7	2.8	83	32
EUR	52 286	48 471	93	59	14	6.8	6.7	6.5	2.9	3.4	74	18
SEAR	755 479	755 489	100	83	3.6	4.2	2.0	5.9	1.1	0.3	87†	49
WPR	564 871	566 238	100	87	3.9	2.3	1.0	1.7	1.4	2.5	91†	59
Global	**2 106 987**	**2 103 878**	**100**	**77**	**7.3**	**4.4**	**1.6**	**5.8**	**2.4**	**2.0**	**84**	**46**

Values over 10 shown as whole numbers.

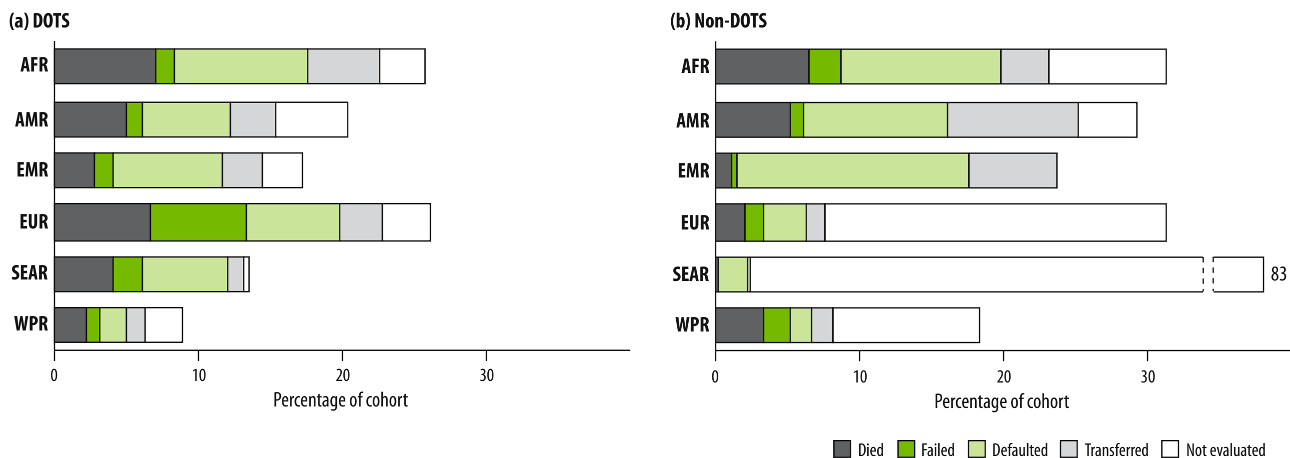
a Cohort: cases diagnosed during 2004 and treated/followed-up through 2005. See Table 5 and accompanying text for definitions of treatment outcomes. If the number registered was provided, this (or the sum of the outcomes, if greater) was used as the denominator for calculating treatment outcomes. If the number registered was missing, then the number notified (or the sum of the outcomes, if greater) was used as the denominator. Est: estimated cases for 2004 (as opposed to notified or registered).

† Treatment success ≥ 85% (treatment success for DR Congo 84.8%).

Laboratory-confirmed notifications from Israel and USA included here under smear-positive notifications.

FIGURE 18

Outcomes for those patients not successfully treated in (a) DOTS and (b) non-DOTS areas, by WHO region, 2004 cohort



the end of 2005; Table 12). An estimated 46% of all smear-positive cases arising in 2004 were treated successfully by DOTS programmes. Of all patients treated under DOTS, 10% had no reported outcome (defaulted, transferred, not evaluated). Treatment results for 11 consecutive cohorts (1994–2004) of new smear-positive patients show that the success rates have been 80% or more in DOTS areas since 1998, even though the number of patients has increased from 240 000 in 1994 to over 2 million in 2004 (Tables 12, 13).

The differences in treatment outcomes among WHO regions were similar to those reported in previous years. Documented treatment success rates by DOTS programmes varied from 74% in Europe and Africa, to 87% in South-East Asia and 91% in the Western Pacific, the latter two regions having exceeded the 85% target (Table 12, Figure 18). Death during treatment was most common in the African Region (7%), where a higher fraction of cases are HIV-positive, and in the European Region (7%), where a higher fraction of cases are drug resistant (eastern Europe) or occur among the elderly (western and central Europe). Treatment interruption (default) was most frequent in the African Region (9%) and the Eastern Mediterranean Region (8%). Transfer without follow-up was also especially high in the African Region (5%). Treatment failure was conspicuously high in the European Region (7%), mainly because failure rates were high in eastern Europe.

DOTS treatment success reached or exceeded 85% in eight HBCs (Table 12), and in 57 countries in total. It was under 60% in Zimbabwe and the Russian Federation, and 90% or more in Cambodia, China, and Viet Nam. Treatment results for individual African countries once again point to the effects of HIV and inadequate patient support: cohort death rates were more than 7% in Mozambique, South Africa, UR Tanzania and Zimbabwe. HIV may also have contributed to the high death rate in Thailand (7%) although, among Asian countries, Thailand has a relatively high proportion of elderly patients (Annex 1).

Treatment outcomes are also poor in some African

TABLE 13

Treatment success for new smear-positive cases (%), 1994–2004 cohorts[a]

		DOTS PROGRAMMES										
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
1	India	83	79	79	82	84	82	84	85	87	86	86
2	China	94	96	96	96	97	96	95	96	93	94	94
3	Indonesia	94	91	81	54	58	50	87	86	86	87	90
4	Nigeria	65	49	32	73	73	75	79	79	79	78	73
5	Bangladesh	73	71	72	78	80	81	83	84	84	85	90
6	Pakistan	74	70	–	67	66	70	74	77	77	75	82
7	South Africa	–	–	69	73	74	60	66	65	68	67	70
8	Ethiopia	74	61	73	72	74	76	80	76	76	70	79
9	Philippines	80	–	82	83	84	87	88	88	88	88	87
10	Kenya	73	75	77	65	77	78	80	80	79	80	80
11	DR Congo	71	80	48	64	70	69	78	77	78	83	85
12	Russian Federation	–	65	62	67	68	65	68	67	67	61	59
13	Viet Nam	91	91	90	85	93	92	92	93	92	92	93
14	UR Tanzania	80	73	76	77	76	78	78	81	80	81	81
15	Brazil	–	–	–	–	91	89	73	67	75	83	81
16	Uganda	–	–	33	40	62	61	63	56	60	68	70
17	Thailand	–	–	78	62	68	77	69	75	74	73	74
18	Mozambique	67	39	54	67	–	71	75	78	78	76	77
19	Myanmar	–	66	79	82	82	81	82	81	81	81	84
20	Zimbabwe	–	–	–	–	70	73	69	71	67	66	54
21	Cambodia	84	91	94	91	95	93	91	92	92	93	91
22	Afghanistan	–	–	–	45	33	87	86	84	87	86	89
High-burden countries		**87**	**83**	**78**	**81**	**83**	**81**	**84**	**84**	**83**	**84**	**86**
	AFR	59	62	57	63	70	69	72	71	73	73	74
	AMR	77	77	83	82	81	83	81	82	83	83	80
	EMR	82	87	86	79	77	83	83	83	83	82	83
	EUR	68	69	72	72	76	77	77	75	76	75	74
	SEAR	80	74	77	72	72	73	83	84	85	85	87
	WPR	90	91	93	93	95	94	92	93	90	91	91
Global		**77**	**79**	**77**	**79**	**81**	**80**	**82**	**82**	**82**	**83**	**84**

– Indicates not available.

[a] See notes for Table 12.

TABLE 14

Re-treatment outcomes for smear-positive cases, DOTS strategy, 2004 cohort[a]

	REGISTERED	TREATMENT OUTCOMES (%)							TREATMENT SUCCESS (%)
		CURED	COMPLETED TREATMENT	DIED	FAILED	DEFAULTED	TRANS-FERRED	NOT EVAL'D	
1 India	196 726	50	23	6.9	4.5	15	0.7	0.1	73
2 China	106 741	84	5.5	2.6	2.7	1.6	1.1	2.9	89†
3 Indonesia	4 429	62	20	4.4	3.2	6.6	4.1	0.0	82
4 Nigeria	3 421	62	11	8.8	4.7	12	1.6	0.1	73
5 Bangladesh	4 305	76	5.1	4.0	2.8	5.9	4.2	1.9	81
6 Pakistan	5 079	63	14	3.8	2.2	12	4.6	0.0	78
7 South Africa	53 511	27	29	12	2.4	17	6.8	6.2	56
8 Ethiopia	3 197	38	16	8.8	2.2	4.6	3.3	27	54
9 Philippines	3 498	41	12	3.8	5.3	5.7	4.2	28	53
10 Kenya	3 646	66	10	11	0.7	6.6	5.4	0.0	76
11 DR Congo	5 463	67	4.4	8.9	4.6	5.3	4.6	5.6	71
12 Russian Federation	3 011	35	3.6	15	26	15	5.4	0.0	39
13 Viet Nam	7 438	80	4.3	5.7	4.8	3.0	2.4	0.0	84
14 UR Tanzania	4 953	36	40	14	0.5	4.0	4.7	1.0	76
15 Brazil	5 029	25	27	7.2	1.2	16	9.2	15	51
16 Uganda	1 592	30	38	7.7	0.8	12	4.8	6.7	68
17 Thailand	2 240	51	5.3	10	6.0	6.6	4.4	17	56
18 Mozambique	–	–	–	–	–	–	–	–	–
19 Myanmar	6 012	60	14	9.0	5.2	7.9	4.1	0.0	74
20 Zimbabwe	6 931	28	25	11	3.5	5.6	4.6	22	53
21 Cambodia	912	71	15	5.8	1.2	3.7	3.6	0.0	86†
22 Afghanistan	–	–	–	–	–	–	–	–	–
High-burden countries	**428 134**	**56**	**18**	**6.6**	**3.7**	**11**	**2.2**	**2.7**	**74**
AFR	96 827	36	24	11	2.6	13	5.8	8.0	60
AMR	11 640	41	18	6.4	2.9	14	6.2	12	59
EMR	10 654	58	16	4.5	3.3	10	3.8	4.1	74
EUR	25 159	33	20	10	11	12	3.9	10	52
SEAR	226 364	52	22	6.7	4.8	14	1.1	0.3	73
WPR	126 075	80	6.1	3.0	2.9	2.0	1.7	4.5	86†
Global	**496 719**	**55**	**18**	**6.8**	**4.1**	**10**	**2.5**	**3.7**	**73**

– Indicates not available.
† Treatment success ≥ 85%
[a] See notes for Table 12.

countries because many patients are lost to follow-up: more than 10% of patients had no recorded outcome in Ethiopia, Kenya, Nigeria, South Africa, Uganda and Zimbabwe (Table 12). The same was true of Brazil, Pakistan, the Philippines and the Russian Federation. Large numbers of patients completed treatment without confirming cure (a final, negative sputum smear) in Brazil (35%) and Uganda (39%).

A total of 496 719 patients were reported to have been re-treated under DOTS in 2004 (Table 14). While some patients remained on treatment (included with those not evaluated), the re-treatment success rate by the end of 2005 was 73%.

When the three registration categories (re-treatment after relapse (post cure), failure and default) are distinguished and compared with new TB patients, three patterns appear. First, the treatment success was lower on average for re-treatment (73%) than for new cases (84%) (Tables 12, 14). In the 2004 cohort of re-treated patients, re-treatment success was higher post-relapse than post-default in eight out of eight HBCs that provided data, and higher post-default than post-failure in four out of seven HBCs (Annex 2). Second, patients who defaulted from their first course of treatment tended to default when treated again. In all eight HBCs that submitted data, patients who were re-treated after default did not complete the subsequent course of treatment more often than patients who were re-treated after relapse or failure. Third, the regional distribution of adverse re-treatment outcomes resembled the pattern observed for new cases. For example, countries in the African Region reported high death rates (11%; Table 14). Countries in the European Region reported high rates of death (10%) and treatment failure (11%). Re-treatment success was much lower than 85% in all regions except the Western Pacific.

For non-DOTS areas, only five of the 12 HBCs that do not have full DOTS coverage provided treatment results for new smear-positive patients in the 2004 cohort. In

India, 93% of 23 677 patients were not evaluated. In China, 91% of 7340 patients were treated successfully. Brazil, the Russian Federation and South Africa reported treatment success rates of 70% (of 20 349 patients), 61% (of 18 570) and 55% (of 5921), respectively.

Meeting targets for case detection and cure – results by country, region and worldwide

The data and estimates in this report suggest that the world as a whole narrowly failed to meet the targets for case detection (60%/70%) and treatment success (84%/85%). Both targets were reached in the Western Pacific Region, and the South-East Asia Region achieved more than 85% treatment success. All other WHO regions missed both targets. The European Region performed worst on both indicators.

Data on both treatment success and case detection were provided by 187 DOTS countries. Case detection exceeded 50%, and treatment success exceeded 70%, in 85 countries (Figure 19). Of these countries, 26 appear to have reached both WHO targets. They include the HBCs China, the Philippines and Viet Nam (Figure 19, 20). Of 164 countries that provided data for both the 2003 and the 2004 cohorts, 87 (53%) showed higher treatment success rates for the 2004 cohort, and 59 of 177 (33%) improved case detection by more than 5% between 2004 and 2005.

The country profiles in Annex 1 give more details of progress in each of the 22 HBCs. Annex 2 tabulates case detection and treatment success rates by country over the 11 years for which data are available.

FIGURE 19

DOTS status in 2005, countries close to targets. 85 countries reported treatment success rates 70% or over and DOTS detection rates 50% or over. 26 countries (including 1 country out of range of graph) have reached both targets; 1 in the African Region, 4 in the Region of the Americas, 5 in the Eastern Mediterranean Region, 5 in the European Region, 3 in the South-East Asia Region and 8 in the Western Pacific Region.

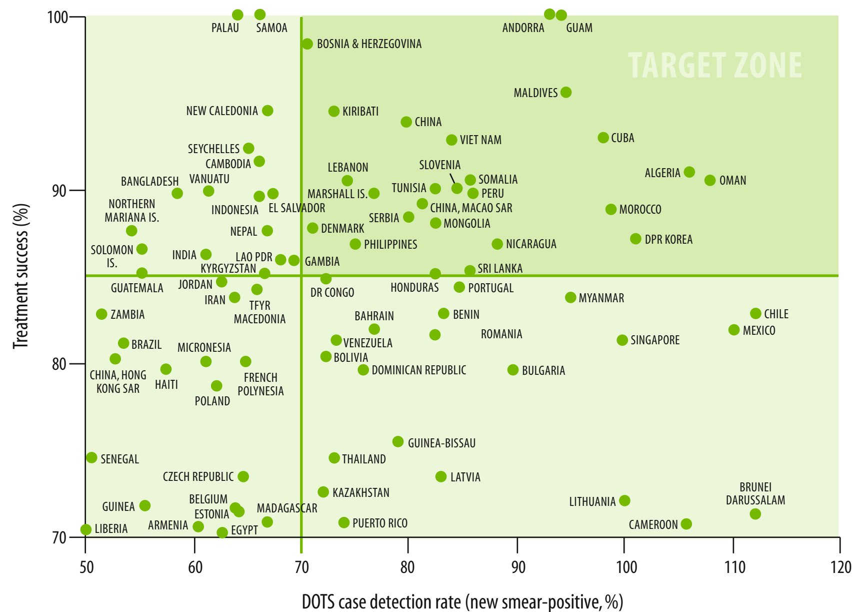
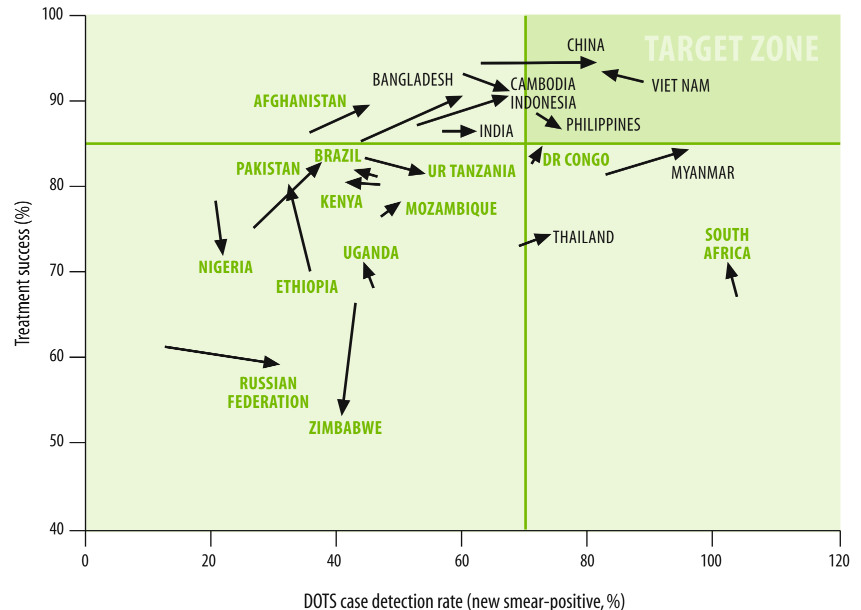


FIGURE 20

DOTS progress in high-burden countries, 2004–2005. Treatment success refers to cohorts of patients registered in 2003 or 2004, and evaluated, respectively, by the end of 2004 or 2005. Arrows mark progress in treatment success and DOTS case detection rate. Countries should enter the graph at top left, and proceed rightwards to the target zone. Countries from AFR, AMR and EMR are shown in green, those from SEAR and WPR are shown in black.



Progress towards the Millennium Development Goals

Trends in incidence, prevalence and mortality

With the 8.8 million new incident TB cases in 2005, there were 14.1 million prevalent cases (217/100 000) on average (Table 9). An estimated 1.6 million people (24/100 000) died from TB in 2005, including those coinfected with HIV (195 000). The sequence of annual estimates suggests that all three major indicators – incidence, prevalence and mortality rates – are now falling globally. Prevalence was already in decline by 1990, mortality peaked before the year 2000, and incidence has begun to fall since 2003 (Figure 21). TB prevalence continued to fall globally between 1990 and 2005 because, in Africa, HIV caused a smaller increase in prevalence than in incidence or mortality. In addition,

FIGURE 21

Estimated global prevalence, mortality and incidence rates, 1990–2005. Note the different scales on y-axes.

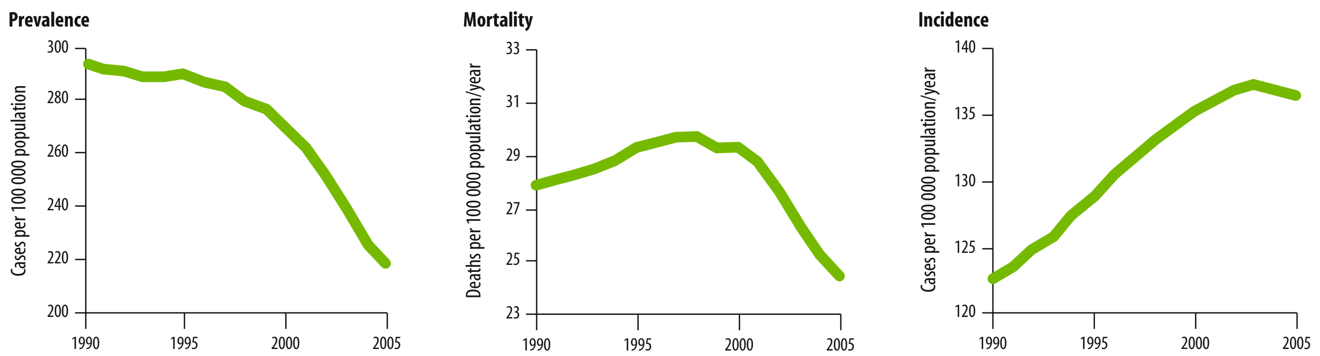
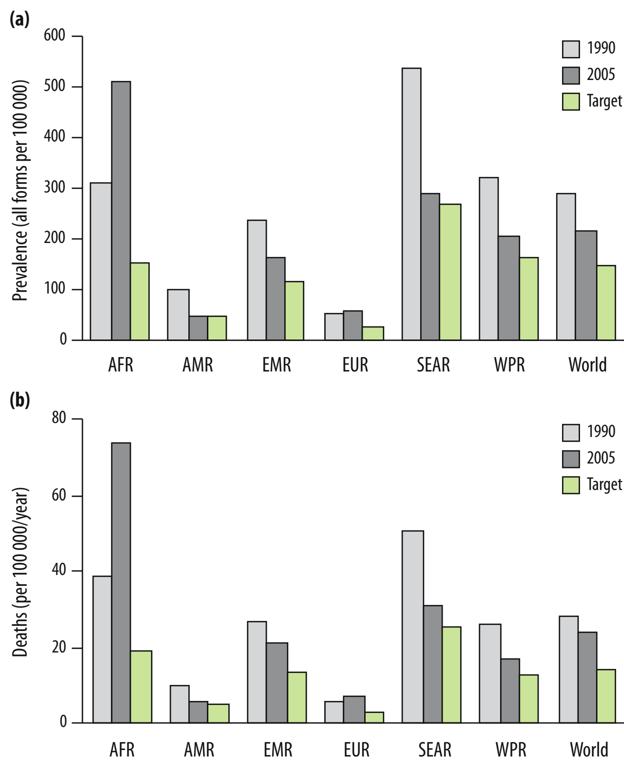


FIGURE 22

Estimated TB prevalence (a) and death rates (b), by WHO region, for the MDG baseline year 1990, for 2005, and compared with the MDG target for 2015



in Asia, our calculations suggest that DOTS has reduced prevalence more than incidence or mortality.

The fall in the global incidence rate, if confirmed by further monitoring, satisfies MDG 6, target 8. The targets set by the Stop TB Partnership – to halve prevalence and death rates by 2015 (compared with levels in 1990) – are more demanding but have, perhaps, almost been reached in the Region of the Americas (Figure 22).[1] Prevalence and death rates have fallen in South-East Asia and the Western Pacific Region at rates that will, if maintained, reach the targets by 2015. In the Eastern Mediterranean Region, both indicators are falling, but too slowly to meet the 2015 targets.

In line with the trends in incidence (Figure 7), prevalence and death rates increased in the African and European regions between 1990 and 2005, but most dramatically in the former. Estimates for these two regions in 2005 are very much larger than the 2015 target values. The combined data from all regions suggest that the world as a whole will not meet the 2015 targets at the current rate of progress.

Epidemic trends and the age distribution of TB cases

The specific effects on TB epidemiology of HIV infection, drug resistance, the impact of DOTS and other phenomena cannot easily be disentangled in routinely collected data. One of several reasons is that the time series of case notifications do not always reflect underlying trends in incidence. The true incidence and its trend may be obscured by the variable effort given to case-finding, by changing diagnostic procedures and by fluctuations in the consistency of reporting. However, the age distribution of notified cases is less susceptible to the vagaries of reporting, and trends in the age of TB cases are more likely to reflect underlying epidemiological processes.

Case reports from Viet Nam show no decline in the overall notification rate, even though the NTP has met the WHO targets for case detection and cure for more

[1] See also: *Health situation in the Americas – basic indicators.* Washington D.C., Pan American Health Organization, 2006 (PAHO/HDM/HA/06.01).

