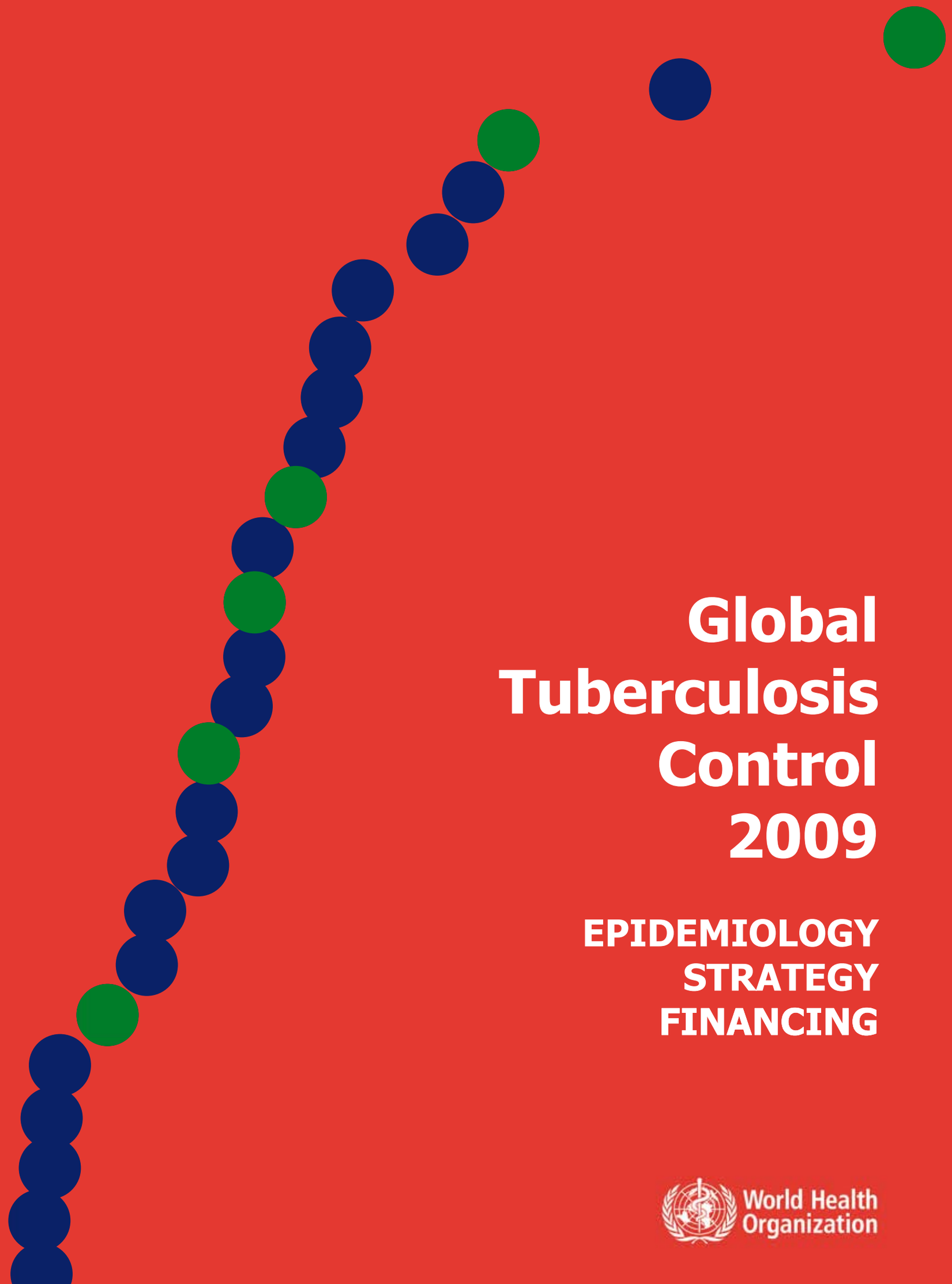

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Cover design by Tom Hiatt, WHO Stop TB Department. Of the estimated 9.3 million new cases of TB that occurred in 2007, 1.4 million (15%) were infected with HIV. The WHO African Region accounted for 79% of these HIV-positive TB cases, followed by the WHO South-East Asia Region (11%). In the absence of appropriate treatment, the mortality rate in HIV-positive TB cases is high. However, this rate can be significantly reduced if provider-initiated HIV testing is made available to all TB patients and if interventions such as early antiretroviral therapy are made available to those who are HIV-positive. The cover image is a dot chart showing the relative contribution of countries (blue dots) and WHO regions (green dots) to the global burden of HIV-positive TB.

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Contents

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Philippe Glaziou, Mehran Hosseini and Catherine Watt analysed surveillance and epidemiological data and prepared the figures and tables for Chapter 1. Mehran Hosseini analysed data about implementation of the Stop TB Strategy and prepared the figures and tables for Chapter 2, with support from Dennis Falzon, Christian Gunneberg and Tom Hiatt. Andrea Pantoja analysed the financial data and prepared the figures and tables for Chapter 3, with support from Inés Garcia.

The country profiles that appear in Annex 1 were designed by Annemieke Brands, Philippe Glaziou, Andrea Godfrey, Mehran Hosseini, Andrea Pantoja and Catherine Watt. Their production was led by Mehran Hosseini (epidemiology and strategy) and Andrea Pantoja (financing), with support from Tom Hiatt and Anne Guilloux. Input to particular sections of the profiles was provided by Rachel Bauquerez, Inés Garcia, Young-Ae Chu, Katherine Floyd, Giuliano Gargioni, Haileyesus Getahun, Malgorzata Grzemska, Wiesiek Jakubowiak, Daniel Kibuga, Knut Lonnröth, Ikushi Onozaki, Salah Ottmani, Angélica Salomao, Mukund Uplekar, Pieter van Maaren, Lana Velebit and Abigail Wright. Annemieke Brands coordinated the review of these profiles by countries.