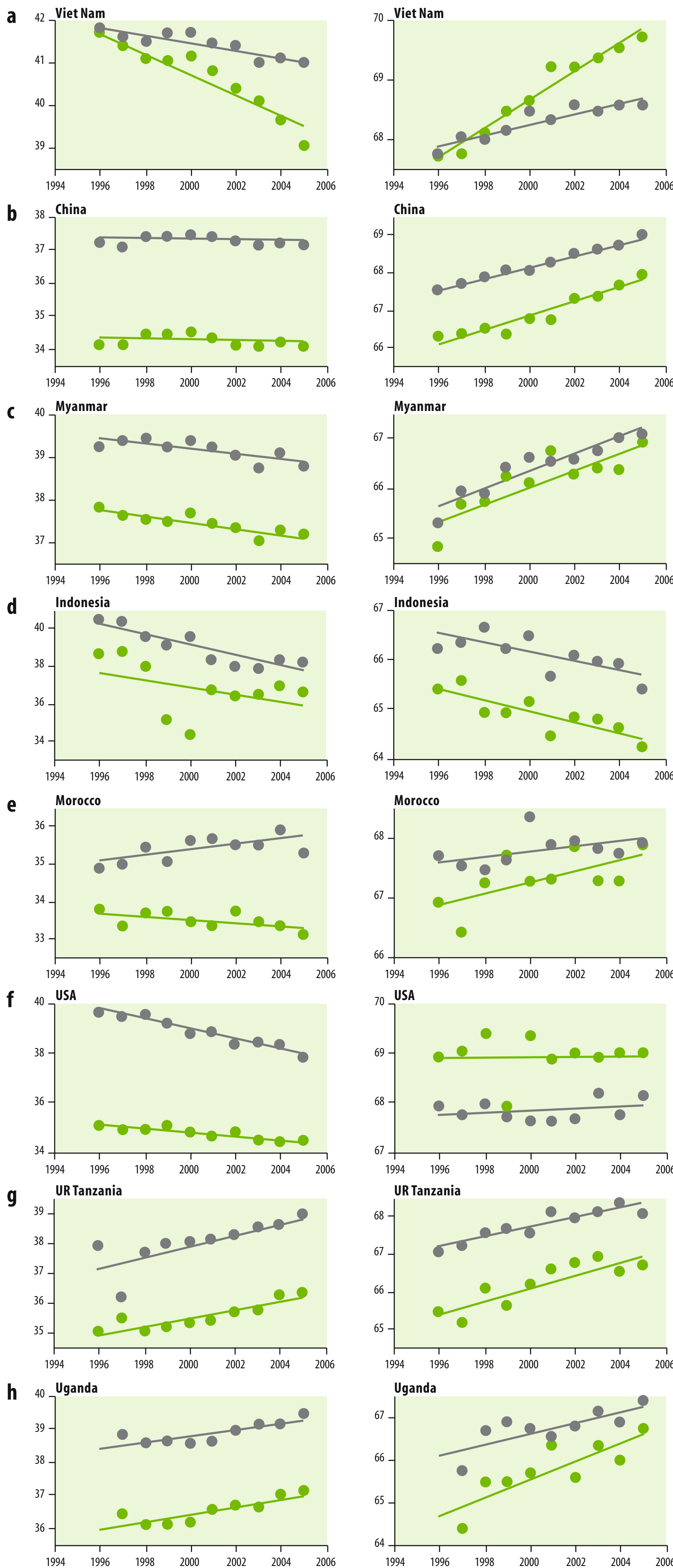


FIGURE 23

Average age of men (grey circles) and women (green circles) aged 15–54 years (left) and ≥55 years (right) with sputum smear-positive TB, notified under DOTS, 1996–2005. The effects of demographic change have been removed by calculating averages from the case notification rates per capita within each age class.

than a decade (Annex 2). Figure 23a reveals that, while the average age of older men and women with TB (≥55 years) has been rising, as expected when transmission is in decline, the average age of TB patients aged 15–54 years has been falling (left). The same is true in Myanmar (Figure 23b), and in Bangladesh, Sri Lanka and Thailand (not shown). Data from China show that new TB patients aged 55 years and over are getting older on average each year, but this is not true for younger patients (Figure 23c). In Viet Nam, the changes have been faster for women than men, opening up an age gap between male and female patients that already existed during the 1990s in Myanmar, and which has persisted until 2005.

The spread of HIV infection is one possible reason for the shift towards younger adults in these Asian countries. Another is that transmission is continuing among younger adults but not among the elderly. In Viet Nam, the shift is due to an increase in case notification rates among 15–24 years-olds (especially men), coupled with a fall in notifications among people aged 25–54 years (especially women). In Indonesia, the average age of men and women with TB has been falling in both younger and older age classes (Figure 22d). This suggests an explanation other than HIV, at least for people aged 55 years and over. In Morocco, the average age of men with TB aged 15–54 years is increasing, while for women it is decreasing (Figure 23e).

The average age of TB patients is also falling among people aged 15–54 years in the United States of America (Figure 23f). The most likely explanation is the growing proportion of cases among immigrants, although it may be reinforced by the age shift in some high-burden countries. During the period 2001–2005, Viet Nam (Figure 23a) was ranked third (behind Mexico and the Philippines) as a source of TB patients born outside the USA.[1]

In UR Tanzania and Uganda (Figure 23g, h), by contrast, the average TB patient is getting older in both age classes. This finding for younger men and women is consistent with, but not proof of, the view that the HIV epidemics are in decline in these countries[2] and that, as a consequence, TB incidence was stable or falling by 2005.

Stop TB Strategy: implementation and planning (2005–2007)

For the first time in 2006, countries were asked specific questions related to the six components of the WHO Stop TB Strategy, which was formally launched early in the year (Table 2). All HBCs have embraced the strategy to some degree and have been implementing diverse activities to achieve full DOTS expansion, to consolidate the gains made in previous years and to begin addressing the remaining challenges. The progress made by countries, and especially by the 22 HBCs, in implementing the Stop TB Strategy was evident from their responses to the questionnaire. These are presented in detail in Annex 2, and summarized below under the various components and subcomponents of the Strategy. Component 1e, concerned with monitoring and evaluation, is covered under **Monitoring progress in TB control**.

1. Pursue high-quality DOTS expansion and enhancement

a. Political commitment

The development of NTP strategic plans in line with *The Global Plan to Stop TB, 2006–2015* is one indicator of sustained political commitment. A total of 18 HBCs reported having such plans, mostly covering the period 2006–2010, with the exception of Brazil (2004–2007), India (2006–2011), Pakistan (2005–2010), the Russian Federation (2007–2011) and Thailand (2006–2015). While Ethiopia's plan was still under development, South Africa, UR Tanzania and Zimbabwe did not have country plans in line with the Global Plan at the time of reporting. A more rigorous assessment of the extent to which country plans are in line with the Global Plan is provided under **Financing TB control** and in Annex 1.

Human resource development

HRD for comprehensive TB control was included in regional strategic plans for TB control 2006–2010 in the African, Americas, South-East Asia and Western Pacific regions, although the level of detail varies considerably. At the end of 2006, the plan for the European Region was under preparation. In the Eastern Mediterranean Region, HRD was included in the TB/HIV strategic plan for 2006–2010, with details for other components not yet finalized.

A total of 15 HBCs reported having a comprehensive HRD plan for TB control (Annex 2). Of the 7 HBCs with no plan, both China and Mozambique had plans under development. In the Russian Federation, HRD has been described briefly in both the World Bank loan and the GFATM grant, but has not been fully developed. Kenya had not developed an HRD plan by the end of 2006. In Uganda, HRD was not directly under the control of the NTP. In UR Tanzania and Zimbabwe, TB control has been integrated with the delivery of other health services and there was no separate HRD plan for TB. Twelve countries reported that their HRD plans were linked and coordinated with national human resources for health plans.

In the 15 HBCs with HRD plans, all have included training and staffing needs for DOTS enhancement and sustainability, together with collaborative TB/HIV activities. Ten have incorporated training and staffing needs for MDR-TB, and 13 included training and staffing needs for PPM.

A total of 17 countries had a staff member at the central level specifically for HRD work, and in 9 countries this

[1] *Reported tuberculosis in the United States, 2005*. Atlanta GA, Centers for Disease Control and Prevention, 2005.
[2] *AIDS epidemic update: December 2006*. Geneva, UNAIDS/WHO, 2006.

person worked on HRD full-time (Bangladesh, Brazil, Ethiopia, India, Indonesia, Nigeria, Pakistan, South Africa, Viet Nam). Some 19 HBCs had job descriptions for HRD positions, which were distributed and known to all staff.

Seven HBCs reported that all peripheral-level health care units had at least one health-care professional trained on TB; 10 countries reported that some units did not have a trained professional. Training on TB control, following NTP guidelines, was included in the basic training of doctors in 19 of the 22 HBCs (all but Ethiopia, Pakistan and Uganda) and was a part of the nursing curricula in 17 HBCs.

b. Case detection through quality-assured bacteriology

Table 15 summarizes information on laboratory services in HBCs. Although there has been improvement in the geographical coverage of laboratory services, these services need to be strengthened in several countries. For example, six HBCs reported not having a fully functional national reference laboratory (Table 15).

In terms of coverage, there has also been an improvement in EQA for smear microscopy in recent years. However, these efforts still need to be intensified, especially in the Region of the Americas, and in the Eastern Mediterranean and European regions. The data reported to WHO were incomplete but, in each of these regions, less than half of the smear microscopy centres appear to have been included in the EQA programme. Only nine HBCs reported EQA coverage exceeding 50% of designated laboratories. Similarly, while all 22 HBCs had plans for laboratory supervision, only half of them implemented these plans during 2006. Laboratory supervision was uneven in the remaining half.

Regarding culture facilities, there were also large gaps in the information reported to WHO. Brazil, Cambodia, China, South Africa, Thailand and Viet Nam were exceptional in reporting good coverage of culture facilities, i.e. exceeding the minimum of one culture facility per five million population. However, over half of the populations in the African, South-East Asia and Western Pacific regions had limited coverage of culture services. India had only five laboratories linked to the NTP that provided a culture service, and only these five were able to do DST. Most countries had neither national policies to expand culture and DST services nor the technical capacity to implement and support such services.

Lack of staff, problems of transportation and inadequate funding, including that for technical assistance, were reported to be the major barriers for HBCs to operate or strengthen quality-assured laboratory services.

TABLE 15

Coverage of laboratory services, high-burden countries, 2005

				ACCESS TO DIAGNOSTIC SERVICES						LABORATORIES INCLUDED IN EXTERNAL QUALITY ASSURANCE (EQA) FOR SPUTUM SMEAR MICROSCOPY	
				SPUTUM SMEAR		CULTURE		DST			
	COUNTRY	POPULATION THOUSANDS	NATIONAL REFERENCE LABORATORY (NRL)	NUMBER OF LABS	PER 100 000 POP	NUMBER OF LABS	PER 5 MILLION POP[a]	NUMBER OF LABS	PER 10 MILLION POP[a]	NUMBER	%
1	India	1 103 371	Y	11 813	1.1	5	0.02	5	0.05	11 813	100
2	China	1 315 844	Y	3 240	0.2	327	1.2	187	2.5	2 904	90
3	Indonesia	222 781	N (one acting)	3 320	1.5	41	0.9	22	1.8	3 294	99
4	Nigeria	131 530	Y	598	0.5	3	0.1	3	0.2	209	35
5	Bangladesh	141 822	Y	635	0.4	2	0.1	0	0.1	26	4.1
6	Pakistan	157 935	Y (weak)	982	0.6	3	0.1	0	0.2	312	32
7	South Africa	47 432	N	143	0.3	18	1.9	18	3.8	0	0
8	Ethiopia	77 431	Y	607	0.8	1	0.1	1	0.1	1 778	limited
9	Philippines	83 054	Y	1 858	2.2	3	0.2	3	0.4	491	26
10	Kenya	34 256	Y (weak)	619	1.8	3	0.4	3	0.9	90	15
11	DR Congo	57 549	Y	1 041	1.8	1	0.1	1	0.2	1 041	100
12	Russian Federation	143 202	Y	4 953	3.5	–	–	–	–	–	limited
13	Viet Nam	84 238	Y	875	1.0	30	1.8	2	3.6	756	86
14	UR Tanzania	38 329	Y	690	1.8	3	0.4	1	0.8	690	100
15	Brazil	186 405	Y	4 000	2.1	187	5.0	33	10	1 800	45
16	Uganda	28 816	Y (weak)	465	1.6	2	0.3	2	0.7	203	44
17	Thailand	64 233	Y	846	1.3	40	3.1	8	6.2	846	100
18	Mozambique	19 792	Y	252	1.3	1	0.3	1	0.5	252	100
19	Myanmar	50 519	Y	310	0.6	2	0.2	1	0.4	14	4.5
20	Zimbabwe	13 010	Y	167	1.3	1	0.4	1	0.8	10	6.0
21	Cambodia	14 071	Y	186	1.3	3	1.1	1	2.1	186	100
22	Afghanistan	29 863	N	435	1.5	0	0	0	0	0	0

– indicates not available; labs, laboratories; pop, population.

[a] To provide culture for diagnosis of paediatric, extrapulmonary and ss-/HIV+ TB, as well as DST for re-treatment and failure cases, most countries will need one culture facility per 5 million population and one DST facility per 10 million population. However, for countries with large populations (numbers shown it italics), one laboratory for culture and DST in each major administrative area (e.g. province) may be sufficient. See also footnote g in country profiles (Annex 1).

c. *Standardized treatment, with supervision and patient support*

All 22 HBCs, and 171 of 176 responding countries, used standardized, short-course chemotherapy in DOTS units; 149 of 178 responding countries routinely used directly observed therapy (DOT) during the initial phase of treatment. In the Russian Federation, South Africa, Thailand, Uganda and Zimbabwe, some DOTS units were not using DOT during the initial phase of treatment.

A total of 159 countries, and all HBCs provided anti-TB drugs free of charge to all patients treated with Category I regimens under DOTS; 129 countries responding to the questionnaire, and all HBCs except Brazil and Zimbabwe, reported that they used the WHO-recommended Category I regimen. Only 20 out of 37 responding NTPs in the European region said that they used the recommended Category I regimen.

Treatment with Category I regimen for six months was reportedly used in 91 countries worldwide; 31 reported that they used an eight-month regimen; 21 of the countries that used an eight-month Category I regimen, notably those in the African Region, said that they had plans to change to the six-month regimen.

d. *An effective drug supply and management system*

Uninterrupted provision of quality-assured anti-TB drugs is central to effective TB control. All WHO regions reportedly had at least one country (16 countries in Africa) facing a stock-out of first line drugs at the central or peripheral levels (basic TB management units). Africa reported that 22% of countries suffered a peripheral-level anti-TB drug stock-out during 2005. Fourteen countries in Africa had a stock-out of first-line drugs at the central level (Annex 2). HBCs reporting a stock-out of any first-line drug at the peripheral level were China, DR Congo, India, Mozambique, Thailand, Uganda and Zimbabwe (Annex 2).

The Stop TB Strategy recommends the use of drugs in fixed-dose combinations (FDCs) in the treatment of TB. During 2006, only 44 countries were using four-drug FDCs in the initial phase and two-drug FDCs in the continuation phase of treatment. The South-East Asia Region had the highest proportion of countries (5/11) using FDCs (Annex 1). Nine HBCs (41%) were using patient kits for drugs, including seven with FDCs: Afghanistan, Brazil, Indonesia, Kenya, Nigeria, the Philippines and Viet Nam. A total of 17 HBCs had in place mechanisms for the quality control of anti-TB drugs.

2. Address TB/HIV, MDR-TB and other challenges

Implement collaborative TB/HIV activities

The association between HIV and TB has been known almost since the start of the HIV-epidemic, but programmes to implement collaborative TB/HIV activities have been developed only in the past five years. Now, with the increasing availability of antiretroviral drugs, and the support of international donors and technical agencies, the number of countries that have policies to implement collaborative TB/HIV activities is increasing rapidly, especially in the African Region (Figure 24).

Of the 63 TB/HIV focus countries, 60 provided data to WHO in 2005. Figure 24 shows that, of those that provided data, between 58% and 71% had appointed a TB/HIV focal point in the NTP, had developed a national plan for implementing collaborative TB/HIV activities, had a national policy of HIV counselling and testing for all TB

FIGURE 24

Development of policies for TB/HIV collaboration; for diagnosing and treating HIV in TB patients; and for diagnosing, treating and preventing TB in people infected with HIV, 2002–2005. Data for those countries that were sent detailed questionnaires about collaborative TB/HIV activities (35 countries in 2002, 36 in 2003, 41 in 2004, and 63 in 2006). Dark portion of each bar shows the number of countries with each type of policy among those 32 countries that provided data for all 4 years. Shown are the numbers of countries with a nominated person in the NTP responsible for collaborative TB/HIV activities (focal person), a national body responsible for coordinating TB/HIV activities (coordination), a national plan for such activities (plan), a national surveillance system to measure the prevalence of HIV in TB patients (surveillance), a policy to offer HIV counselling and testing to TB patients, a policy to offer CPT to HIV-infected TB patients (CPT), a policy to offer ART to HIV-infected TB patients (ART), a policy of intensified case-finding by screening people with HIV for TB annually (ICF), a policy to offer IPT to people with HIV, and a policy for controlling the spread of TB in congregate settings (infection control).

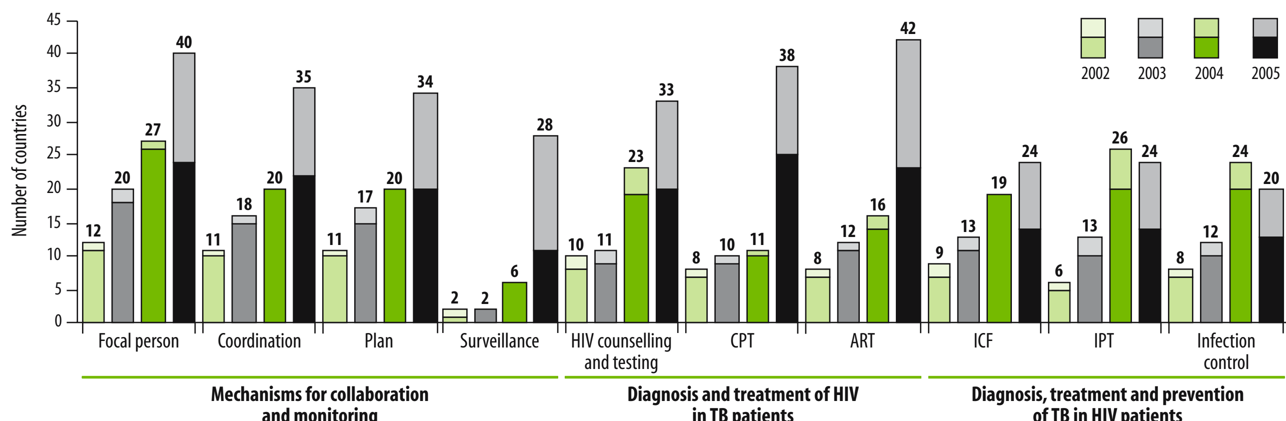
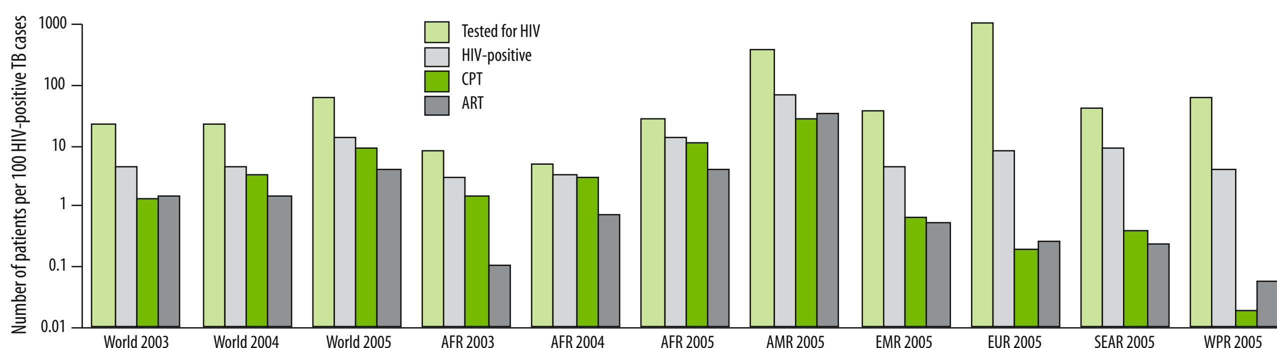


FIGURE 25

Diagnosis and treatment of HIV in TB patients, globally and in the African Region, 2003–2005, and in other WHO regions, 2005.
TB patients tested for HIV, that were found to be HIV-positive, that were given CPT, and that started ART, for every 100 estimated HIV-positive TB cases.



patients, and had a national policy to provide CPT and ART to HIV-positive TB patients. However, fewer countries had policies and procedures for diagnosing (through screening, ICF), treating and preventing TB (IPT) in people infected with HIV. Only 34–41% had policies on intensified TB case-finding among HIV-positive people, to provide IPT to people who are HIV-positive but who do not have active TB, and on infection control to minimize the spread of TB among HIV-positive people. Figure 24 also shows that only 47% had a system for HIV surveillance among TB patients.

Table 16, and Figure 26, show the number of TB patients tested for HIV, and the numbers testing HIV-positive, started on CPT, ART and IPT, how the numbers varied among regions, and how they changed between 2003 and 2005. For every 100 adult (15–49 years) HIV-positive TB cases in the world, estimated as described in the **Methods**, 59 TB patients were tested for HIV in 2005 (Figure 25; this index is expected to be greater than 100). The highest testing rates were in the European Region, which has the lowest incidence rate of HIV-positive TB cases; the lowest testing rates were in the African Region, where the incidence rate is highest. The Eastern Mediterranean, South-East Asia and Western Pacific regions had the lowest rates of HIV testing among notified TB patients in 2005 (*T/N* in Table 16). The European and Western Pacific regions had the lowest prevalence of HIV among those tested (*P/T*). In the African Region, where all TB patients should be tested for HIV, about 10% of notified TB cases were tested.

A better measure of the coverage of HIV testing is the number of TB cases that were found to be HIV-positive, expressed as a percentage of the expected number of incident HIV-positive TB cases (Figure 25; *P/E* in Table 16). In the Region of the Americas in 2005, 66% were detected. In the African Region 13% were detected, while only 4% were found in the Western Pacific Region. Globally, only 14% of all estimated HIV-positive TB cases were identified by testing in 2005 (Figure 25, Table 16). Among all TB patients tested, the proportion positive (*P/T*) remained fairly constant between 2003 and 2005 at about 51% in African Region, and about 23% worldwide (Table 16).

Table 16 also shows that the African Region led the

TABLE 16

Detection and treatment of HIV-positive TB patients, by WHO region, 2005. T is the number of TB patients that were tested for HIV, N the number of notified TB patients, P the number of TB patients that were found to be HIV-positive, E the estimated number of HIV-positive TB cases, C the number of HIV-positive TB patients that were treated with CPT, and A the number of HIV-positive TB patients that were started on ART. Ranges express uncertainty within each region by including in the denominator all countries that were asked for data on A, C and P (lower limit, assuming C = A = 0 for countries that reported on P but not C or A), or only those countries that reported all these data (upper limit). *C/P and A/P could not be meaningfully calculated for the European Region: 1064 HIV-positive TB patients were reported from 16 countries; information about CPT was provided only by Armenia, Georgia, Iceland and Serbia (26 patients in total), and information about ART was provided by these countries and by Slovakia and TFYR Macedonia (36 patients in total). The final column gives the percentage of total estimated HIV-positive TB cases in each region.

	TESTED FOR HIV/ NOTIFIED	HIV-POSITIVE/ TESTED FOR HIV	HIV-POSITIVE/ ESTIMATED HIV-POSITIVE TB CASES	STARTED CPT/ TESTED HIV-POSITIVE	STARTED ART/ TESTED HIV-POSITIVE	REGIONAL DISTRIBUTION OF ESTIMATED HIV-POSITIVE TB CASES
	T/N (%)	P/T (%)	P/E (%)	C/P (%)	A/P (%)	
AFR	10	51	13	82–92	29–33	80
AMR	26	17	66	41–85	52–89	2.7
EMR	1.0	11.6	4.4	14.8–15.4	12–14	1.2
EUR	32	0.6	7.8	*	*	2.2
SEAR	1.6	22	8.9	4–50	3–31	13
WPR	0.5	1.8	4.0	0.5–18	1–55	1.8
Global	**6.7**	**23**	**14**	**68–91**	**30–38**	**100**

FIGURE 26

Collaborative TB/HIV activities, 2002–2005. Bars show the numbers (in thousands) of TB patients that were tested for HIV, found to be HIV-positive, given CPT, started on ART; and for HIV-positive people, the number (in thousands) that were screened for TB, diagnosed with active TB, or given IPT after screening. The numbers of countries reporting data in each year are given above the bars.

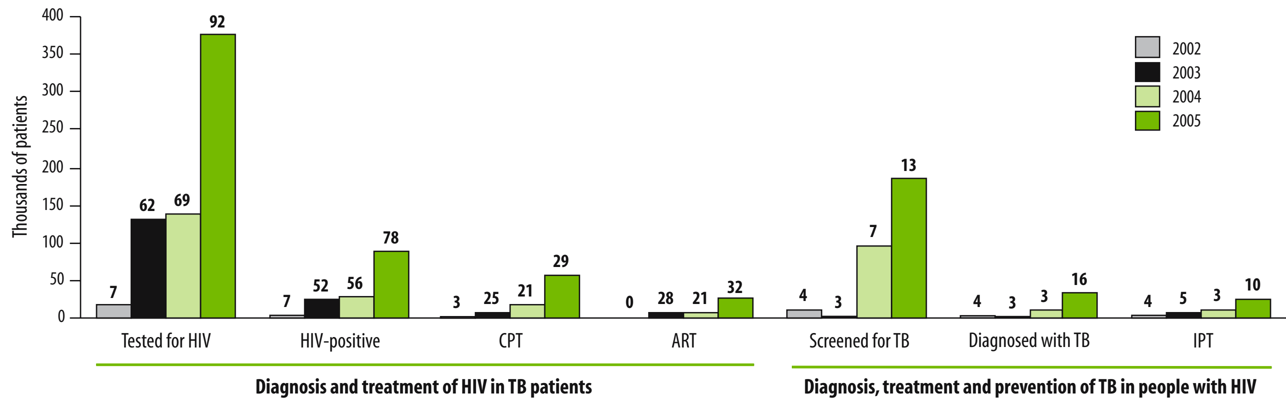


TABLE 17

Country reports for 2005 compared with expectations for 2006 given in *The Global Plan to Stop TB, 2006–2015*

	COUNTRY REPORTS, 2005[a]	GLOBAL PLAN, 2006
	(MILLIONS OR PERCENTAGES)	
DOTS EXPANSION		
Number of new smear-positive cases notified under DOTS	2.3	2.1
Estimated number of new smear-positive cases	3.8	3.3
New smear-positive case detection rate under DOTS	60%	65%
Number of new smear-positive cases successfully treated under DOTS	1.7	1.8
Number of new smear-positive cases registered for treatment under DOTS	2.1	2.1
New smear-positive treatment success rate, 2004	84%	83%
Number of new smear-negative and extrapulmonary cases notified under DOTS	2.2	3.0
Estimated number of new smear-negative and extrapulmonary cases	4.8	4.5
New smear-negative and extra-pulmonary case detection rate under DOTS	46%	66%
MDR-TB		
Number of laboratory-confirmed MDR-TB cases treated by GLC-approved programmes or equivalent	0.005	0.02
Number of laboratory-confirmed MDR-TB cases treated by all programmes	0.02	0.12
Proportion of laboratory-confirmed MDR-TB cases treated by GLC-approved programmes or equivalent	27%	17%
TB/HIV		
Number of HIV-positive people attending HIV services screened for TB	0.18	11
Number of HIV-positive people attending HIV services	4.0	18
Proportion of HIV-positive people attending HIV services that were screened for TB	8.8%[b]	61%
Number of eligible HIV-positive people offered IPT	0.026[c]	1.2
Estimated number of HIV-positive people	29	30
Proportion of HIV-positive people and eligible for IPT that received IPT	0.27%[d]	4%
Number of TB patients tested for HIV	0.22[e,f]	1.6[f]
Total number of notified TB cases including new, re-treatment and other cases	3.3[e,f]	3.4[f]
Proportion of all notified TB cases that were tested for HIV	6.6%[g]	47%
Number of HIV-positive TB cases enrolled on ART	0.025[e]	0.22
Number of TB cases found to be HIV-positive	0.083[e]	0.50
Proportion of all HIV-positive TB patients that enrolled on ART	38%[h]	44%

GLC indicates Green Light Committee.

[a] Includes only those countries in the Global Plan, i.e countries in sub-regions Central Europe and Established Market Economies (see legend of Figure 7) are excluded here.

[b] Only the 9 countries which provided both numerator and denominator are included in this percentage.

[c] While the Global Plan includes only people newly diagnosed with HIV in this indicator, country reports include all HIV-positive people eligible for IPT, regardless of year of diagnosis.

[d] Only the 4 countries which provided both numerator and denominator are included in this percentage.

[e] Includes patients reported from DOTS and non-DOTS areas.

[f] The numbers of notified TB cases, and the numbers tested for HIV, are weighted according to the population coverage of collaborative TB/HIV activities anticipated by the Global Plan.

[g] Only the 91 countries which provided both numerator and denominator are included in this percentage.

[h] Only the 31 countries which provided both numerator and denominator are included in this percentage.

world in the provision of CPT, at least in relation to TB patients who tested HIV-positive (*C/P*), while the Eastern Mediterranean Region lagged behind in the provision of ART (*A/P*). The uncertainties in the estimated proportion of HIV-positive TB patients that are given CPT or that start ART (ranges in Table 16) reflect fundamental problems in patient management as well as in reporting.

The Global Plan laid out objectives for TB/HIV control in 2006 (Table 17). It proposed that 1.6 million TB patients would be tested for HIV in 2006. It also suggested that 220 000 patients should be started on ART, as compared with a total of 80 000 in country plans for 2006. In 2005, 14% and 11% of the expected numbers for 2006 were reported to have been tested for HIV and started on ART, respectively. In the African Region in 2005, where the burden of HIV-related TB is highest, 17% of 737 000, suggested in the Global Plan for 2006, were tested for HIV and 10% of the 197 000, suggested in the Global Plan for 2006, were started on ART. Furthermore, the number of HIV-positive people screened for TB in 2005 was only 1.7% of the 11 million targeted for 2006; the number started on IPT in 2005 was 2.2% of the 1.2 million targeted for 2006.

The proportion of all (estimated) adult (15–49) HIV-positive TB patients put on ART was only 4% in 2005 (Annex 2). Although screening is an efficient way of finding TB patients, just 0.2% of the estimated 24 million HIV-positive people in the African Region were screened in 2005, and approximately 0.1% of the estimated 21 million HIV-positive people without active TB were started on IPT.[1]

In sum, many more HIV-positive TB patients need to be diagnosed and treated in order to satisfy expectations of the Global Plan from 2006 onwards.

The time trends in these indicators are more encouraging because they do show rapid expansion of diagnosis and treatment, albeit from low levels (Figures 25 and 26). The numbers of TB patients tested for HIV, and found to be HIV-positive, increased more then 15-fold between 2002 and 2005 (Figure 26). The provision of CPT and ART to TB patients has also expanded globally (Figure 26), in the African Region (especially ART, Figure 25), and in some countries (Box) Screening for TB among HIV-positive cases, followed by the provision of IPT, also increased quickly between 2002 and 2005 (Figure 26).

Recording and reporting of HIV testing in TB patients is improving but still weak. Of the 63 TB/HIV focus countries, 6 that account for 2.7% of all HIV-positive TB patients had modified their TB registers to capture HIV data routinely (Belize, Brazil, Estonia, Jamaica, the Russian Federation and Trinidad and Tobago), 19 that account for 57% of HIV-positive TB patients were planning to do so, and 32 that account for 37% of HIV-positive TB patients did not have plans to do so. Only 21 out of 37 focus countries in the African Region reported the number of TB cases tested for HIV.

[1] 2006 Report on the Global AIDS Epidemic (UNAIDS/WHO) May 2006.

Prevent and control MDR-TB

MDR-TB surveillance and control in high-burden countries

Among the 22 HBCs, 11 had carried out nationwide drug resistance surveys by 2006, including Ethiopia and the Philippines, with UR Tanzania finalizing its first nationwide survey. A further 6 HBCs are expanding regional coverage of DRS, among which China, India and the Russian Federation have all made substantial progress. Additionally, China is planning to undertake a nationwide survey in 2007. Indonesia has its first DRS under way. Afghanistan, Bangladesh, Nigeria and Pakistan have never reported drug resistance data, but all except Afghanistan have plans to carry out surveys.

A total of 13 NTPs have staff responsible at central level for drug-resistant TB, 9 of which have national guidelines on the programmatic management of MDR-TB. In seven HBCs (Brazil, DR Congo, Mozambique, Philippines, the Russian Federation, South Africa and Thailand), MDR-TB is managed by the NTP.

Prior to 2006, the NTPs of Kenya, the Philippines and the Russian Federation were approved by the GLC for management of MDR-TB. In addition, India was approved by the GLC in 2005 for a project in New Delhi. In Kenya, the MDR-TB management project has not yet been launched because of lack of human and financial resources. In 2006, three additional HBCs were approved by the GLC: Bangladesh and DR Congo as part of the NTP, and Cambodia for an operational research project. A major geographical expansion of GLC-approved MDR-TB management occurred in 2006 in the Russian Federation, with eight additional regions approved and two regions under review. Before 2006, only four regions were approved. In 2006, China and India submitted applications from the NTPs, which are currently under review. In addition, Uganda has a GLC application under review submitted by a national university working with an international NGO. The NTPs in Myanmar and Viet Nam have started preparing applications to the GLC, which should be submitted at the beginning of 2007 (Table 18).

TABLE 18

GLC collaboration, high-burden countries, end 2006

GLC-APPROVED		UNDER GLC REVIEW		PREPARATION OF GLC APPLICATION
NTP	NON-NTP[a]	NTP	NON-NTP[a]	NTP
Bangladesh DR Congo Kenya Philippines Russian Federation	Cambodia India	China India	Uganda	Ethiopia Myanmar Viet Nam

[a] e.g. projects proposed and implemented by private health-care providers, NGOs, universities

BOX

Scaling up HIV testing among TB patients: three case studies

In many countries, HIV testing is the major bottleneck in the provision of CPT and ART for HIV-positive patients. In several African countries, HIV testing for TB patients has increased dramatically over the past two years. Where there has been good collaboration between the HIV/AIDS and TB control programmes, provider-initiated testing has led to substantial increases in the number of TB/HIV patients starting CPT and ART. This is illustrated with data from Kenya, Rwanda and Zambia. Similar results have been reported from Malawi.[1]

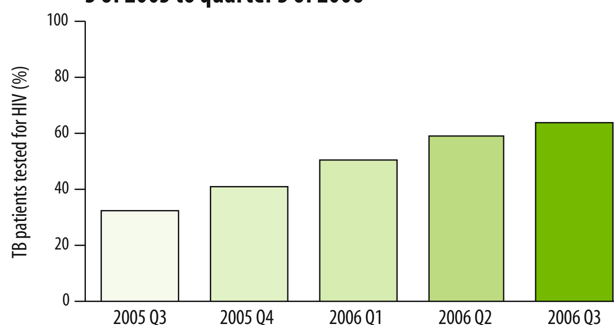
Kenya

Population: 34.3 million
Tuberculosis cases notified in 2005: 108 401
Estimated proportion of TB patients infected with HIV in 2005: 52%

Before 2005, few TB patients in Kenya knew their HIV status, even though about half of them were infected with HIV. Collaborative TB/HIV activities, guided by a national steering committee, led to the development of a provider-initiated programme of rapid HIV testing for TB patients. Starting in March 2005, district and health-centre staff treating TB patients throughout Kenya were trained to do HIV-testing. TB patients are offered HIV testing at TB clinics, and those who are infected with HIV are given CPT at the same clinic. Patients are referred to ART centres, usually in the district hospital. TB recording and reporting forms, adapted to capture TB/HIV data, have been introduced throughout the country. Routine testing began in 2005. In the third quarter of 2005, 32% of TB patients in Kenya were tested for HIV, and this had increased to 64% by the third quarter of 2006 (Figure B1). Of those found to be HIV-positive from the third quarter of 2005 to the third quarter of 2006, 80% were given CPT and 30% started ART.

FIGURE B1

Kenya: percentage of TB patients tested for HIV, quarter 3 of 2005 to quarter 3 of 2006



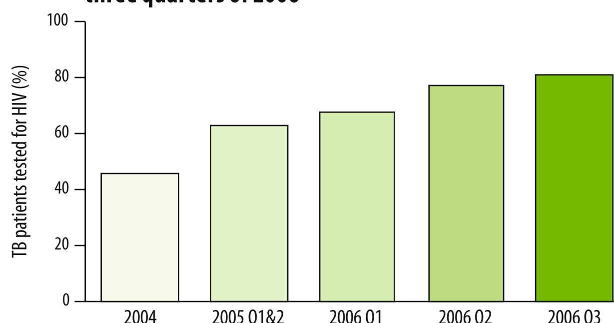
Rwanda

Population: 9.0 million
Tuberculosis cases notified in 2005: 7220
Estimated proportion of TB patients infected with HIV in 2005: 38%

In 2004, a programme of TB/HIV collaborative activities was established and a national programme was developed to train health workers who diagnose TB to test patients for HIV. During 2005, health workers throughout the country were trained in HIV counselling and testing. TB monitoring and recording forms, revised to include TB/HIV data, were introduced in late 2005 and were made available in all health centres by the beginning of 2006. In 2004, 46% of TB patients were tested for HIV; by the third quarter of 2006, this had increased to 81% (Figure B3). HIV-positive TB patients are given CPT by health workers who treat TB patients and then referred to the district ART services. In the first two quarters of 2006, 43% of TB patients were given CPT and 31% started ART.

FIGURE B3

Rwanda: percentage of TB patients tested for HIV in 2004, in quarters 1 and 2 of 2005, and in each of the first three quarters of 2006



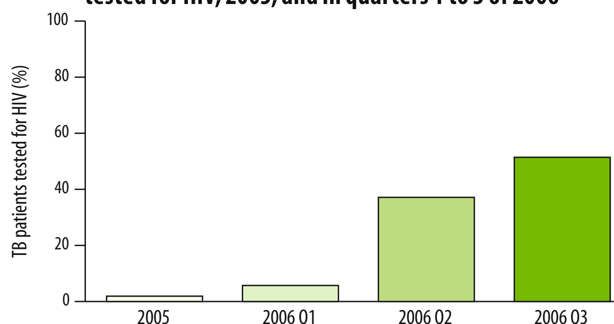
Zambia

Population: 11.7 million
Tuberculosis cases notified in 2005: 49 567
Estimated proportion of TB patients infected with HIV in 2005: 56%

The national TB/HIV coordinating committee met quarterly during 2005 and 2006. Counselling and testing guidelines have been developed; during 2006, all district and clinic staff were trained to use them. Revised monitoring and recording forms to capture TB/HIV data were introduced at the beginning of 2006. CPT is given at ART clinics from where patients are referred to ART centres, which are usually in the district hospital. Data are available from Southern Province, where the percentage of TB patients tested for HIV increased from 2% in 2005 to 52% in the third quarter of 2006 (Figure B2). Of those found to be HIV-positive from the first quarter of 2006 to the third quarter of 2006, 29% were given CPT and 33% started ART.

FIGURE B2

Zambia (Southern Province): percentage of TB patients tested for HIV, 2005, and in quarters 1 to 3 of 2006



1 *Global tuberculosis control: surveillance, planning, financing. WHO report 2006*. Geneva, World Health Organization, 2006 (WHO/HTM/TB/2006.362).

The GFATM has approved funding (up to round 5) for both DRS and MDR-TB control in seven HBCs (Bangladesh, China, DR Congo, India, Indonesia, Mozambique and the Russian Federation). In addition, Cambodia, Nigeria and Zimbabwe have been approved for DRS and Kenya and the Philippines for MDR-TB management.

MDR-TB surveillance and control globally

Out of 182 countries that filled in the standard data collection form, 125 (69%) reported that management of MDR-TB patients was an activity of the NTP (Figure 27); a further 31 stated that they planned to treat MDR-TB in the next two years. Globally in 2005, 98 728 drug susceptibility tests were done at the start of treatment, of which 39% were reported from the European Region (38 818); 104 countries reported 18 422 laboratory-confirmed MDR-TB cases (16 countries in the African Region, 20 in the Region of the Americas, 14 in the Eastern Mediterranean Region, 38 in the European Region, 3 in the South-East Asia Region and 13 in the Western Pacific Region). Out of all MDR-TB cases, 10 828 (59%) were reported from the European Region (Figure 28). The total number of laboratory-confirmed MDR-TB patients reported in 2005, and the number known to be treated by WHO-recommended procedures, are far lower than the numbers anticipated by the Global Plan for 2006 (Table 17).

Up to December 2006, the Global DRS Project had collected data from areas representing more than 40% of global smear-positive TB cases. The GLC had approved 53 projects for more than 25 000 MDR-TB patients in 42 countries.[1] This is almost a doubling of MDR-TB patients since December 2005, by which time about 13 000 MDR-TB patients had been approved for treatment. The countries approved in 2006 were: Armenia, Bangladesh, Belize, Burkina Faso, Cambodia, DR Congo, Ecuador, Guinea, Kazakhstan, Paraguay and Rwanda. Most GLC-approved countries are in the European Region and the Region of the Americas (12 countries each), followed by the African Region (6 countries), the Eastern Mediterranean Region (5 countries), the South-East Asia Region (4 countries) and the Western Pacific Region (3 countries).

From the data provided in the standard data collection form, GLC-approved projects globally were reporting slightly better outcomes at the end of treatment than non-GLC approved projects, with cure rates of 57% (variation among WHO regions 50–80%) and 50% (range 48–79%), respectively (Figure 28). Countries reported that they were expecting to treat 16 990 MDR-TB cases in 2006 (6345

[1] Armenia, Azerbaijan, Bangladesh, Belize, Bolivia, Burkina Faso, Cambodia, Costa Rica, DR Congo, Dominican Republic, Ecuador, El Salvador, Egypt, Estonia, Georgia, Guinea, Haiti, Honduras, India, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Latvia, Lebanon, Lithuania, Malawi, Mexico, Mongolia, Nepal, Nicaragua, Paraguay, Peru, Philippines, Republic of Moldova, Romania, Russian Federation, Rwanda, Syrian Arab Republic, Timor-Leste, Tunisia and Uzbekistan.

FIGURE 27

Percentage of NTPs that manage MDR-TB patients as part of their routine activities, by WHO region, 2005

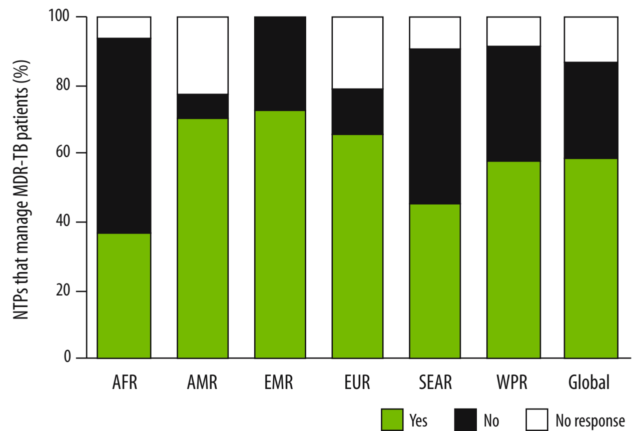


FIGURE 28

Numbers of patients for whom DST was carried out at the start of treatment, and the number of patients with confirmed MDR-TB, by WHO region, 2005. Note that some countries reported the number of confirmed cases of MDR-TB without providing the number tested. Furthermore, confirmed MDR-TB cases may have been tested at any time during treatment.

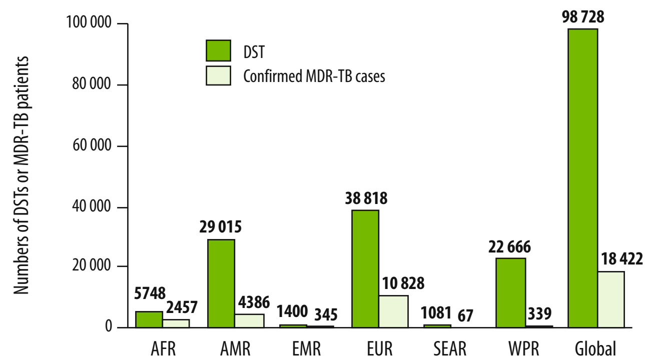
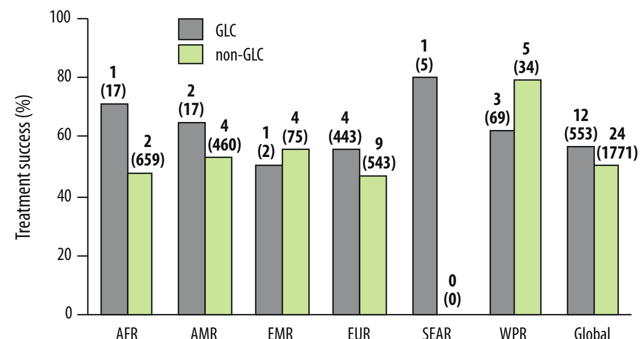


FIGURE 29

Treatment success among MDR-TB cases, by WHO region, 2002 cohort. The number of countries providing outcomes is shown above each bar; the total number of patients is shown in parentheses.



under the GLC and 10 645 outside of GLC programmes; cf 20 000 in the Global Plan, Table 17), and 16 714 MDR-TB cases in 2007 (7096 under the GLC and 9618 outside GLC programmes).

Address prisoners, refugees, other high-risk groups and special situations

Prison inmates are among the high-risk groups that have received most attention in HBCs. Some 20 HBCs had a plan of action for TB control in prisons. Other high-risk groups for which HBCs had specific action plans included refugees (11 countries), ethnic minorities (9 countries) and other marginalized groups (6 countries).

While Afghanistan, DR Congo and Nigeria have been addressing TB control among refugees following political unrest, India, Indonesia and Pakistan were attempting to manage TB among people forced to move by natural disasters. Efforts to improve TB control in Afghanistan, DR Congo and Uganda have been hampered by outbreaks of war.

FIGURE 30

Level of the health-care system with staff fully dedicated to TB, high-burden countries, 2005

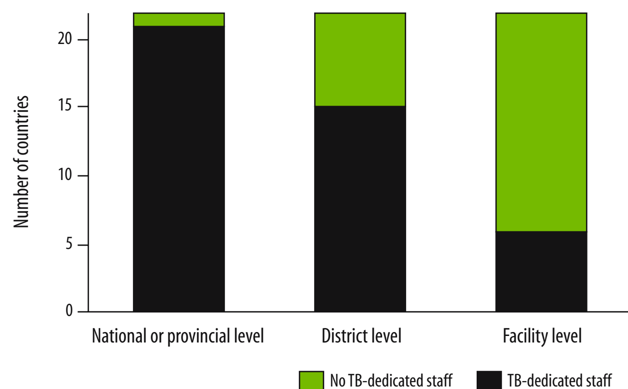
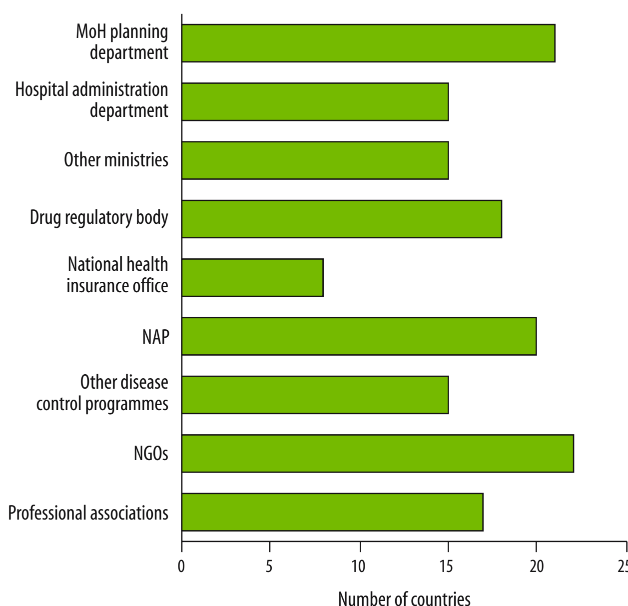


FIGURE 31

Partners involved in the development of national TB control plans, high-burden countries, 2005



3. Contribute to health system strengthening

The diagnosis and treatment of TB are fully integrated into the public health systems of most countries. Although HBCs normally have staff fully dedicated to TB control in central and provincial planning and supervision units, as well as dedicated TB control supervisors at the district level, a few also have dedicated staff at facility level (Figure 30). Some TB control functions were typically managed by NTPs, such as quality control of sputum smear microscopy and monitoring and evaluation. By contrast, anti-TB drug management was fully integrated into general drug management systems in nine HBCs. It was partly integrated in a further nine HBCs, while four managed the supply of anti-TB drugs separately.

Because TB services are normally delivered in general health facilities by multi-purpose staff, NTPs rely on a well-functioning health-care infrastructure, including committed and well-trained general health staff. Any challenge to the general health system is thus a challenge for TB control. Optimal planning of TB control therefore requires collaboration with relevant stakeholders involved in general health-care planning. It also requires coordination among the various health development frameworks at central, provincial and district levels, such as poverty reduction strategy papers (PRSP), sector-wide approaches (SWAPs) and medium-term expenditure frameworks (MTEF).

The extent to which this was being done in 2005 varied among HBCs. Most of the HBCs had developed their TB control plans with the involvement of a broad range of stakeholders (Figure 31). Eighteen had aligned their plans for TB control with a national health development plan. With respect to HRD, only 13 had coordinated the plan for TB with a national plan.[1] Of the 19 HBCs with a PRSP, 14 had aligned their TB control plans accordingly. The TB control plans of nine HBCs were aligned with SWAPs.

Practical Approach to Lung Health

Worldwide, 70 countries reported that the Practical Approach to Lung Health (PAL) was a part of the national plan for TB control (including 10 HBCs). In 2005, PAL was operational in some form in 20 countries. Among them, Chile, El Salvador, Kyrgyzstan, Morocco and South Africa have been scaling up PAL activities, while Algeria, Bolivia, Guinea, Jordan, the Syrian Arab Republic and Tunisia have developed and tested their PAL guidelines and have begun the process of implementation. The remaining nine countries were at a preliminary phase

[1] It is not known how many of the HBCs have formal sector-wide human resource development plans in the health sector, so further integration may be hindered by the lack of such a plan.

of PAL development. Among the 22 HBCs, Uganda had adapted and was field-testing PAL guidelines. South Africa had progressed further in PAL development and implementation, with guidelines and training materials developed for primary health-care workers, emphasizing HIV-infected TB patients. Five additional Latin American countries, including Brazil, were planning to begin implemention of PAL early in 2007.

4. Engage all care providers

Public–Public and Public–Private mix approaches

By September 2006, 11 HBCs (Bangladesh, China, DR Congo, India, Indonesia, Kenya, Mozambique, Myanmar, Philippines, UR Tanzania and Viet Nam) had started scaling up public–private mix for TB care and control (PPM), 5 were preparing to scale up and had developed PPM guidelines (Cambodia, Nigeria, Pakistan, Thailand and Zimbabwe), while the remaining had either initiated or prepared for PPM pilot projects. Specific training for non-NTP providers was organized in 18 HBCs, and 16 HBCs were providing anti-TB drugs free of charge to such providers. A focal person for PPM in the central NTP office was appointed in 14 HBCs, of which 4 were working full-time and 10 part-time.

Several HBCs had involved all health institutions belonging to public sector health-care networks, such as public hospitals, medical college hospitals, army health facilities and prison health facilities (Figures 32 and 33). However, many such providers continued to operate without formal links to the NTP and did not follow NTP or ISTC guidelines. Facilities governed by health insurance agencies were partly or fully engaged with the NTP in 8 of the 16 countries where such agencies were of relevance for TB control.

All but one HBC (Russian Federation) had begun to involve at least some private practitioners, private hospitals and NGO health facilities in referral to the NTP (Figure 32), in diagnosis following programme guidelines and/or in treatment with recommended drugs (Figure 33). However, in most HBCs, only a small fraction of all eligible private providers have so far been involved.

International Standards for Tuberculosis Care

The International Standards for Tuberculosis Care were familiar to 17 HBCs, of which 11 had developed plans for their wide dissemination and use as an advocacy and training tool so as to engage all health-care providers. Among HBCs, Indonesia, India, Kenya and UR Tanzania are pilot sites for implementing ISTC, and have adopted diverse approaches to make best use of the published standards. The ISTC have been particularly useful in engaging the national professional societies and academic institutions in TB control.

FIGURE 32

Engagement of different types of providers in referral of TB suspects, high-burden countries, 2005

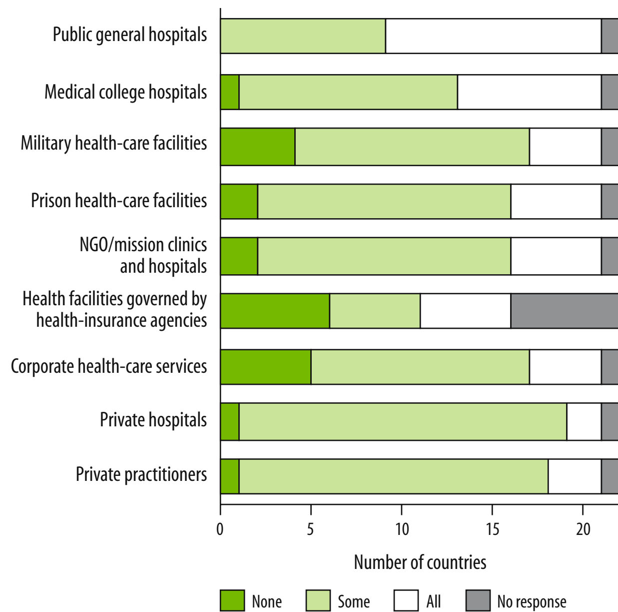
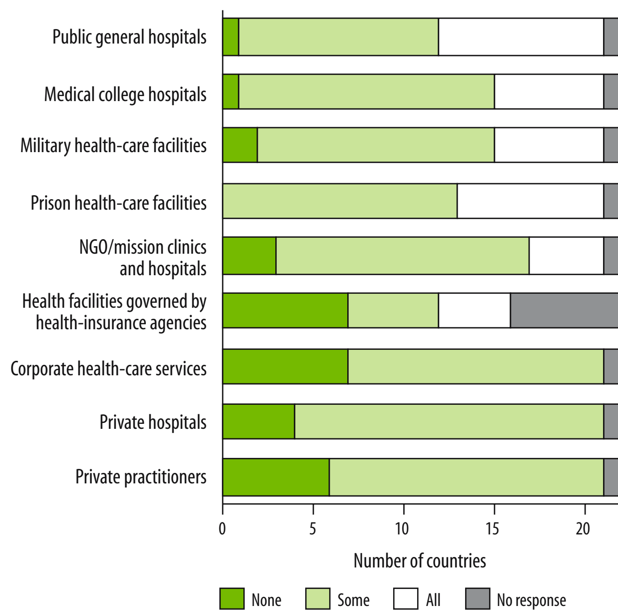


FIGURE 33

Engagement of different types of providers in free-of-charge TB treatment with recommended drugs, high-burden countries, 2005



5. Empower people with TB, and communities

Advocacy, communication and social mobilization

The implementation of advocacy, communication and social mobilization (ACSM) at country level has been uneven. Some countries already have extensive experience carrying out communication programmes aimed at increasing case detection rates while, for other countries, ACSM is an entirely new field. The quality of ACSM depended largely on resources available. Some large programmes made liberal use of partners including NGOs, media and advertising agencies, multi-disease ACSM resources in governments, community groups, and others, who helped to develop materials and to disseminate key messages from national level down to community level.

The two major barriers reportedly faced by HBCs to implement successful ACSM plans were limited resources and staff capacity. With the GFATM (round 5) approving substantial grants for ACSM for 18 countries (US$ 36 million over 5 years), a lack of skilled staff at the central and peripheral levels, rather than the availability of money, is likely to be the main problem.

Monitoring and evaluation of ACSM is a major challenge for all HBCs: only seven HBCs currently claim to have data sources in place to measure and assess ACSM results. The Stop TB Partnership is in the process of developing guidelines on ACSM indicators to help countries develop a robust monitoring and evaluation system, and to develop strategies through identification of the most important gaps in knowledge and attitudes among their key target groups.

Community participation in TB care

Community-based approaches to TB control were implemented in all regions. All (except for one) countries in the South-East Asia Region reported interventions for community involvement in TB control to a varying extent. About half of the countries in Africa, the Americas and in the Eastern Mediterranean and Western Pacific regions (65 countries), and only a quarter of countries in Europe (10 countries), reportedly engaged communities in TB care and prevention (Annex 1).

Most HBCs have been engaging communities in activities other than treatment support, with the exception of Afghanistan, India and Thailand. Other areas of involvement included case detection, defaulter tracing and raising awareness about TB. Future plans to involve communities included expansion of ongoing activities and new ACSM activities related mostly to raising awareness.

More than half of the HBCs have GFATM funding for community involvement (14 and 20 countries had grants approved in rounds 5 and 6, respectively). Among GFATM TB grants approved in round 6, 20 countries (including two HBCs, India and UR Tanzania) included community involvement as a part of their application, worth a total of US$ 25.7 million for up to 5 years (6.4% of overall budgets).

Patients' Charter for Tuberculosis Care

The Patients' Charter for Tuberculosis Care was being promoted in all regions, although few countries reported any specific promotional activities. In the Indian state of Kerala, the state health minister launched the charter, presenting it to a TB patient and distributing copies translated into the local language. The minister also launched the ISTC, directed at health-care providers in the state.

6. Enable and promote research

Globally, no specific mechanism yet exists to promote or oversee TB research activities. Few, if any, NTPs monitor the TB research under way in their countries. NTPs were therefore expected to report mainly on research with which they were associated in 2005.

All HBCs did report having operational research (OR) in their respective NTP strategic plans, but only India and Pakistan provided details. TB/HIV and prevalence surveys were the most common OR activities undertaken across the HBCs. Mozambique and Zimbabwe reported only drug resistance surveys under OR. Kenya, Mozambique and Thailand reported no OR activities for 2005.

Financing TB control

Data received

Financial data were received from 156 out of 212 (74%) countries (Table 19), continuing the year-on-year increase in reporting since the start of data collection in 2002 (the total in *Global tuberculosis control 2006* was 140 countries).[1] Complete budget data for 2006 were provided by 98 countries (up from 87 in last year's report), 87 countries provided complete budget data for 2007, and 83 provided complete expenditure data for 2005 (compared with 73 that provided complete expenditure data for 2004). The countries that provided financial reports accounted for 96–100% of the regional burden of TB in four WHO regions, with lower figures of 85% and 81% for the Region of the Americas and the European Region, respectively. Overall, countries that reported financial data accounted for 98% of the global burden of TB.

Data were received from all 22 HBCs, including South Africa for the first time (Table 20). Complete budget data for 2006 were provided by 21 countries (the exception was Thailand), and complete budget data for 2007 were provided by 19 countries (the exceptions were Thailand, UR Tanzania[2] and Zimbabwe). Complete expenditure data for 2005 were provided for 19 countries, with data missing for Thailand, Uganda and Zimbabwe. A total of 21 countries provided data on the utilization of health

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1 *Global tuberculosis control: surveillance, planning and financing.* Geneva, World Health Organization, 2006 (WHO/HTM/TB/2006.362).

2 As in previous years, the planning cycle in UR Tanzania means that we did not expect budget data for 2007 to be reported.

TABLE 19

Budget, expenditure and utilization data received, all countries, 2007

	NUMBER OF COUNTRIES	FINANCIAL REPORTS RECEIVED	BUDGET 2006			BUDGET 2007			EXPENDITURE 2005			UTILIZATION OF HEALTH SERVICES	PROP. OF ESTIMATED REGIONAL TB INCIDENCE ACCOUNTED FOR BY COUNTRIES THAT REPORTED FINANCIAL DATA (%)
			COMPLETE	PARTIAL	NONE	COMPLETE	PARTIAL	NONE	COMPLETE	PARTIAL	NONE		
AFR	46	43	31	7	5	25	5	13	23	1	19	22	99
AMR	44	26	16	6	4	15	7	4	15	3	8	21	85
EMR	22	18	13	1	4	13	1	4	11	1	6	14	96
EUR	53	29	16	8	5	17	6	6	16	3	10	22	81
SEAR	11	9	6	3	0	5	3	1	5	1	3	8	99
WPR	36	31	16	8	7	12	7	12	13	4	14	26	100
Global	**212**	**156**	**98**	**33**	**25**	**87**	**29**	**40**	**83**	**13**	**60**	**113**	**98**

TABLE 20

Budget, expenditure and utilization data received, high-burden countries, 2007

	NUMBER OF COUNTRIES	FINANCIAL REPORTS RECEIVED	BUDGET 2006			BUDGET 2007			EXPENDITURE 2005		UTILIZATION OF HEALTH SERVICES
			COMPLETE	PARTIAL	NONE	COMPLETE	PARTIAL	NONE	COMPLETE	NONE	
AFR	9	9	9	0	0	7	0	2[a]	7	2[b]	9
AMR	1	1	1	0	0	1	0	0	1	0	1
EMR	2	2	2	0	0	2	0	0	2	0	2
EUR	1	1	1	0	0	1	0	0	1	0	1
SEAR	5	5	4	1[c]	0	4	1[c]	0	4	1[c]	4[c]
WPR	4	4	4	0	0	4	0	0	4	0	4
Global	**22**	**22**	**21**	**1**	**0**	**19**	**1**	**2**	**19**	**3**	**21**

[a] UR Tanzania and Zimbabwe.
[b] Uganda and Zimbabwe.
[c] Thailand did not report data.

services and made projections of the number of cases they would treat in 2006 and 2007. While considerable clarification and verification of data by WHO are still required, the quality of the data when first submitted is improving: Bangladesh, Brazil, China, India, Indonesia, South Africa and UR Tanzania provided timely and exemplary data that required almost no follow-up.

NTP budgets and funding

High-burden countries, 2002–2007

NTP budgets in 21 of the 22 HBCs have increased during the period 2002–2007, sometimes by substantial amounts (Figures 34–35; Table 21). There are insufficient data to make an assessment for Thailand. The total combined budget for the 22 HBCs in 2007 is US$ 1.25 billion, 2.5 times the US$ 509 million budgeted in 2002. The Russian Federation has by far the largest budget (US$ 513 million), followed by China (US$ 200 million), South Africa (US$ 95 million), India (US$ 75 million) and Indonesia (US$ 59 million), making a combined total that is 75% of the NTP budgets reported by HBCs. There are three countries with budgets in the range US$ 30–50 million and four with budgets in the range US$ 20–30 million; the rest (10 countries, half of which are in Africa) have budgets of under US$ 20 million.

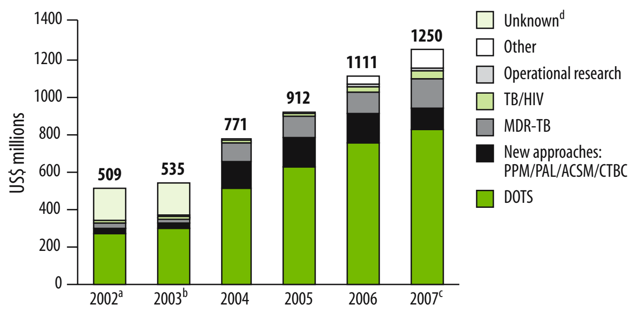
In absolute terms, the budgetary increase in the Russian Federation dwarfs that in any other HBC, at US$ 351 million since 2002; the second largest increase (in China) was US$ 103 million. In relative terms, the increases in nine countries (Afghanistan, Brazil, DR Congo, Kenya, Myanmar, Nigeria, Pakistan, the Russian Federation and Zimbabwe) stand out, with three- to eight-fold increases over six years (Table 21). Countries with relatively small increases are Ethiopia, the Philippines, UR Tanzania and Viet Nam. Across all 22 HBCs, DOTS has consistently accounted for the largest share of NTP budgets,[1] but since 2004 an increasing share of these budgets has been accounted for by MDR-TB treatment and new approaches such as PPM, community TB care, ACSM and PAL (Figure 34). NTP budgets for collaborative TB/HIV activities remain small, although Kenya is an exception (see Annex 1).

These large budget increases have been accompanied by big improvements in available funding (Figures 35–36; Table 21). For all HBCs, funding for NTP budgets has increased by US$ 592 million since 2002, reaching US$ 1 billion of the US$ 1.25 billion needed in 2007. Kenya and Viet Nam are the only countries where projected funding for 2007 is less than in 2002, although in the case of Kenya this is because the NTP is unsure about whether funding theoretically available in GFATM grants will be approved for disbursement and because multi-

[1] See **Methods** for definition of the budgetary line items included in the category DOTS.

FIGURE 34

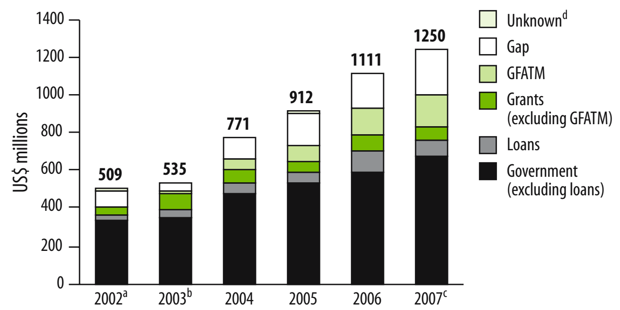
Total NTP budgets by line item, high-burden countries, 2002–2007



[a] Estimates assume budget 2002 equal to expenditure 2002 (Ethiopia), budget 2003 (Afghanistan, Bangladesh, Mozambique and Uganda) or expenditure 2003 (Russian Federation and Zimbabwe).
[b] Estimates assume budget 2003 equal to expenditure 2003 (Russian Federation and Zimbabwe) or budget 2004 (Thailand).
[c] Estimates assume budget 2007 equal to budget 2006 (UR Tanzania and Zimbabwe).
[d] "Unknown" applies to Afghanistan 2002–2004, Russian Federation 2002–2003 and Mozambique 2002–2003, as breakdown by line item not available.

FIGURE 35

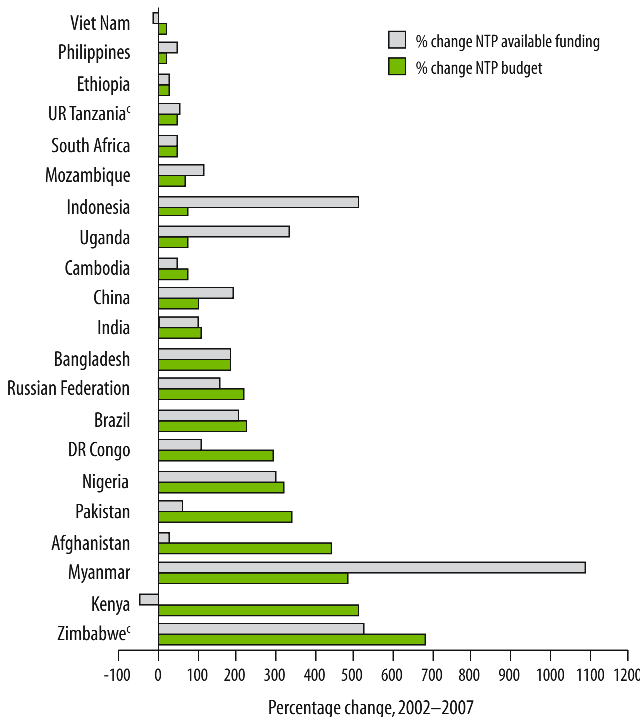
Total NTP budgets by source of funding, high-burden countries, 2002–2007



[a] Estimates assume budget 2002 equal to expenditure 2002 (Ethiopia), budget 2003 (Afghanistan, Bangladesh, Mozambique and Uganda) or expenditure 2003 (Russian Federation and Zimbabwe).
[b] Estimates assume budget 2003 equal to expenditure 2003 (Russian Federation and Zimbabwe) or budget 2004 (Thailand).
[c] Estimates assume budget 2007 equal to budget 2006 for UR Tanzania and Zimbabwe.
[d] "Unknown" applies to Afghanistan 2004, DR Congo 2002 and Nigeria 2002 as breakdown by funding source not available.

FIGURE 36

Changes in NTP budget and available funding, 21 high-burden countries,[a,b] 2002–2007



[a] Complete data not available for Thailand.
[b] Countries ranked by percentage change in NTP budget.
[c] Comparison is 2002–2006 for UR Tanzania and Zimbabwe.

year grants with bilateral donors need to be renegotiated during 2007.[1] While most of the extra US$ 592 million has come from HBC governments (US$ 404 million including loans), this overall statistic conceals the fact that most of the additional domestic funding comes from three countries only: China, the Russian Federation and South Africa (an extra US$ 340 million including loans since 2002). Although most other HBC governments have also increased their domestic funding (the six exceptions are Afghanistan, Cambodia, Ethiopia, Kenya, the Philippines and Viet Nam), the remaining increase in funding is largely due to the GFATM. Funding from the GFATM in 2007 amounts to US$ 168 million compared with zero in 2002, and all HBCs have now secured GFATM grants (although Myanmar's grant has been terminated and funding ended in 2006). The largest grants are held by Bangladesh, China, India, Indonesia, Nigeria and the Russian Federation (worth US$ 10–30 million in 2007); in other HBCs, grants are worth in the range US$ 1–8 million in 2007. In relative terms, the most impressive improvements in funding overall (from all sources) have occurred in Indonesia, Myanmar and Zimbabwe (Figure 36), mainly due to GFATM funding in Indonesia and Zimbabwe and GDF funding in Myanmar.

Among all HBCs, national governments will provide US$ 758 million (61%) of the funding required by NTPs in 2007 and US$ 241 million (19%) will be funded by donor agencies (Table 21). This leaves a reported funding gap of US$ 251 million (20%). In absolute terms, the largest funding gaps (as in 2006) are those reported by China, Kenya, Pakistan and the Russian Federation (US$ 186 million, or 74% of the total gap). Proportionally,

[1] If multi-year grants are successfully renegotiated and GFATM grants are disbursed on schedule, then the funding available in 2007 will be higher than in 2002.

TABLE 21

NTP budgets and available funding, high-burden countries, 2007

		TOTAL NTP BUDGET (US$ MILLIONS)	CHANGE SINCE 2002[a] (US$ MILLIONS)	CHANGE SINCE 2002 (%)	AVAILABLE FUNDING (US$ MILLIONS)				FUNDING GAP (US$ MILLIONS)	CHANGE IN AVAILABLE FUNDING SINCE 2002[b] (US$ MILLIONS)				CHANGE IN FUNDING GAP SINCE 2002 (US$ MILLIONS)
					GOVERNMENT (EXCL. LOANS)	LOANS	GRANTS (EXCL. GFATM)	GFATM		GOVERNMENT (EXCL. LOANS)	LOANS	GRANTS (EXCL. GFATM)	GFATM	
1	India	75	39	109	9.2	37	10	14	3.4	2.9	13	5.0	14	3.4
2	China	200	103	105	120	11	2.7	26	41	68	11	0.2	26	-2.5
3	Indonesia	59	25	73	25	0	11	23	0	18	0	8.0	23	-25
4	Nigeria	36	28	323	17	0	4.2	13	2.3	15	0	0	13	-4.3
5	Bangladesh	20	13	184	2.9	0.9	2.5	14	0	-0.5	0.8	-0.9	14	0
6	Pakistan	23	18	341	3.4	0	2.0	0.6	17	0.4	0	1.3	0.6	16
7	South Africa	95	32	50	88	0	2.5	4.0	0	30	0	0.9	4.0	0
8	Ethiopia	6.3	1.5	30	0.2	0	1.5	4.5	0	-0.9	0	-2.2	4.5	0
9	Philippines	20	3.8	23	10	0	1.5	6.4	2.1	-1.8	0	1.5	6.4	-2.3
10	Kenya	32	26	508	1.0	0	0.2	1.0	29	-0.5	0	-2.4	1.0	28
11	DR Congo	26	19	292	1.4	0.8	5.0	6.7	12	0.4	0.8	-0.7	6.7	8.1
12	Russian Federation	513	351	216	360	25	2.2	27	99	206	25	-5.4	27	99
13	Viet Nam	14	2.2	19	6.6	0	1.9	1.9	3.4	-2.1	-1.8	0.9	1.9	3.4
14	UR Tanzania[c]	8.1	2.6	47	2.1	0	5.7	0	0.4	1.9	0	0.9	0	-0.2
15	Brazil	44	30	225	29	0.5	2.8	8.1	3.0	16	0.5	2.8	8.1	3.0
16	Uganda	9.2	3.9	75	1.7	0	0.5	6.2	0.8	1.6	-1.2	-0.1	6.2	-2.5
17	Thailand[c]	2.0	–	–	–	–	–	2.0	–	–	–	–	2.0	–
18	Mozambique	14	5.7	72	0.8	0	3.9	1.2	7.8	0.5	0	1.5	1.2	2.5
19	Myanmar	16	14	484	0.5	0	6.6	0	9.2	0.1	0	6.4	0	7.0
20	Zimbabwe[c]	13	12	679	2.3	0	3.2	5.1	2.6	2.2	0	1.6	5.1	2.6
21	Cambodia	7.6	3.3	77	0.6	0	1.8	2.1	3.1	-0.7	-0.7	0.7	2.1	1.9
22	Afghanistan	17	14	445	0.1	0	0.7	1.3	15	-0.2	0	-0.6	1.3	13
High-burden countries		**1 250**	**746**	**109[d]**	**683**	**76**	**73**	**168**	**251**	**356**	**48**	**19**	**168**	**152**

– Indicates not available.

[a] Figures assume budget 2002 equal to expenditure 2002 (Ethiopia), budget 2003 (Afghanistan, Bangladesh, Mozambique and Uganda) or expenditure 2003 (Russian Federation and Zimbabwe).

[b] Total of changes in available funding and funding gap does not equal the total in column 3 because comparisons by source of funding are with 2003 for DR Congo and Nigeria.

[c] Data for UR Tanzania and Zimbabwe are for 2006. Data for Thailand are partial.

[d] Median value.

the largest gaps are in Afghanistan, Cambodia, DR Congo, Kenya, Mozambique, Myanmar and Pakistan (with gaps representing 40–93% of the required budget).

Further details, including charts showing trends in NTP budgets by funding source and line item for each HBC during the period 2002–2007, are provided in Annex 1.

All countries by region, 2007

The Global Financial Monitoring Project started to collect data from all countries (rather than focusing only on the 22 HBCs) in 2003 and to report on these data in 2004. Since there is variation in the set of countries that report complete data each year, presentation of needs for all countries over time is difficult. For this reason, Figure 37 presents NTP budgets by source of funding for 2007 only. In 2007, 90 countries (22 HBCs and 68 other countries) that collectively account for 90% of the global burden of TB submitted complete data.[1] These countries accounted for almost all of the regional burden of TB in the Eastern Mediterranean, South-East Asia and Western Pacific regions, for 87% of the regional burden in the African Region, 57% of the burden in the Region of the Americas, and 65% of the regional burden in the European Region. These figures mean that the reporting of complete financial data to WHO has been maintained (compared with 2006) in the South-East Asia and Western Pacific regions, and improved in all regions except the Region of the Americas.[2]

NTP budgets in 2007 in these 90 countries total US$ 1.6 billion, with a funding gap of US$ 307 million (both figures higher than for 2006). Budgetary funding gaps as a proportion of the total budget are higher in HBCs compared with other countries, except in the African Region and the Region of the Americas. Overall, NTP budgets per TB case (estimated annual incidence) were lower for HBCs compared with non-HBCs in four regions; in the African Region, budgets were very similar (US$ 138 per case and US$ 135 per case for HBCs and non-HBCs respectively), and in the European Region the budget for the Russian Federation was higher than the average for the other 16 countries that reported data.

[1] Data in 2007 assumed to be as for 2006 in Thailand, UR Tanzania and Zimbabwe.

[2] This is because Peru reported data in the 2005 round of data collection, but not the 2006 round of data collection used for this report.

FIGURE 37

Regional distribution of NTP budgets by source of funding, 22 high-burden countries and 68 non high-burden countries, 2007.
Numbers in parentheses above bars show the percentage of all estimated TB cases in the region accounted for by the countries included in the bar. Numbers in parentheses in the x-axis show the number of countries contributing to each bar.

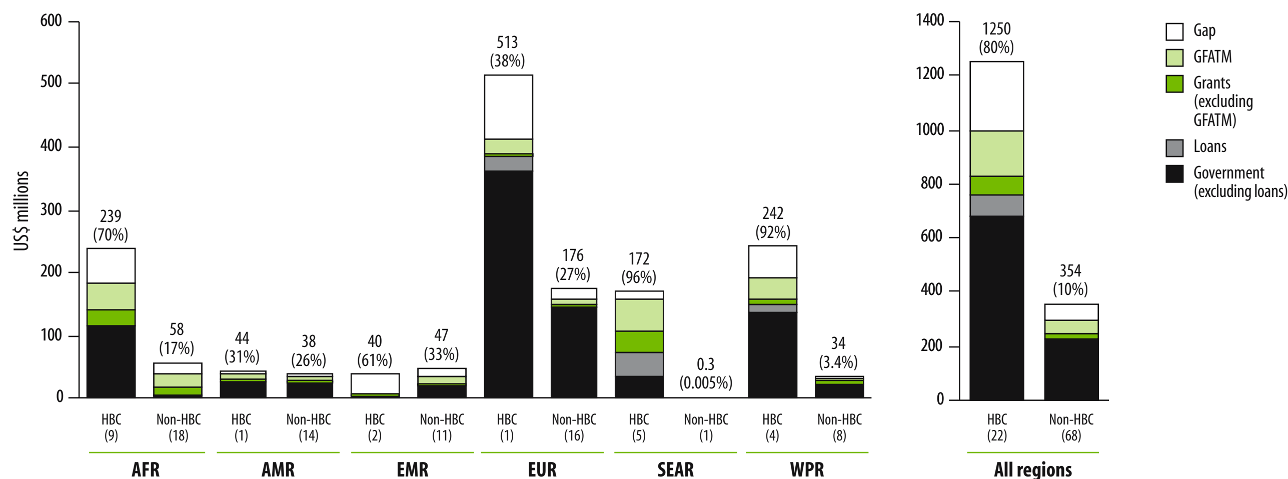
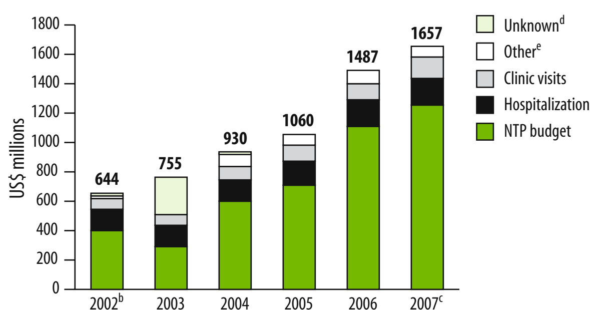


FIGURE 38

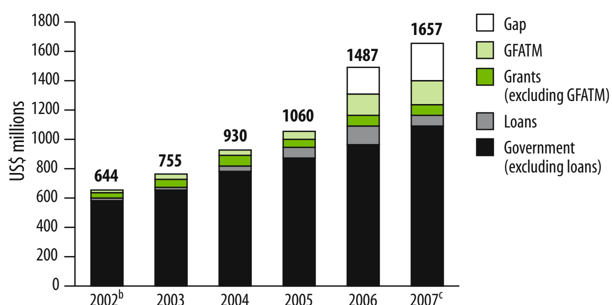
Total TB control costs by line item, high-burden countries,[a] 2002–2007



[a] Total TB control costs for 2002–2005 are based on expenditure data, whereas those for 2006–2007 are based on budget data.
[b] Estimates assume costs 2002 equal to costs 2003 for Afghanistan, Bangladesh, Mozambique, Nigeria, Uganda and Zimbabwe.
[c] Estimates assume costs 2007 equal to costs 2006 for UR Tanzania and Zimbabwe.
[d] "Unknown" applies to Russian Federation 2003 and Thailand 2002–2004.
[e] "Other" includes costs for hospitalization and fluorography in the Russian Federation not reflected in NTP budget or NTP expenditure data.

FIGURE 39

Total TB control costs by source of funding, high-burden countries,[a] 2002–2007



[a] Total TB control costs for 2002–2005 are based on expenditure data, whereas those for 2006–2007 are based on budget data.
[b] Estimates assume costs 2002 equal to costs 2003 for Afghanistan, Bangladesh, Mozambique, Nigeria, Uganda and Zimbabwe.
[c] Estimates assume costs 2007 equal to costs 2006 for UR Tanzania and Zimbabwe.

Total costs of TB control

High-burden countries, 2002–2007

NTP budgets include only part of the resources needed for TB control. In particular, they do not include the costs associated with general health-service staff and infrastructure, which are used when TB patients are hospitalized or make outpatient clinic visits for DOT and monitoring. For the 22 HBCs combined, the total cost of TB control is projected to be almost US$ 1.7 billion in 2007, compared with US$ 644 million in 2002 (Figures 38–40; Table 22). The figures for total costs 2002–2006 are lower than those reported in *Global tuberculosis control 2006*, due to downward revisions of the costs estimated for South Africa following the reporting of financial data and related estimates of health services utilization (hospitalization and clinic visits) to WHO for the first time in 2006. Notably, the financial report for South Africa included lower estimates of the frequency and duration of hospitalization compared with the costing studies conducted in the mid-late 1990s that were used to produce cost estimates for previous reports in this series.

Increases in projected costs during the period 2002–2007 arise because of the large increases in NTP budgets (described above) and because of the higher costs of clinic visits and hospitalization that are associated with treating more patients. As in previous years, the largest costs in 2007 are for the Russian Federation and South Africa, which together account for US$ 829 million, or almost exactly half of the total cost of US$ 1.7 billion (Figure 40; Table 22). South Africa is a middle-income country, and the high costs are mainly explained by the higher prices for items such as hospitalization and outpatient visits, compared with those typical in low-income countries, as well as a relatively large budget for treatment of MDR-TB (US$ 43 million for about 6000 patients). The high costs in the Russian Federation reflect continued staffing and maintenance of an extensive network of TB hospitals and

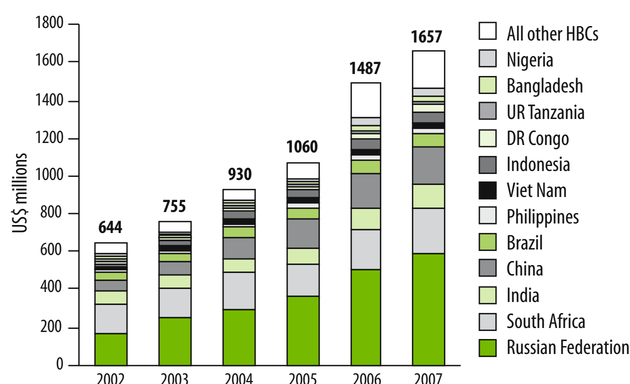
sanatoria, a large budget for second-line anti-TB drugs to treat many MDR-TB patients (US$ 91 million, with an estimated total of about 34 000 cases) and continued use of fluorography for mass population screening. China (US$ 200 million), India (US$ 119 million), Brazil (US$ 74 million) and Indonesia (US$ 64 million) rank third to sixth. These six countries account for 78% of the total cost of TB control in the 22 HBCs. An additional nine countries have total costs in the range US$ 23–52 million in 2007, and the remaining seven have costs of US$ 19 million or less.

The countries with by far the largest projected absolute increases in annual costs between 2002 and 2007 are the Russian Federation and China (US$ 423 million and US$ 139 million respectively). They are followed by increases in the range US$ 36–81 million in Brazil, India, Indonesia, Nigeria and South Africa. The smallest absolute changes are projected for Cambodia, Ethiopia, Uganda, UR Tanzania, and Viet Nam. The biggest proportional increases are for Afghanistan, Kenya, Myanmar, Nigeria and Pakistan.

Funding for the general health-service staff and infrastructure used by TB patients during clinic visits and hospitalization is assumed to be provided by governments.

FIGURE 40

Total TB control costs by country, high-burden countries,[a] 2002–2007



[a] Total TB control costs for 2002–2005 are based on expenditure data, whereas those for 2006–2007 are based on budget data.

TABLE 22

Total TB control costs and available funding, high-burden countries, 2007

		TOTAL COSTS (US$ MILLIONS)	CHANGE SINCE 2002[a] (US$ MILLIONS)	CHANGE SINCE 2002 (%)	AVAILABLE FUNDING (US$ MILLIONS)				FUNDING GAP (US$ MILLIONS)	CHANGE IN AVAILABLE FUNDING SINCE 2002 (US$ MILLIONS)				CHANGE IN FUNDING GAP SINCE 2002 (US$ MILLIONS)
					GOVERNMENT (EXCL. LOANS)	LOANS	GRANTS (EXCL. GFATM)	GFATM		GOVERNMENT (EXCL. LOANS)	LOANS	GRANTS (EXCL. GFATM)	GFATM	
1	India	119	56	90	53	37	10	14	3.4	13	20	5.6	14	3.4
2	China	200	139	229	120	11	2.7	26	41	63	9.8	-0.6	26	41
3	Indonesia	64	43	209	29	0	11	23	0	10	0	9.4	23	0
4	Nigeria	52	43	435	33	0	4.2	13	2.3	27	0	0.4	13	2.3
5	Bangladesh	27	17	160	10	0.9	2.5	14	0	3.2	0.8	-0.9	14	0
6	Pakistan	27	22	444	7.0	0	2.0	0.6	17	3.2	0	0.8	0.6	17
7	South Africa	235	81	53	228	0	2.5	4.0	0	80	0	0.9	4.0	0
8	Ethiopia	14	7.0	99	8.0	0	1.5	4.5	0	4.7	0	-2.2	4.5	0
9	Philippines	31	8.9	40	21	0	1.5	6.4	2.1	1.5	-2.2	1.0	6.4	2.1
10	Kenya	34	28	533	3.1	0	0.2	1.0	29	0.3	0	-2.4	1.0	29
11	DR Congo	35	23	196	11	0.8	5.0	6.7	12	4.9	0.8	-1.1	6.7	12
12	Russian Federation	594	423	247	442	25	2.2	27	99	271	25	2.2	27	99
13	Viet Nam	23	2.2	10	16	0	1.9	1.9	3.4	-2.7	-1.8	1.4	1.9	3.4
14	UR Tanzania[b]	15	3.7	33	8.7	0	5.7	0	0.4	2.4	0	0.9	0	0.4
15	Brazil	74	36	93	60	0.5	2.8	8.1	3.0	21	0.5	2.8	8.1	3.0
16	Uganda	10	6.9	245	2.2	0	0.5	6.2	0.8	1.2	-1.2	-0.1	6.2	0.8
17	Thailand[b]	4.0	–	–	2.0	–	–	2.0	–	–	–	–	2.0	–
18	Mozambique	24	20	518	11	0	3.9	1.2	7.8	8.5	-0.8	3.6	1.2	7.8
19	Myanmar	19	16	531	3.4	0	6.6	0	9.2	1.2	0	5.7	0	9.2
20	Zimbabwe[b]	18	12	201	7.0	0	3.2	5.1	2.6	2.6	0	1.6	5.1	2.6
21	Cambodia	10	5.1	104	3.0	0	1.8	2.1	3.1	0.2	-0.7	0.4	2.1	3.1
22	Afghanistan	27	23	542	10	0	0.7	1.3	15	10	0	-3.3	1.3	15
High-burden countries		**1 657**	**1 017**	**201[c]**	**1 089**	**76**	**73**	**168**	**251**	**527**	**50**	**26**	**168**	**251**

– Indicates not available.

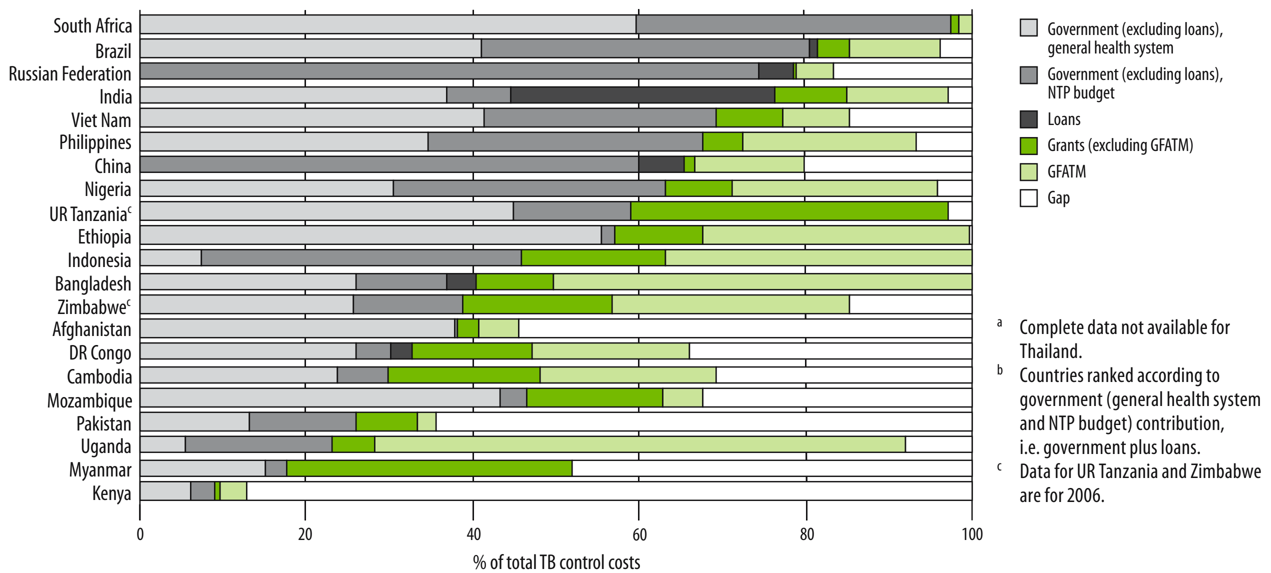
[a] TB control costs for 2006–2007 were estimated using budget data, whereas those for 2002–2005 were estimated using expenditure rather than budget data wherever possible. Estimates assume expenditure 2002 equal to available funding 2002 (Kenya and UR Tanzania), to expenditure 2003 (Afghanistan, Bangladesh, Mozambique, Nigeria and Zimbabwe) or to available funding 2003 (Uganda).

[b] Data for UR Tanzania and Zimbabwe are for 2006. Data for Thailand are partial.

[c] Median value.

FIGURE 41

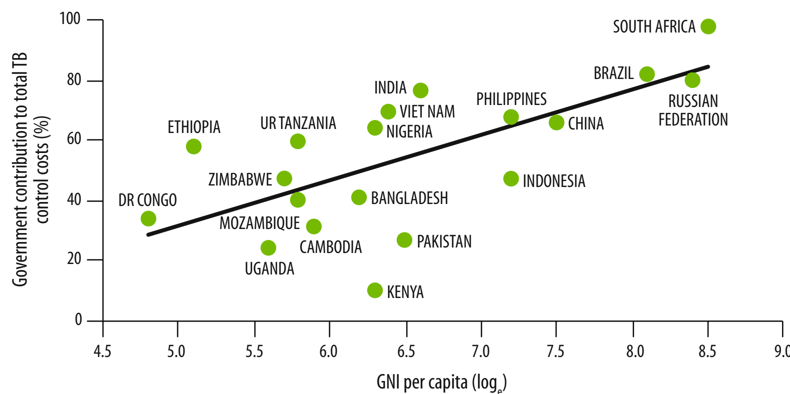
Sources of funding for total TB control costs, 21 high-burden countries,[a,b] 2007



[a] Complete data not available for Thailand.
[b] Countries ranked according to government (general health system and NTP budget) contribution, i.e. government plus loans.
[c] Data for UR Tanzania and Zimbabwe are for 2006.

FIGURE 42

Government contribution (including loans) to total TB control costs by gross national income (GNI) per capita, 19 high-burden countries,[a] 2007



[a] Data on GNI per capita not available for Myanmar and Afghanistan. Complete data for Thailand not available.

This assumption, together with the implicit assumption that health systems have sufficient capacity to support the treatment of growing numbers of patients in 2007,[1] means that the resources available for TB control are estimated to have increased from almost US$ 644 million in 2002 to US$ 1.4 billion in 2007 (Figure 39; Table 22). The contribution by HBC governments to the total cost of TB control in 2007 is 70% on average, which is larger than their contribution to NTP budgets. However, this high average figure conceals important variations among countries. There are 10 HBCs that are dependent on grants to cover more than one-third of the total costs of TB control (Bangladesh, Cambodia, DR Congo, Ethiopia, Indonesia, Myanmar, Nigeria, Uganda, UR Tanzania and Zimbabwe), and a further four (Afghanistan, Kenya, Mozambique and Pakistan) that are likely to rely on grant funding to a similar or greater extent to fill reported funding gaps (Figure 41). The share of the total costs provided by HBC governments is closely related to average income levels (Figure 42), although the government contribution relative to income levels is comparatively high in Ethiopia, India, South Africa, UR Tanzania and Viet Nam, and comparatively low in Indonesia, Kenya, and Pakistan. For all HBCs, the estimated gap between the funding already available and the total cost of TB control is US$ 251 million in 2007, i.e. the NTP budget gap reported above.

Further details, including charts for each country that show trends in total TB control costs by line item for each year 2002–2007, are shown in Annex 1.

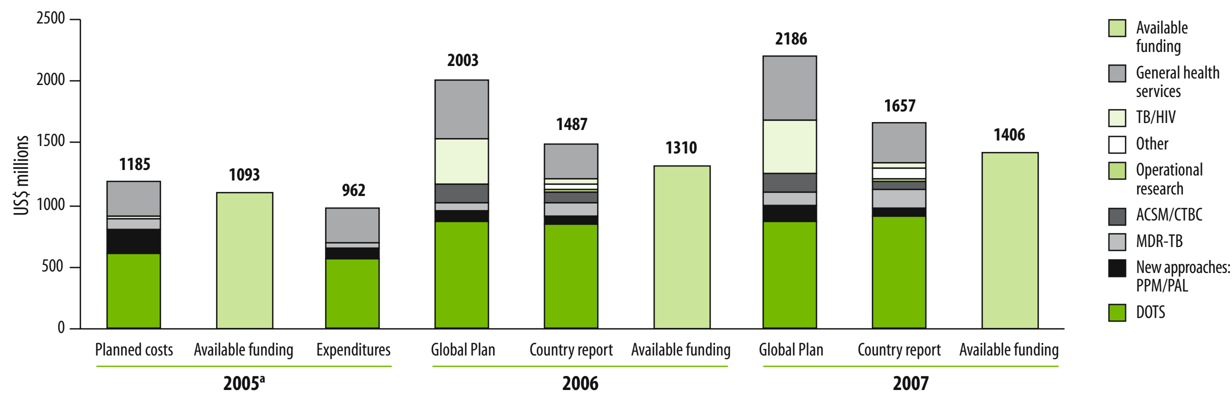
High-burden countries: country reports compared with the Global Plan

The Global Plan has set out what needs to be done between 2006 and 2015 to achieve the MDG and related Stop TB Partnership targets for TB control. For the Global Plan to be successfully implemented, country-level planning and budgeting for TB control needs to be in line with the seven regional plans and budgets that are described in the Global Plan; plans need to be fully funded; and planned interventions and activities need to be fully implemented. For the 22 HBCs as a whole, planned costs and available funding for 2006 and 2007 according to country reports

[1] Nonetheless, the capacity of health systems to manage an increasing number of TB patients warrants further analysis, particularly in countries where the number of patients will need to increase substantially to achieve the MDG and related Stop TB Partnership targets for TB control.

FIGURE 43

Global Plan compared to planned costs, available funding and expenditures, 22 high-burden countries, 2005–2007



[a] Planned costs are higher than actual costs shown in Figures 38–40 (actual costs are based on expenditures).

are compared with those derived from the Global Plan,[1] as well as with planned costs, available funding and actual expenditures in 2005, in Figure 43. This shows that while planned costs and available funding reported by countries are higher in 2006 and 2007 compared with 2005, they are much less than the funding requirements included in the Global Plan. For example, in 2007 the Global Plan indicates that US$ 2.2 billion is required in the 22 HBCs, while country reports indicate planned costs of US$ 1.7 billion, and available funding of US$ 1.4 billion. The discrepancy is mostly due to lower planned costs for collaborative TB/HIV activities (especially in the African region – see Annex 1) and ACSM. Exceptions where planned costs in country reports are either in line with or more ambitious than the Global Plan include Brazil, China, Kenya, the Philippines and Viet Nam (see Annex 1).

All countries: country reports compared to the Global Plan

The financial data submitted to WHO allow total TB control costs for 2007 to be estimated for 84 of the 172 countries that were included in the Global Plan (22 HBCs and 62 other countries).[2] These 84 countries account for 90% of all new cases arising each year, while the 172 countries included in the Global Plan account for 98% of such cases. A regional comparison of costs and available funding based on (a) country reports and (b) the Global Plan is shown for these 84 countries in Figure 44. Overall, country reports indicate planned costs of US$ 2.3 billion, compared with US$ 3.1 billion in the Global Plan. As for the 22 HBCs, the main discrepancy is the higher costs for collaborative TB/HIV activities and ACSM that are included in the Global Plan. However, Figure 44 also illustrates that this overall discrepancy is mostly accounted for by the African and (to a lesser extent) South-East Asia regions. In the Western Pacific Region, costs based on country reports are similar to those set out in the Global Plan. In the Region of the Americas and the Eastern Mediterranean Region, higher costs in the Global Plan reflect higher projections of the number of patients that need to be treated in DOTS programmes (both regions) and, in the Eastern Mediterranean region, an NTP budget that is not increasing in line with country projections of patients to be treated (notably in Pakistan). In the European Region, planned costs based on country reports are higher than those in the Global Plan. These differences mean that while the funding gap reported by countries amounts to US$ 307 million in 2007, the funding gap would be US$ 1.1 billion if the available funding of US$ 2.0 billion is compared with the funding requirements of US$ 3.1 billion set out in the Global Plan.

Budgets and costs per patient

Budgets and costs per patient in HBCs are shown in Table 23. The budget for first-line anti-TB drugs is lowest in Bangladesh (US$ 13) and highest in South Africa (US$ 61). In most countries, the budget is in the range US$ 16–35. The relatively high figure of US$ 51 for Kenya is due to the purchase of a one-year buffer stock; it is possible that the comparatively high figures for Mozambique and UR Tanzania have a similar explanation.

The budget per patient, including all line items, also varies. Three countries have budgets below US$ 100 per patient (Ethiopia, India and Pakistan). A total of eight countries have budgets in the range US$ 100–200 per patient, five are in the range US$ 200–300 and four are in the range US$ 300–550.[3] The Russian Federation is the only country with a budget above US$ 1000 per patient. The total cost per patient treated in 2007 is below US$ 100 in Ethiopia and India, in the range US$ 100–300 in 12 countries, and US$ 300–500 in three countries. There are four countries with much higher costs: Afghanistan, Brazil, the Russian Federation, and South Africa. Afghanistan's

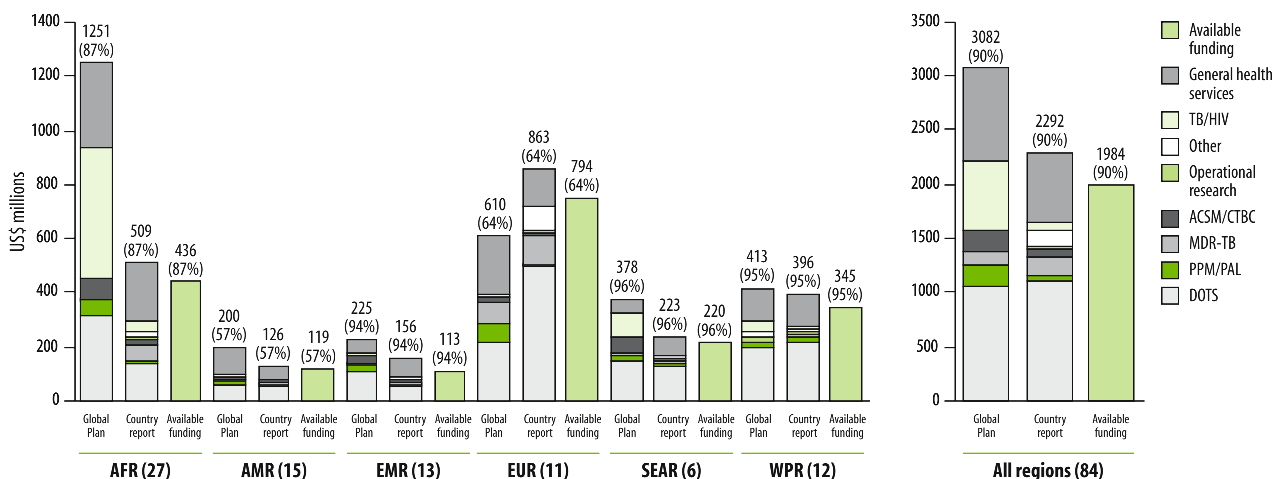
[1] See **Methods** for explanation of how costs for individual countries were derived from the Global Plan.

[2] Six of the 90 countries that reported complete data were not considered in the Global Plan cost estimates.

[3] Figures were not calculated for Thailand because the budget and health services utilization data reported to WHO were incomplete.

FIGURE 44

Total TB control costs in 2007 in 22 high-burden countries and 62[a] other countries by region: country reports compared with *The Global Plan to Stop TB, 2006–2015.* Numbers in parentheses above bars show the percentage of all estimated TB cases in the region accounted for by the countries included in the bar. Numbers in parentheses in the x-axis show the number of countries contributing to each bar.



[a] Iceland, the Netherlands, Serbia, Slovakia, Switzerland and TFYR Macedonia are excluded since they were not included in the Global Plan.

TABLE 23

Total TB control costs and NTP budgets per patient, high-burden countries, 2007

	2007 (US$)			CHANGES SINCE 2002, (FACTOR[a])		
	FIRST-LINE DRUGS BUDGET	NTP BUDGET	TOTAL COSTS	FIRST-LINE DRUGS BUDGET	NTP BUDGET	TOTAL COSTS
1 India	16	57	91	1.6	1.7	1.5
2 China	23	250	250	1.4	1.9	1.9
3 Indonesia	31	171	185	1.0	1.5	1.4
4 Nigeria	14	346	497	0.3	2.4	2.0
5 Bangladesh	13	101	136	0.6	1.2	1.1
6 Pakistan	19	97	112	0.3	2.1	1.2
7 South Africa	61	324	803	1.0	1.1	1.1
8 Ethiopia	26	39	88	1.0	0.9	1.4
9 Philippines	30	145	222	0.6	1.2	1.2
10 Kenya	51	263	280	1.4	5.1	4.2
11 DR Congo	19	228	309	0.5	2.5	1.8
12 Russian Federation	17	1 465	1 698	0.3	3.5	3.9
13 Viet Nam	35	166	283	1.0	1.9	1.3
14 UR Tanzania[b]	49	137	248	1.2	1.7	1.3
15 Brazil	67	516	864	1.5	3.1	1.7
16 Uganda	24	146	154	0.5	3.1	2.2
17 Thailand	–	–	–	–	–	–
18 Mozambique	51	297	522	2.2	3.8	3.4
19 Myanmar	21	117	138	1.2	5.6	2.6
20 Zimbabwe[b]	33	221	298	1.2	7.7	3.0
21 Cambodia	26	197	259	0.6	1.5	1.3
22 Afghanistan	20	545	598	0.7	2.4	5.2
High-burden countries (median value)	**26**	**197**	**259**	**1.0**	**1.9**	**1.8**

– Indicates not available.
[a] Calculated as 2007 value divided by 2002 value.
[b] Latest available data are for 2006.

relatively high costs reflect the need to rebuild the basic infrastructure required for TB control,[1] as well as a plan for 2006–2010 that incorporates all elements of the new Stop TB Strategy and follows the planning and costing framework used for the Global Plan. The other three countries are middle-income countries with generally higher prices for the inputs needed for TB control and in the Russian Federation, as noted above, a further explanation is the continued reliance on lengthy hospitalization of patients as well as mass population screening using fluorography. Among the low-income countries, there is no clear-cut relationship between the cost per patient treated and GNI per capita: for example, in India and Pakistan the cost per patient treated is low relative to income levels, while in DR Congo and Mozambique the cost per patient treated is relatively high compared with GNI per capita (data not shown). Overall, budgets and costs per patient are generally increasing, with a median increase of 90% per patient for budgets and of 80% for total costs (though the median for first-line drugs shows no change since 2002).

Further details, including charts that show five per patient indicators (costs, budgets, available funding, expenditures and budget for first-line anti-TB drugs) for each year 2002–2007 for each HBC, are provided in Annex 1. Data have also been compiled and analysed for all other countries that reported data, and are available upon request.

Expenditures compared with available funding and case detection

For countries that have received large increases in funding, there are two important challenges: to spend the extra money, and to translate extra spending into improved case detection and treatment success rates. To date, we have been able to conduct analyses for the HBCs only.

The ability to translate additional funding into spending can be assessed by comparing expenditures with available funding (Table 24; Figure 45). Complete sets of data on budgets, funds and expenditures for 2005 were available for 18 HBCs (the exceptions being South Africa, Thailand, Uganda and Zimbabwe). When budget and funding data were prospectively reported for 2005, five of these 18 HBCs had fully-funded budgets (Afghanistan, Brazil, India, Indonesia and Viet Nam). Among these five countries, Brazil, India, and Viet Nam spent all the available funds; in Brazil and India, expenditures included the spending of funds that were mobilized in excess of the original budget.[2]

China was also successful in mobilizing additional funding during 2005, and spent funds that were in excess of the original budget. Apart from these six countries,

[1] While we have reported these costs as part of the NTP budget, they will help to strengthen the health system as a whole.

[2] This explains why the value of expenditures in 2005 as a percentage of the available funding prospectively reported in 2005 (final column of Table 24) is above 100.

TABLE 24

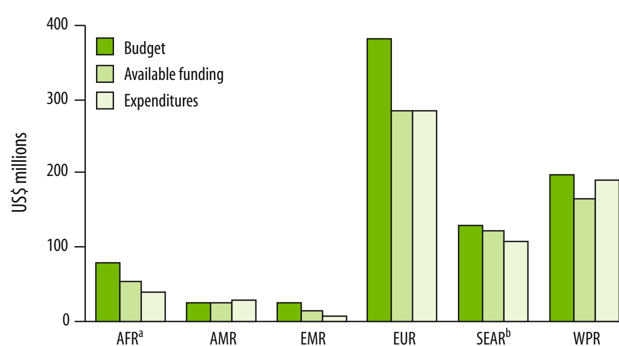
Budgets, available funding and expenditures (US$ millions), high-burden countries, 2005

		BUDGET	AVAILABLE FUNDING[a]	EXPENDITURE[b]	AVAILABLE FUNDING AS % OF NTP BUDGET	EXPENDITURE AS % OF AVAILABLE FUNDING[c]
1	India	47	47	51	100	108
2	China	155	127	157	82	123
3	Indonesia	53	53	40	100	76
4	Nigeria	14	8.6	8.5	63	100
5	Bangladesh	17	14	12	85	85
6	Pakistan	19	8.7	3.1	45	36
7	South Africa	–	41	41	–	99
8	Ethiopia	6.8	6.2	5.9	91	95
9	Philippines	20	17	13	86	78
10	Kenya	10	7.8	7.7	77	98
11	DR Congo	11	8.7	7.9	81	91
12	Russian Federation	382	284	284	74	100
13	Viet Nam	17	17	17	100	100
14	UR Tanzania[d]	7.6	6.5	5.1	86	78
15	Brazil	24	24	28	100	117
16	Uganda	6.0	3.6	–	60	–
17	Thailand[d]	4.7	4.7	–	100	–
18	Mozambique	7.7	7.3	4.8	95	66
19	Myanmar	5.8	2.1	2.6	36	122
20	Zimbabwe[d]	16	5	–	30	–
21	Cambodia	6.9	4.6	4.4	67	94
22	Afghanistan	4.0	4.0	1.8	100	44
	High-burden countries	**833**	**702**	**694**	**79[e]**	**90[e]**

– Indicates not available.
[a] Based on budget data, reported prospectively in 2005.
[b] Based on actual expenditures reported in 2006.
[c] Figures can be above 100% when additional funds were mobilized after reporting data in 2005.
[d] Data for UR Tanzania and Zimbabwe are for 2006. Data for Thailand are partial.
[e] Average values.

FIGURE 45

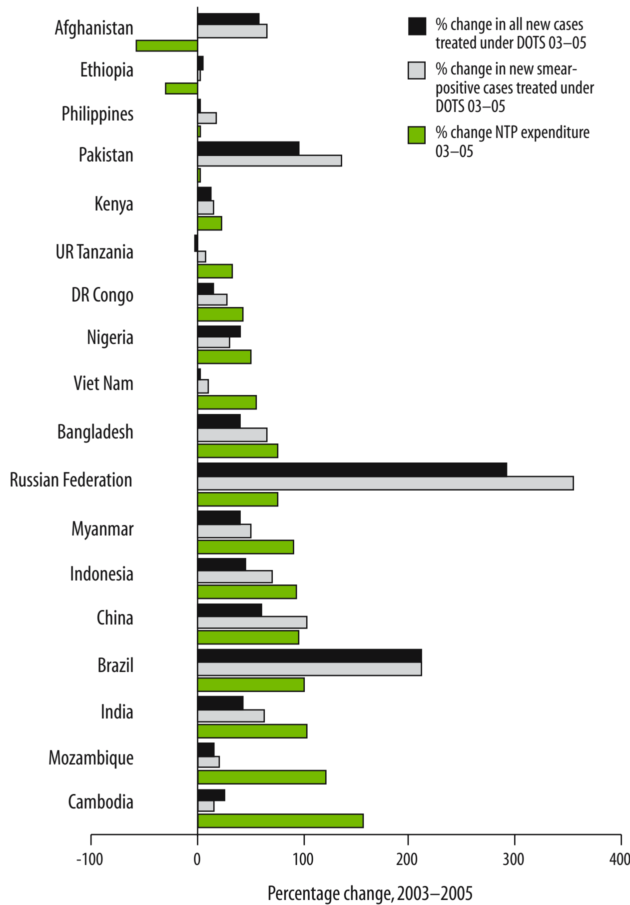
Budget, available funding and expenditures by WHO region (US$ millions), high-burden countries, 2005



[a] Expenditure data not available for Uganda and Zimbabwe. Budget data not available for South Africa.
[b] Expenditure data not available for Thailand.

FIGURE 46

Change in NTP expenditure and change in new smear-positive and all types of patients treated under DOTS, 18 high-burden countries,[a,b] 2003–2005



[a] Expenditure data for both years not available for South Africa, Thailand, Uganda and Zimbabwe. Comparison for Kenya is with expenditure 2004.
[b] Countries ranked by percentage change in NTP expenditure.

budgets were not fully funded and, except for Myanmar, Nigeria and the Russian Federation, expenditures were almost always less than available funding. Expenditures were particularly low in relation to available funding in Afghanistan and Pakistan. For three African countries highlighted as spending less than 50% of the funding available to them in 2004, there was an improvement in 2005. In 2005, Kenya, Mozambique and UR Tanzania spent 98%, 66% and 78% of available funding, respectively.

The ability to translate spending into improved case detection can be assessed by comparing changes in expenditures 2003–2005 with changes in the number of patients treated 2003–2005 (Figure 46; 2005 is the most recent year for which both case notification and expenditure data are available). Of the 18 countries for which data were available, all but one that increased spending between 2003 and 2005 also increased the number of cases (both new smear-positive and new cases as a whole) that were detected and treated in DOTS programmes (the exception was UR Tanzania). However, the relationship was variable. In Brazil and the Russian Federation, the increase in the number of patients treated under DOTS was far in excess of the increase in expenditures, probably because increasing the number of cases treated under DOTS requires a substitution of DOTS for non-DOTS treatment rather than an increase in total notifications. There was a close to one-to-one relationship between increased expenditures and increased notifications of new smear-positive cases under DOTS in China, while the percentage increase in notifications of new smear-positive cases under DOTS was 56–87% of the percentage increase in expenditures in Bangladesh, DR Congo, India, Indonesia, Kenya, Myanmar and Nigeria (with a range of 46–81% when all forms of new case are considered). There were four countries where the percentage increase in the number of cases treated in DOTS programmes was small compared with the increase in expenditures (Cambodia, Mozambique, UR Tanzania and Viet Nam). In three countries, reported expenditures fell while the number of cases treated increased (Afghanistan, Ethiopia and Pakistan). This fall in expenditures combined with an increase in the number of cases treated is plausible in Ethiopia, since large capital expenditures occurred in 2003, but the data for Afghanistan and Pakistan suggest that expenditures are being underreported. Finally, in the Philippines there were relatively small absolute changes in both expenditures and cases (all forms) treated (2% and 3% respectively).

GFATM contribution to TB control

High-burden countries

In HBCs, the GFATM is the single most important source of external financing, with nine countries (Bangladesh, Cambodia, DR Congo, Ethiopia, Indonesia, Nigeria, the Philippines, Uganda and Zimbabwe) relying on the GFATM to fund more than 25% of their NTP budgets. After six rounds of proposals, the total value of approved proposals in the HBCs is US$ 1.3 billion (Table 25). The amounts in the Phase 1 grant agreements (i.e. the grants that cover the first two years of the proposal) total US$ 519 million.

By the end of 2006, US$ 324 million had been disbursed. For each country, we can compare the actual and expected rates of disbursal, where the expected rate assumes that disbursements should be spread evenly over the two or five year period of the grant agreement following the programme start date (Table 25).[1] Across all grants and countries, the actual disbursement rate is similar to the expected rate. However, for half (19 out of 38) of the grants the actual disbursement rate is below the expected rate, and for half it is above the expected rate. Disbursements are particularly low in relation to the expected disbursement

[1] For other countries, a summary table with the same indicators as those shown for the HBCs is available upon request.

TABLE 25

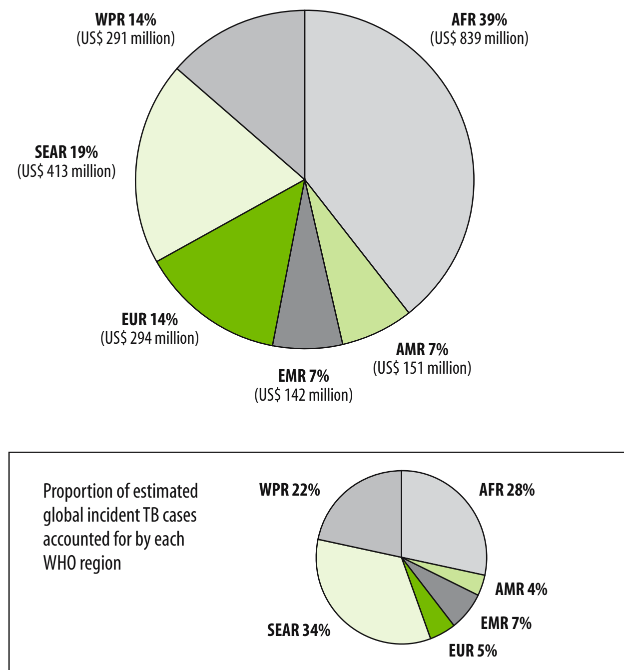
The Global Fund to Fight Aids, Tuberculosis and Malaria financing for high-burden countries, as of end 2006

	ROUND	TOTAL BUDGET (YEARS 1–5)[a] US$ MILLIONS	GRANT AMOUNT PHASE 1 (YEARS 1–2)[b] US$ MILLIONS	GRANT AMOUNT PHASE 2 (YEARS 3–5) US$ MILLIONS	TOTAL DISBURSEMENT BY END 2006 (AS OF 23 DEC 2006) US$ MILLIONS	TOTAL DISBURSEMENT BY END 2006 AS % OF GRANT AGREEMENT		DATE GRANT AGREEMENT SIGNATURE	PROGRAMME START DATE	DATE OF FIRST DISBURSEMENT	TIME BETWEEN BOARD APPROVAL AND SIGNATURE OF GRANT AGREEMENT[d] (MONTHS)	TIME BETWEEN SIGNATURE OF GRANT AGREEMENT AND FIRST DISBURSEMENT (MONTHS)
						ACTUAL (%)	EXPECTED (%)[c]					
1 India	1[e]	8.7	5.7	3.0	7.2	84	75	Jan-03	Apr-03	Jul-03	9	6
	2	29	7.1	22	6.8	23	55	Feb-04	Apr-04	Mar-04	13	2
	3[f]	15	2.7	–	2.2	82	100	Oct-04	Nov-04	Jan-05	12	3
	4	27	6.8	–	4.0	59	86	Feb-05	Apr-05	Mar-05	7	1
	6	24	9.1	–	–	–	–	–	–	–	>2	–
2 China	1	48	25	23	36	74	75	Jan-03	Apr-03	Apr-03	9	3
	4	56	28	–	22	79	74	Jun-05	Jul-05	Jul-05	11	1
	5	53	18	–	3.9	22	7.2	Sep-06	Nov-06	Oct-06	12	0.5
3 Indonesia	1	69	22	47	38	56	68	Jan-03	Aug-03	Mar-03	9	2
	5	69	18	–	–	–	–	Sep-06	–	–	12	–
4 Nigeria	5	68	26	–	8.4	33	0	Sep-06	Jan-07	Dec-06	12	2
5 Bangladesh	3	42	11	16	15	57	48	Jul-04	Aug-04	Jul-04	9	1
			5.5	10	4.5	29	46	Aug-04	Sep-04	Oct-04	10	1
	5	46	3.9	–	1.5	39	32	May-06	May-06	Jun-06	7	1
			5.8	–	1.5	25	32	May-06	May-06	Aug-06	7	3
6 Pakistan	2	4.0	2.2	1.8	1.7	43	60	Aug-03	Jan-04	Jan-04	7	5
	3	9.9	5.6	–	3.7	67	99	Oct-04	Jan-05	Nov-04	12	2
7 South Africa	1[f]	20	2.4	–	2.4	100	100	Aug-03	Dec-03	Dec-03	16	5
			18	–	18	100	100	Aug-03	Aug-03	Dec-03	16	5
	1[f]	62	27	–	22	84	100	Aug-03	Jan-04	Dec-03	16	5
	2[f]	25	8.4	–	1.8	21	49	Nov-05	Jan-06	Dec-05	34	1
8 Ethiopia	1	27	11	16	15	57	68	Mar-03	Aug-03	Aug-03	11	5
	6	44	12	–	–	–	–	–	–	–	>2	–
9 Philippines	2	11	3.4	8.0	9.3	81	68	Jun-03	Aug-03	Jul-03	5	1
	5	50	15	–	4.6	30	11	Aug-06	Oct-06	Sep-06	>2	–
10 Kenya	2	8.8	4.9	3.8	2.5	28	63	Jun-03	Nov-03	Oct-03	5	4
	5	20	7.9	–	3.5	44	16	Jul-06	Sep-06	Aug-06	9	2
	6	9.2	4.2	–	–	–	–	–	–	–	>2	–
11 DR Congo	2[e]	7.6	6.4	1.2	7.6	100	68	Jun-03	Aug-03	Jul-03	5	1
	5	36	15	–	4.7	32	3.1	Oct-06	Dec-06	Nov-06	13	1
	6	12	8.5	–	–	–	–	–	–	–	>2	–
12 Russian Federation	4	88	49	–	18	36	53	Oct-05	Dec-05	Dec-05	15	3
Tomsk	3	11	6.3	4.5	6.5	61	41	Oct-04	Dec-04	Dec-04	12	2
13 Viet Nam	1	10	2.5	7.5	2.5	25	51	Oct-03	Jun-04	Apr-04	9	7
	6	11	1.6	–	–	–	–	–	–	–	>2	–
14 UR Tanzania	3[f]	83	24	–	20	85	100	Sep-04	Nov-04	Nov-04	11	2
	6	37	18	–	–	–	–	–	–	–	>2	–
Zanzibar	3	1.7	1.0	–	1.0	100	100	Sep-04	Dec-04	Nov-04	20	3
15 Brazil	5	27	2.8	–	–	–	–	Dec-06	–	–	15	–
			8.8	–	–	–	–	Dec-06	–	–	15	–
16 Uganda	2	5.7	4.7	–	4.6	98	100	Mar-04	Mar-04	Mar-04	14	0.4
	6	26	11	–	–	–	–	–	–	–	>2	–
17 Thailand	1	11	7.0	4.5	6.9	60	65	May-03	Oct-03	Jul-03	13	2
	6	20	7.7	–	–	–	–	–	–	–	>2	–
18 Mozambique	2	15	9.2	–	7.2	78	99	Apr-04	Jan-05	Dec-04	15	9
19 Myanmar[g]	2	17	2.7	–	2.7	100	99	Aug-04	Jan-05	Sep-04	19	1
20 Zimbabwe	5	12	9.2	–	–	–	–	Dec-06	–	–	15	–
21 Cambodia	2	6.2	2.5	3.7	4.0	64	60	Oct-03	Jan-04	Dec-03	9	2
	5	9.7	3.3	–	0.8	24	7.2	Sep-06	Nov-06	Nov-06	12	1
22 Afghanistan	4[e]	3.4	2.3	–	1.3	56	66	Jun-05	Sep-05	Aug-05	12	2
High-burden countries		**1 298**	**519**	**171**	**324**	**62[h]**	**65[h]**				**11[h]**	**2[h]**

– Indicates not available.
[a] Budgets are for 5 years, unless otherwise stated.
[b] Phase 1 amounts for round 6 grants are provisional because the grants have not yet been signed.
[c] Shows the percentage of the grant period that has elapsed since the programme start date.
[d] Board approval dates: 22 April 2002 for round 1, 13 January 2003 for round 2, 15 October 2003 for round 3, 28 June 2004 for round 4, 30 September 2005 for round 5 and 3 Novemeber 2006 for round 6.
[e] Budget is for three years.
[f] TB/HIV grant.
[g] Grant has been terminated.
[h] Median values.

FIGURE 47

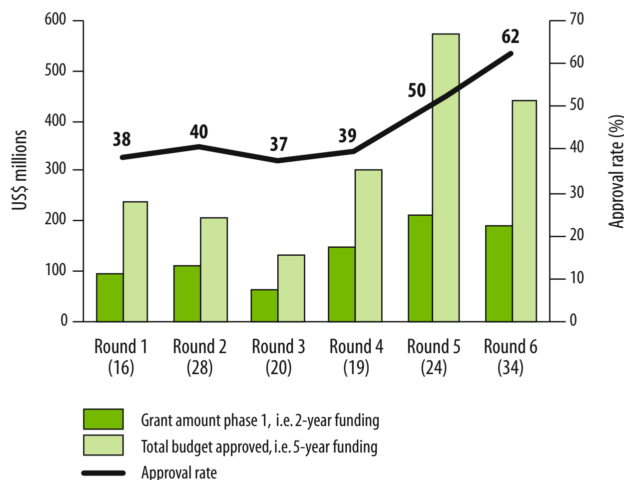
GFATM funding for TB control by WHO region, as of end 2006[a]



[a] Refers to the total budgets approved in rounds 1–6.

FIGURE 48

GFATM financing and proposal approval rate by round. Numbers in the horizontal axis show the number of TB proposals approved in each round.



of funds in India (round 2 but not rounds 1, 3 and 4), Kenya (round 2 but not round 5), South Africa (rounds 1 and 2) and Viet Nam (round 1). The main delay in the initial flow of funds to countries is the time taken to sign the grant agreement after proposal approval; the median time is 11 months (range 2–34 months), which is in line with GFATM expectations that it takes about one year to prepare and finalize the Phase 1 grant agreement and related documentation. Once grant agreements are signed, disbursements are usually made within 2 months.

All countries

In six funding rounds between 2002 and 2006, the GFATM approved proposals worth a total of US$ 2.1 billion for control of TB and TB/HIV in 92 countries, including all 22 HBCs. The total for TB proposals was US$ 1.9 billion. The African Region has the single largest share, at 39% (Figure 47), which is higher than its share of the global burden of TB (28%). The South-East Asia and Western Pacific regions have the second and third highest funding in absolute terms, but less than might be expected given their share of the global burden of TB. The funding approved for the Eastern Mediterranean Region is in line with its share of the global burden of TB (7%), while the share of funding for the European Region and the Region of the Americas is higher than these regions' share of the global burden of TB.

The value of approved proposals for TB control was relatively high in rounds 5 and 6 compared with rounds 1–4, as was the proposal approval rate (Figure 48).[1] The approval rate for TB proposals submitted to the GFATM was 50% in round 5 and 62% in round 6, up from 37–40% in rounds 1–4.

[1] Calculated as the number of proposals approved divided by the number of proposals reviewed by the GFATM's Technical Review Panel.

Conclusions

Monitoring progress in TB control

This report draws four main conclusions about progress in TB control, based on routine monitoring and surveillance data. The first is that NTPs worldwide narrowly missed the 2005 targets for case detection (60%/70%) and treatment success (84%/85%). However, both targets were met in the Western Pacific Region, and in 26 countries including China, the Philippines and Viet Nam. Second, while the total number of patients diagnosed and treated under DOTS approached target levels in 2005, the numbers known to be HIV-positive or carrying drug-resistant bacteria (MDR-TB) were far fewer than anticipated by the Global Plan in 2006. Therefore a major effort is needed to step up collaborative TB/HIV activities and the management of MDR-TB. Third, the global TB epidemic appears to be on the threshold of decline. The incidence rate (per capita) worldwide has evidently stabilized or begun to fall, following the earlier downturns in prevalence and mortality.[1] The incidence rate is now stable or falling in all WHO regions, including Africa and Europe. These findings, if robust, mean that MDG target 8 was met before 2005, and more than 10 years before the target date of 2015. However, the total number of new TB cases was still rising slowly in 2005, and in the African, Eastern Mediterranean and South-East Asia regions. In some Asian countries that report high rates of case detection and treatment success, incidence has not apparently been reduced as quickly as expected, for reasons that are not fully understood. This is linked to the fourth conclusion: that the global TB burden is not yet falling fast enough to satisfy the more demanding targets set by the Stop TB Partnership within the MDG framework. That is, at the current rate of progress, the 1990 prevalence and mortality rates will not be halved worldwide by 2015. The following sections discuss these conclusions in more detail.

Case detection

The point estimate of the global case detection rate in 2005 is 60%, i.e. 10% below target. The data suggest that the target was reached in the Western Pacific Region and in seven HBCs. Calculations that attempt to allow for many of the uncertainties surrounding the point estimate indicate that case detection could have been as high as 69% or as low as 52%. It therefore seems unlikely that case detection exceeded 70%, both on the basis of these calculations and in view of much independent data showing why detection and/or reporting of patients is low in some places. For example, improving links among public health providers, and between public and private sectors, can substantially increase the number of patients reported to NTPs.[2,3]

While the case detection rate accelerated markedly between 2000 and 2004, the annual increase slowed between 2004 and 2005. Saturation in case-finding is expected where detection rates are high, but the deceleration began in South-East Asia, the Americas and the Western Pacific Region at rates of detection that were below the 70% target. Among HBCs, the slowdown was conspicuous in India, where the final stages of national DOTS expansion are taking place in states with the weakest health systems, such as Bihar and Jharkhand.

Case detection inevitably becomes more difficult at the limits of public health systems, but there are still some comparatively easy gains to be made. Several WHO reports in this series have emphasized that, in the Americas and Europe, many TB cases are reported through the public health system but from outside DOTS programmes. This implies that target rates of case detection could be achieved in these two regions by implementing the procedures required under DOTS, including the more frequent use of smear microscopy in the European Region. In other parts of the world, especially the African and the Eastern Mediterranean regions, case detection must be improved by finding more patients in total, for example by increasing the number and diversity of clinics and hospitals that report TB cases.

The acceleration in case detection since 2000 has been achieved both by improving detection within established DOTS areas and by expanding geographical coverage. However, “coverage” is now less useful as an indicator than in the early years of DOTS expansion, for two reasons. First, geographical coverage was high in most DOTS countries by 2005. Second, other determinants of case detection (e.g. diagnosis and treatment in the private sector, the efficiency of public health services) have, in many countries, become more important than recruiting new districts and provinces to DOTS programmes.

Outcomes of treatment

DOTS programmes treated more than two million smear-positive patients in the 2004 cohort, and achieved a global success rate just below the 85% target. The target was met in the South-East Asia and Western Pacific regions, and in eight HBCs. However, the overall treatment success, coupled with the 54% case detection rate in 2004, means that less than half (46%) of all new smear-positive patients were known to have been successfully treated in that cohort.

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1 *Global tuberculosis control: surveillance, planning and financing. WHO report 2006*. Geneva, World Health Organization, 2006 (WHO/HTM/TB/2006.362).

2 Lönnroth K et al. Public–private mix for DOTS implementation: what makes it work? *Bulletin of the World Health Organization*, 2004, 82:580–586.

3 Lönnroth K et al. Hard gains through soft contracts: productive engagement of private providers in tuberculosis control. *Bulletin of the World Health Organization*, 2006, 84:876–883.

In the countries where treatment outcomes have been poor in recent years, little change was visible in the results for 2004. In the African and European regions, where high proportions of patients fail treatment or die, or are lost from DOTS cohorts, HIV/AIDS and MDR-TB are, respectively, major obstacles to TB control. But incomplete cohort data from these regions show that programme management also continues to be weak.

Clearly, NTPs must continue to improve case-finding and treatment success within the framework of the Global Plan, working towards the MDGs. To reach the targets of 70% case detection and 85% treatment success is a precondition for achieving a major impact with DOTS and the Stop TB Strategy.

Epidemiological trends and the impact of TB control

Our conclusion that incidence, prevalence and mortality were falling globally by 2005 is based on the best available evidence, but needs to be verified with more and better information. Current point estimates of the key epidemiological indicators are, for many countries, derived by mathematical and statistical modelling, and from weak or indirect evidence. For example, it is uncertain whether the TB incidence rate is still increasing in subregion Africa – low HIV, given that HIV prevalence is thought to be in decline in this group of African countries (Figure 7).[1] In the Region of the Americas, TB prevalence and death rates had already fallen by 2005 to about half the 1990 values, 10 years ahead of the 2015 target year. But this conclusion is not based on direct measurements of prevalence, and is guided by limited information about TB deaths (Annex 3). Moreover, the fall in case notifications has, for unknown reasons, slowed or reversed in recent years in some Latin American countries, including Brazil, Mexico and Peru.

The ultimate goal is to measure incidence through reliable case notifications, prevalence via well-designed prevalence surveys, and deaths by comprehensive vital registration (Table 4). Most countries cannot yet measure all key indicators, and there is much scope for improving and validating methods such as verbal autopsy for counting TB deaths in the population at large (i.e. outside DOTS cohorts).

Notwithstanding this cautious note on evaluation, the trend in TB incidence in some countries is clear and, in a few instances, the fall in TB can be attributed to the implementation of good control programmes. In 10 countries in the Eastern Mediterranean Region, for example, case notification rates were falling at 2–10% annually between 1994 and 2005. For the majority of these countries, the trends in case reports probably reflect the underlying trend in incidence. The higher rates of reduction (e.g. Jordan, Lebanon) are likely to reflect some impact of DOTS programmes, although the size of this impact is not easily quantified. New Caledonia is a more persuasive example, albeit on a small scale, of impact due to a good programme of drug treatment: the overall case notification rate fell at an average of 9% each year between 1990 and 2005.

In contrast, some countries are not showing the reductions in incidence expected after several years of DOTS implementation. Viet Nam has apparently had high and stable case detection and treatment success rates for a decade, and yet there are no indications that the total number of TB cases is falling. An examination of the notification trends by age and sex shows that case rates are falling among adults aged 35–64 years (especially women), but they are increasing among 15–24 year-olds (especially men) (data in Annex 2 and previous reports). In Figure 23 we have presented this phenomenon in another way: the average age of TB patients is falling among younger adults but increasing among the elderly. Such differences among and between younger and older adults can be seen in data from Bangladesh, China, Myanmar, Sri Lanka and Thailand. In Indonesia, exceptionally, the average age of older as well as younger TB patients is falling. In the United States of America, the average age is falling among younger men and women, but is not obviously increasing among older people. Among people 15–54 years old in Morocco, the average age of women with TB is falling, but for men it is increasing.

This analysis, based only on surveillance data, is not powerful enough to determine the direction of the TB epidemics in these countries, or to fully explain the patterns of change with age. The observations do, however, help to refine the epidemiological questions. In particular, they underline the importance of understanding how the epidemiology of TB among young men and women could be slowing the decline of the epidemic in the established market economies, and in those Asian countries that have most of the world's TB cases.

While the slow decline in TB incidence is a concern in Asia, any sign of a reduction in TB is welcome news in Africa. After more than a decade of rising case numbers, the increase in the case notification rate in eastern and southern African countries (sub-region Africa – high HIV) appears to have halted and may now be in decline. The upward shift in the average age of TB patients in Uganda and UR Tanzania is consistent with the flat or declining trend in case notifications, and follows the trend in HIV prevalence in these two countries. The stabilization or decline of TB in parts of sub-Saharan Africa is the main reason why the incidence rate has begun to fall globally.

Although incidence, prevalence and death rates now appear to be in decline, prevalence and death rates are not yet falling fast enough to achieve the 2015 targets. The decline will be accelerated by finding and curing more patients. The total number of patients diagnosed and treated in 2005 is in line with expectations for 2006, but the marked variations in case detection among WHO

[1] *AIDS epidemic update: December 2006*. Geneva, UNAIDS/WHO, 2006.

regions in 2005 will persist without remedial action. And there were major deficiencies in 2005 in the diagnosis and treatment of HIV-positive and MDR-TB patients, which are reflected in budgets for 2005–2007 (see **Financing TB control**). The present analysis leads to the conclusion that investment and implementation need to be stepped up especially, but not exclusively, in the African, Eastern Mediterranean and European regions.

Stop TB Strategy: implementation and planning

Eight main themes emerge from this review of the transition from DOTS to the Stop TB Strategy during 2006.

Strategic planning

The majority of HBCs have developed strategic plans that recognize most of the elements of the Stop TB Strategy but which are not yet in line with the Global Plan. The identification of extensively drug-resistant tuberculosis (XDR-TB) during 2006 has prompted many countries to review the quality of their TB control strategy, and to take the necessary steps to strengthen basic TB control. However, some country plans are modest in terms of the investments needed, especially to improve the quality of DOTS, to treat patients with MDR-TB, and to implement collaborative TB/HIV activities on a large scale (see **Financing TB control**).

Human resource development

The strength and sustainability of NTPs depend on timely, adequate and ongoing training and deployment of personnel. The performance of staff depends on various factors such as motivation, training, supervision, salaries and working conditions, all of which must be included in carefully-formulated and implemented HRD policies.

With the transition from DOTS to the Stop TB Strategy, HRD is becoming more complex. Compared with previous years, NTPs are now producing more comprehensive HRD plans, and there is a growing recognition that HRD consists of more than training. Also needed are routine data to monitor staff turnover, improved working conditions, and motivation and retention strategies. The systematic development of human capacity is becoming central to TB control in many countries.

Monitoring missions have shown that many NTPs now have a system and structure for HRD. However, the quality of the system is often insufficient and the HR management capacity is often inadequate at provincial and district levels. One of the key challenges is to retain enough competent staff to cover TB control when general health service staff are overstretched. Few countries routinely report data related to HRD, or systematically review staffing and training during routine supervision. Such information would lead to improvements in training and recruitment.

HRD needs better advocacy and promotion, and NTP staff need to understand its essential role in TB control. The lessons learnt by NTPs in countries such as India and Indonesia on how HRD should be organized and managed should be widely disseminated. Furthermore, there must be greater collaboration on HRD among government departments and ministries that service the whole health system.

Quality-assured laboratory and treatment services

The prompt diagnosis and effective treatment of all types of TB underpin the Stop TB Strategy. Both functions require a strong laboratory network, but the quality of laboratory services has been given too little attention. DOTS, as a part of the Stop TB Strategy, requires high-quality sputum smear microscopy. Implementation of the strategy also requires the phased expansion of culture and DST facilities, but this is being done slowly in all regions except the Americas and Europe. Although all HBCs require more funds to develop their laboratory networks, India in particular needs substantial additional investment.

While there have been major improvements in the procurement, supply and use of quality-assured anti-TB drugs, NTPs must be prepared to confront new challenges, such as XDR-TB. Standardized, free-of-charge, short-course chemotherapy is now routinely used worldwide. Patient kits and FDCs are also being increasingly used. However, some weaknesses need to be rectified, such as the use of the WHO-recommended Category I regimen in only half of the countries in Europe. Of greater concern is the observation that all WHO regions had at least one country that experienced first-line drug stock-outs at some level during 2005, and seven HBCs reported first-line drug stock-outs at the peripheral level.

Collaborative TB/HIV activities

The TB and HIV/AIDS control programmes in most countries have begun to respond to the challenge presented by the interaction between these two epidemics. But the majority of countries do not yet offer widely the essential diagnostic and treatment services: HIV testing, screening for TB among HIV-positive people, and the provision of CPT, ART and IPT. Low rates of HIV testing are, in most countries, currently the principal obstacle to providing ART to TB patients. The coverage of these services in 2005 was far less than anticipated by the Global Plan in 2006, the first year of its implementation. It is therefore clear that collaborative TB/HIV activities need to be stepped-up rapidly, to respond to the TB emergency declaration in Africa,[1] and to satisfy the needs of "universal access" as described in the Global Plan.

This report shows that there were in fact significant improvements between 2003 and 2005, at least in some

[1] See: www.who.int/tb/features_archive/tb_emergency_declaration/en/

aspects of diagnosis and treatment in some countries. For example, Kenya, Malawi and Rwanda are now testing a growing number of notified TB cases for HIV, providing CPT to around 80% of their HIV-positive TB patients, and ART to around 30%. The total number of reported patients beginning ART in the African Region increased about 40-fold between 2003 and 2005.

In 2005, CPT was more widely available to HIV-positive TB patients than ART. In part this is because CPT is cheaper and easier to distribute and administer than ART, which must be taken for life. But CPT is also provided at the periphery of health services, while ART is often available only in hospitals to which fewer patients have access. As the costs of diagnosis and treatment fall, and as experience in the care of HIV-positive TB patients grows, it will be easier to simplify and decentralize the provision of ART.

There has been less progress in screening HIV-positive people for TB, even though screening appears to be an efficient way of finding TB cases, and despite the demonstrated efficacy of preventive therapy (IPT) for those who have not (yet) progressed to active TB. Botswana, uniquely, has shown that IPT can be provided to HIV-positive people on a large scale.

The expansion of HIV testing among TB patients, and the recording and reporting of test results, will provide important information for monitoring and evaluation. With this information, TB epidemic trends can be monitored separately among HIV-positive and HIV-negative populations, so as to obtain a better understanding of the underlying epidemiology and impact of TB control. It will also be possible to monitor treatment outcomes according to HIV status, in particular mortality. Smear-positive patients treated under DOTS in Africa had higher death rates than in any other WHO region in 2004. This is presumably because of the high prevalence of HIV in the region, but the contribution of HIV to TB deaths in Africa has not yet been demonstrated directly on a large scale.

In this context, several countries including Brazil, Jamaica, Belize, Estonia and the Russian Federation, have developed their own recording and reporting systems to ensure that information on TB and HIV is systematically collected, compiled and analysed. The quality of information about TB and HIV will increase greatly as more countries follow the revised (2006) WHO guidelines on recording and reporting.[1]

MDR-TB surveillance and control

The long-term vision for control of MDR-TB includes DRS and treatment of MDR-TB as standard components of all TB control programmes. True integration of surveillance and treatment of MDR-TB requires the scale-up of culture and DST services, which were the primary limiting factors for expansion in 2006.

Currently, few countries, with the exception of the established market economies and the subregions of Central and Eastern Europe, are providing diagnostic services including culture and DST for all TB cases. In most countries, culture and DST are provided to a group of patients selected on a clinical basis, often treatment failures or contacts of known MDR-TB patients. Therefore, routine surveillance data and survey data obtained through the Global DRS Project are poorly correlated, with the exception of the European Region which provides wide access to culture and DST services.[2]

A total of 182 countries filled in the WHO standard data collection form for MDR-TB data for 2005, but only 104 countries reported at least one MDR-TB case, and the majority of countries reported less than 50 cases. It is expected that expansion of culture and DST, as well as treatment for MDR-TB as outlined in the Global Plan, will improve the routine surveillance of drug resistance, particularly among re-treatment cases. In the meantime, the Global DRS Project continues to play an important role in supplementing routine surveillance, and in monitoring trends in drug resistance. The Global Plan anticipates that 20 000 and 36 000 MDR-TB cases will be treated according to international standards in 2006 and 2007, respectively. In 2005, the total number of MDR-TB patients reported, and the number reported as being diagnosed in GLC programmes (probably overestimated), were far below the Global Plan proposal for 2006. However, the number of known MDR-TB patients is growing, and the proportion treated under the GLC is expected to increase from about a third (35%) in 2006 to a half (47%) in 2007.

The 2004 cohort of MDR-TB patients was the first for which data on treatment outcomes were collected. The treatment success rate for patients in GLC projects was 57% on average somewhat better than for patients treated outside GLC projects (50% treatment success).[3] In future, we expect treatment outcomes in GLC projects to improve as cohorts are likely to include fewer chronic cases and a higher proportion of new MDR-TB patients carrying bacteria that are typically resistant to fewer drugs. In addition, the GLC has in recent years approved more countries that do not have a history of second-line drug use. In such settings, MDR-TB control is likely to yield better treatment outcomes; susceptibility to the most

1 *The revised TB recording and reporting forms – version 2006*. Geneva, World Health Organization, 2006. Available at www.who.int/tb/dots

2 Data not presented in this report. This is a repeat of the analysis presented in *Global tuberculosis control: surveillance, planning and financing. WHO report 2006*. Geneva, World Health Organization, 2006 (WHO/HTM/TB/2006.362). The reanalysis gives essentially the same results.

3 This is lower than reported in another publication from the same GLC-approved countries (Nathanson E et al. Multidrug-resistant tuberculosis management in resource-limited settings. *Emerging Infectious Diseases*, 2006, 12:1389–1397). The paper reported that an average of 70% of MDR-TB patients were successfully treated (higher among new, 77%, than among previously treated MDR-TB patients, 69%). In that source, the number of patients was higher because the data covered three years instead of one year in this report. The MDR-TB patients discussed in the article also included a high proportion of severe chronic cases, with 65% of patients resistant to both first- and second-line anti-TB drugs.

effective second-line drugs should be preserved, perhaps permitting shorter regimens with fewer, less toxic drugs.

The number of GLC-approved, MDR-TB control programmes is increasing rapidly, both as a result of more funding for TB control from the GFATM, and through the integration of MDR-TB management into general TB control efforts, as outlined in the Stop TB Strategy and described in the new guidelines for the management of drug-resistant TB.[1] The GLC is receiving a growing number of applications from low-income countries (as defined by the World Bank). By the end of 2006, 15 low-income countries had been approved by the GLC, among which 10 were approved during the past two years. In addition, applications from two low-income countries were under GLC review.

Although the number of GLC-approved MDR-TB treatments is increasing, with an estimated global incidence of over 400 000 MDR-TB cases, most patients remain undiagnosed and untreated. And many of those patients who have been identified are still treated inadequately, with inappropriate diagnostic and treatment procedures.

WHO and its partners will focus on assisting countries in planning, piloting and scaling-up procedures for the management of MDR-TB, following the new guidelines and in line with the Global Plan. Several HBCs and high MDR-TB prevalence countries have plans and resources to improve MDR-TB management. By the end of 2006, the newly-established UNITAID[2] also agreed to scale-up access to second-line anti-TB drugs by contributing significant financial resources for GLC-approved countries.

Extensively drug-resistant TB

Although resistance to second-line TB drugs is not a recent development, it gained considerable attention during 2006, following a review of findings by supranational TB reference laboratories, and a highly-publicized occurrence of resistance to second-line drugs among HIV-infected TB patients in South Africa,[3] coupled with high mortality. The term extensively drug-resistant TB (XDR-TB) is defined as TB due to strains that are resistant to the two most important first-line drugs, isoniazid and rifampicin (MDR-TB), and further resistance to a fluoroquinolone and at least one second-line injectable agent (amikacin, kanamycin and/or capreomycin).[4] DST is not routinely carried out in most national reference laboratories. Therefore, to assess the magnitude of the XDR-TB problem, second-line testing must be conducted on isolates from MDR-TB patients identified in routine drug-resistance surveys. This is under way in at least 10 countries, and data will be available in 2007.

Strengthening health systems, improving access to care

The Stop TB Strategy reinforces the natural linkages between TB control and general health systems. It highlights the need for NTPs to actively participate in efforts to improve health policy, human resources, financing, management, logistics, service delivery and information systems.

Most HBCs have developed plans for TB control jointly with a range of stakeholders involved in health-care planning financing and health systems development. Several NTPs have actively engaged in SWAPs, MTEFs and PRSPs. However, this may not be sufficient in the context of the current, wide-ranging debate on health system strengthening. Most NTPs need to participate more actively in that debate, particularly in countries with ongoing health sector reforms.

Some of the innovative but well-tested approaches, which are integral components of the Stop TB Strategy, provide opportunities for NTPs to strengthen health systems while also enhancing TB control. These include community-based TB care (linking community and health services), PAL (TB care in the context of all respiratory problems) and PPM (exposing and sensitizing non-state health-care providers to public health through collaboration with NTPs).

So far, a few countries have initiated PAL, and some have begun scaling up. Countries, including those with a high prevalence of HIV infection, should actively consider starting PAL implementation and mobilize the required resources through, for example, applications to the GFATM. PPM has been shown in some settings not only to improve access to care for the poor but also to reduce costs to patients.[5] There has been a significant increase in the number and the scale of initiatives to actively engage all health-care providers through PPM approaches to TB care and control. This is being facilitated by two important tools launched during 2006: the *International Standards for Tuberculosis Care and Engaging all health care providers in TB control: guidance on implementing public–private mix approaches*. All regions have now included PPM in the regional TB control plans, and more

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[1] *Guidelines for the programmatic management of drug-resistant tuberculosis*. Geneva, World Health Organization, 2006 (WHO/HTM/TB/2006.361).

[2] UNITAID is a financing mechanism established in 2006 to facilitate access to high-quality drugs and diagnostics for HIV, TB and malaria, led by Brazil, Chile, France, Norway and the United Kingdom, and based primarily on a tax contribution to the price of airline tickets.

[3] Gandhi N et al. Extensively drug-resistant tuberculosis as a cause of death in patients co-infected with tuberculosis and HIV in a rural area of South Africa. *Lancet*, 2006, 368:1575–1580.

[4] Fluoroquinolones and injectable agents are the most effective second-line anti-TB drugs, and the only ones that have bactericidal effect. They are therefore recommended in the initial phase of any MDR-TB treatment regimen. Fluoroquinolones and aminoglycosides are the most common second-line anti-TB drugs, largely available also in most low-income countries. XDR-TB is therefore a term intended to describe a resistance pattern for which patients are much less likely to be successfully treated with existing second-line regimens. See: *Guidelines for the programmatic management of drug-resistant tuberculosis*. Geneva, World Health Organization, 2006 (WHO/HTM/TB/2006.361).

[5] Floyd K et al. Cost and cost-effectiveness of PPM-DOTS for tuberculosis control: evidence from India. *Bulletin of the World Health Organization*, 2006, 84:437–445.

countries are bringing PPM into the national planning and implementation process. All HBCs have some form of PPM activity in progress. Increased attention to PPM in countries also means a significant increase in the need for technical assistance in this area. Major challenges for PPM scale-up are skilled staff in countries and adequate external and internal technical assistance for country-level implementation.

Working with people and communities

Community-based TB care has been shown to improve both access to services and adherence to treatment, and is in place in many countries.[1] However, it needs to be promoted actively and implemented more widely.

The wider involvement of communities in TB care and prevention – going beyond patient care – should be based on the assessment of possible synergies with existing community initiatives, and with a view to improving physical, social and economic access to services for TB care and control. The vision underlying principles for community empowerment is one of partnership between health systems and communities, aimed at establishing a patient-centred approach, with earlier and higher case detection, better treatment adherence throughout the period of treatment, and mitigation of the economic impact of the disease on patients and their families. So far, the approach to ACSM under the Stop TB Strategy has been uneven. WHO and partners, including a wide range of civil society organizations, will address these challenges by publishing guidelines for community empowerment early in 2007. These guidelines will serve as a basis for developing country-specific strategies, and should benefit all countries, especially those which have mobilized funding for ACSM activities from the GFATM.

Research to improve TB control

Implementation of the various components of the Stop TB Strategy requires a greater and more systematic effort on the part of countries to plan, design and undertake research. This will be required as much for the rapid deployment of new and improved technology as for the implementation of innovative, programme-based approaches to TB control. The limited research activities reported by NTPs in 2006 included surveys of the prevalence of HIV infection among TB patients, surveys of drug resistance, studies on health-seeking behaviour and the effectiveness of FDCs, and the evaluation of PPM initiatives. The development and promotion of a set of research priorities, the harnessing and strengthening of research capacity at the regional, national and local levels, and the establishment of institutional mechanisms to support research are all needed to reinforce component 6 of the Stop TB Strategy.

1 *Community contribution to TB care: practice and policy.* Geneva, World Health Organization, 2003 (WHO/CDS/TB/2003.312).

Financing TB control

The financial analyses included in this report are based on data from 90 countries that together account for 90% of the global TB incidence, including all 22 HBCs and 84 of the countries considered in the Global Plan. These data show that NTP budgets in the 22 HBCs have increased substantially over the past six years, from just over US$ 500 million in 2002 to US$ 1.25 billion in 2007, while total costs (NTP budgets plus the cost of general health system staff and infrastructure used for the treatment of TB patients) have risen from US$ 644 million in 2002 to US$ 1.65 billion in 2007. When all 90 countries are considered, NTP budgets for 2007 amount to US$ 1.65 billion, with total costs of US$ 2.3 billion. In response to these growing budgets, funding for TB control has also increased, from US$ 644 million in 2002 to US$ 1.4 billion in 2007 in HBCs. Nonetheless, funding gaps reported by countries in 2007 amount to US$ 307 million, of which US$ 251 million is accounted for by the 22 HBCs. Moreover, despite increases in planned costs and available funding for TB control since 2002, these funding gaps would be larger still if country plans and assessments of funding requirements were in line with the Global Plan. For the 84 countries for which an assessment could be made, the Global Plan indicates that US$ 3.1 billion is required in 2007, compared with planned costs based on country reports of US$ 2.3 billion and available funding of US$ 2.0 billion. Figures for the 22 HBCs specifically are US$ 2.2 billion, US$ 1.7 billion and US$ 1.4 billion, respectively. The discrepancy is mostly explained by the higher costs for collaborative TB/HIV activities and ACSM that are included in the Global Plan (US$ 832 million in the Global Plan compared with US$ 128 million in country reports), especially in the African and South-East Asia regions.

National budgets compared with the Global Plan

The Global Plan has set out what needs to be done to achieve the MDG and related Stop TB Partnership targets for TB control set for 2015. For this reason, it is important to understand why there are differences between country reports and the Global Plan.

For collaborative TB/HIV activities, the big difference between the Global Plan and NTP country reports has two possible explanations. The first is that the budgets reported by NTPs exclude national AIDS programme budgets for collaborative TB/HIV activities, as well as funding channelled through other mechanisms (e.g. via NGOs). For items such as ART for HIV-positive TB patients, these amounts could be large. The second is that the scale at which implementation of collaborative TB/HIV activities is planned is much less than described in the Global Plan.

The process of clarification and verification of the financial data reported by NTPs clearly demonstrated that NTP budgets do not include all of the budgets and

funding available for collaborative TB/HIV activities in some countries. Kenya and India are two examples. Planning for collaborative TB/HIV activities in Kenya is in line with and sometimes ahead of the Global Plan (for example, 57% of TB patients were tested for HIV in the first half of 2006 with a target of reaching 85% by the end of 2006, compared with the figure of 47% included in the Global Plan for 2006 as a whole). However, the NTP budget is lower than the funding requirements set out in the Global Plan because US$ 7 million is being channelled through NGOs rather than the NTP, and the budget for antiretroviral drugs is part of the national AIDS programme budget (see Annex 1). In India, the only collaborative TB/HIV activity included in the NTP budget is HIV testing of TB patients, which is among the least expensive of the 12 recommended activities. The extent to which other activities are budgeted for and funded by the national AIDS programme is not known.

While NTP budgets are therefore undoubtedly an underestimate of total budgets and funding for collaborative TB/HIV activities, the figures presented in the TB/HIV sections of this report also show that, compared with the Global Plan, there is a large deficit in actual implementation in 2005 as well as in the planned level of implementation in 2006–2007. For example, country reports indicate plans to enrol about 80 000 HIV-positive TB patients on ART in 2006, which is 36% of the 220 000 proposed in the Global Plan. This means that the financing data, in which budgets reported by NTPs are about 10% of those included in the Global Plan, illustrate, but also overstate, a real deficit in both funding and implementation. If ART is considered a good marker for collaborative TB/HIV activities as a whole, then planned budgets for collaborative TB/HIV activities are about one-third rather than one-tenth of the total set out in the Global Plan.

In the case of ACSM, Global Plan estimates of funding requirements were based on a limited number of countries that had developed detailed ACSM plans in the context of applications for GFATM funding in round 5, with guidance from the Stop TB Partnership's ACSM secretariat. Funding requirements in other countries were extrapolated from this set of countries. Given that ACSM is a relatively new area for most NTPs, and that country-specific data were not available in most cases, it is not surprising that budgets reported by countries tend to be comparatively small.

In contrast to TB/HIV and ACSM, the funding available for MDR-TB treatment is higher than the requirement set out in the Global Plan. This is mostly due to the large budgets reported by the Russian Federation and South Africa; the combined total (US$ 134 million) for these two countries is higher than the US$ 129 million included in the Global Plan for the 84 countries that we were able to analyse for this report. The aggregated data for all countries conceal the fact that budgets, as well as the planned number of patients to be enrolled on treatment, are lower than Global Plan expectations in many countries, including the two with the largest estimated number of cases (China and India).

These differences highlight a need for better alignment between country plans and budgets and the Global Plan. The existing evidence already demonstrates that this has been achieved in some countries – notable examples being Brazil, Kenya, the Philippines, Viet Nam and, with the exception of MDR-TB treatment, China. However, these countries remain a small minority.

If the 2015 targets are to be achieved, robust country-owned plans that include implementation of all components of the Stop TB Strategy at a scale consistent with the Global Plan are needed. In this context, WHO has developed a tool for planning and budgeting in line with the Global Plan and the Stop TB strategy at country level.[1] The tool was field-tested in a range of countries in 2006, and an early version was used to help develop strategic plans in Afghanistan and Brazil. The first major use of the final version will be as part of a planning and budgeting workshop for 15 priority African countries including all nine HBCs in the region, scheduled for the first half of 2007. The tool will be used to help develop strategic plans and budgets in priority countries in the European Region during the same period.

Financing the Global Plan

Country plans that are in line with the Global Plan will have larger funding requirements and larger funding gaps, as illustrated by our comparisons with the Global Plan for 84 countries and by specific examples such as Kenya. Filling these funding gaps will require intensive resource mobilization. External grant funding to the 84 countries that could be compared with the Global Plan reaches about US$ 300 million in 2007, with GFATM grants now in place in almost all of these countries and other grant funding stable during the period 2002–2007. Filling the likely funding gap of over US$ 1 billion in 2007 is equivalent to an almost four-fold increase in grant financing. Existing domestic funding, including loans, is about US$ 1.7 billion in 2007; filling the likely gap of around US$ 1.1 billion would therefore need an increase of approximately 65% in existing domestic funding. These figures show that it is unlikely that the funding gap will be filled by donor agencies, and that domestic financing from national governments will be crucial.

Increasing domestic financing for TB control means a major shift from trends during the period 2002–2007, when almost all of the increase in domestic funding among the 22 HBCs was accounted for by three countries (China, the Russian Federation and South Africa). Data from HBCs show that while there is a clear relationship between a country's national income (measured as GNI

[1] This tool is available on a Sharepoint site, accessible by contacting tbbudget@who.int

per capita) and the share of funding for TB control that is provided by HBC governments, two countries with similar levels of income and burden of TB can have very different levels of domestic funding for TB control. This implies that there is real scope for increasing domestic funding in several countries including Indonesia (compared with the Philippines), Pakistan (compared with India), and Kenya (compared with several low-income countries). There should also be potential for increasing loan funding. In 2007, World Bank loans for TB control in the 22 HBCs are restricted to China, India and the Russian Federation.

Broader trends in funding for the health sector also offer an opportunity to increase domestic funding for TB control in India, to support the management of TB/HIV and MDR-TB, and to expand ACSM. The Government of India has pledged to increase public investment in health care by an amount equivalent to 1–2% of GDP over five years. Other than India, funding needs according to the Global Plan amount to about US$ 650 million for low-income countries in 2007. This suggests that if 50% of needs in low-income countries were funded domestically, if middle-income countries financed their TB control entirely from domestic sources,[1] and if donor resources were channelled primarily to low-income countries, then much of the increased funding required for implementation of the Global Plan could be mobilized from domestic sources.

While some countries need to mobilize additional funding, others face the task of maintaining their funding for TB control. Viet Nam, which has achieved the implementation targets of a 70% case detection rate and 85% treatment success for several years, is the only one of the 22 HBCs where funding projected for 2007 is less than in 2002. This decrease in funding includes a reduction in government funding. Failure to maintain financial support for the NTP risks undermining TB control and could prevent implementation of the newer components of TB control included in the Stop TB Strategy.

Resource mobilization is more likely to be successful if it is based on a credible plan and related budget, if there is evidence that increased funding can be spent, and if there is proof that increased spending can be translated into improved TB control. For several of the countries with the largest numbers of TB cases, larger sums of money have been spent, and increased spending has been associated with an increase in the number of patients treated in DOTS programmes. Notable examples are Bangladesh, Brazil, China, India, Indonesia and the Russian Federation where, for a 100% increase in funding, there has been an increase in new smear-positive cases treated under DOTS of at least 61%. Similar figures also apply to five other HBCs with smaller absolute increases in treated cases: DR Congo, Kenya, Myanmar, Nigeria and the Philippines. In other HBCs, the relationship between increased spending and increased cases treated in DOTS programmes was much weaker or could not be demonstrated due to a lack or apparent underreporting of expenditure data. Afghanistan and Pakistan both reported large increases in the numbers of cases treated in DOTS programmes between 2003 and 2005 and large funding gaps for 2007, but expenditure data appear to have been underreported. With better expenditure data, it would be easier to make a case for increased funding in these countries. Overall, the data also illustrate that, when assessing the impact of increased funding on the burden of TB, as will be done by the GFATM during 2007 and 2008, it is advisable to look first at the relationship between expenditures and outcome indicators (such as the number of patients treated or the number of patients successfully treated), prior to linking funding with impact indicators such as prevalence or mortality rates. In countries where there is no clear relationship, an in-depth analysis of how the increased funding was used and how the lack of a relationship with outcome indicators can be explained is warranted.

Strengthening the financial monitoring system

The financial monitoring system itself has grown in strength between 2002 and 2007, yielding more data of higher quality year-on-year. Nonetheless, there is scope for improvement. Beyond the 90 countries included in our analyses, there were a further 66 countries that submitted incomplete financial data. In at least some of these, it is probably possible to provide a complete report. Better data are needed for Thailand, which reported only partial data because, in their decentralized system, financial data are not reported or aggregated at national level. The South African NTP illustrates how it might be possible to address this difficulty – in 2006, the NTP manager sent the WHO data collection form to each of the country's nine provinces for the first time, allowing an aggregated report to be prepared. Budgets and funding for collaborative TB/HIV activities that are included in national AIDS programmes need to be better understood, for example via better linkages with resource tracking work undertaken by UNAIDS.

In summary, there has been major progress in the financing of TB control during the six-year period 2002–2007, with big increases in budgets, available funding and expenditures. However, large funding gaps remain, and the gaps reported by countries for 2006 and 2007 would be larger still if country plans and assessments of funding requirements were fully aligned with the Global Plan. The Global Plan needs to be translated into country-owned plans and budgets, which should then underpin intensified efforts to mobilize the necessary resources.

[1] As indicated for health care as a whole in the report of the WHO Commission on Macroeconomics and Health. See: *Macroeconomics and health: investing in health for economic development. Report of the Commission on Macroeconomics and Health*. Geneva, World Health Organization, 2001, pp. 166–167.