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The main purpose of this report is to provide a comprehensive and up-to-date assessment of the TB epidemic and progress in control of the disease at global, regional and country levels. This analysis is based on data about notifications of TB cases and the outcomes of treatment (from surveillance systems) as well as data related to the implementation and financing of the Stop TB Strategy. Data are supplied primarily by national TB control programme managers who lead work on surveillance, strategy and financing in countries. These people are listed in Annex 3, and we thank them all for their invaluable contribution and collaboration.

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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
ARI	annual risk of infection
ART	antiretroviral therapy
BMU	basic management unit
BRAC	Bangladesh Rural Advancement Committee
CPT	co-trimoxazole preventive therapy
CTBC	community-based TB care
DHIS	District Health Information Software
DOT	directly observed treatment
DOTS	the basic package that underpins the Stop TB Strategy
DRS	drug resistance surveillance or survey
DST	drug susceptibility testing
ECDC	European Centre for Disease Prevention and Control
EMR	WHO Eastern Mediterranean Region
EMRO	WHO Regional Office for the Eastern Mediterranean
ENRS	Electronic National Record System
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 the Union
FIND	Foundation for Innovative New Diagnostics
GDF	Global TB Drug Facility
GLC	Green Light Committee
GLI	Global Laboratory Initiative
Global Fund	The Global Fund to fight AIDS, Tuberculosis and Malaria
Global Plan	Global Plan to Stop TB, 2006–2015
GNI	gross national income
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 resource development
ICD-10	International Statistical Classification of Diseases
IEC	information, education, communication
IPT	isoniazid preventive therapy
IRR	incidence rate ratio
ISTC	International Standards for Tuberculosis Care
KAP	knowledge, attitudes and practice
MDG	Millennium Development Goal
MDR	multidrug resistance (resistance to, at least, isoniazid and rifampicin)
MDR-TB	multidrug-resistant tuberculosis
NGO	nongovernmental organization
NRL	national reference laboratory
NTP	national tuberculosis control programme or equivalent
OpenMRS	Open Medical Records System
PAL	Practical Approach to Lung Health
PPM	Public–Private Mix
PPP	Public–Private Partnerships
RDBMS	relational database management system
SCC	short-course chemotherapy
SEAR	WHO South-East Asia Region
SEARO	WHO Regional Office for South-East Asia
SRL	supranational reference laboratory
SRLN	supranational reference laboratory network
TB	tuberculosis
TBTEAM	TB Technical Assistance Mechanism
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNITAID	international facility for the purchase of drugs to treat HIV/AIDS, malaria and TB
USAID	United States Agency for International Development
WHA	World Health Assembly
WHO	World Health Organization
WHO-CHOICE	CHOosing Interventions that are Cost-Effective
WPR	WHO Western Pacific Region
WPRO	WHO Regional Office for the Western Pacific
XDR-TB	TB caused by MDR strains that are also resistant to a fluoroquinolone and, at least, one second-line injectable agent (amikacin, kanamycin and/or capreomycin)

Key points

On trouvera les points essentiels du rapport 2009 de l'OMS relatif à la lutte antituberculeuse dans le monde sur le site Web indiqué ci-dessous:
Los puntos principales del informe mundial de 2009 de la OMS sobre la tuberculosis se pueden consultar en el sitio web que se indica más abajo:
世卫组织 2009 年全球结核病控制报告的要点请参见以下所示网站:
С основными положениями Доклада ВОЗ о глобальной борьбе против туберкулеза за 2009 г. можно ознакомиться на приведенном ниже веб-сайте:
ترد النقاط الرئيسية في تقرير منظمة الصحة العالمية لعام ٢٠٠٩ عن مكافحة السل على الصعيد العالمي في الموقع الوارد أدناه على شبكة الإنترنت:

www.who.int/tb/publications/global_report/2009/key_points/

1. This report is the 13th annual report on global control of tuberculosis (TB) published by the World Health Organization (WHO) in a series that started in 1997. Its main purpose is to provide a comprehensive and up-to-date assessment of the TB epidemic and progress in controlling the disease at global, regional and country levels, in the context of global targets set for 2015. Results are based primarily on data reported to WHO via its standard TB data collection form in 2008 and on the data that were collected every year from 1996 to 2007. The 196 countries and territories that reported data in 2008 account for 99.6% of the world's estimated number of TB cases and 99.7% of the world's population.

2. The main targets for global TB control are (i) that the incidence of TB should be falling by 2015 (MDG Target 6.c), (ii) that TB prevalence and death rates should be halved by 2015 compared with their level in 1990, (iii) that at least 70% of incident smear-positive cases should be detected and treated in DOTS programmes and (iv) that at least 85% of incident smear-positive cases should be successfully treated. The latest data suggest (i) that the incidence rate has been falling since 2004, (ii) that prevalence and death rates will be halved in at least three of six WHO regions by 2015 compared with a baseline of 1990, but that these targets will not be achieved for the world as a whole, (iii) that the case detection rate reached 63% in 2007 and (iv) that the treatment success rate reached 85% in 2006.

3. Globally, there were an estimated 9.27 million incident cases of TB in 2007. This is an increase from 9.24 million cases in 2006, 8.3 million cases in 2000 and 6.6 million cases in 1990. Most of the estimated number of cases in 2007 were in Asia (55%) and Africa (31%), with small proportions of cases in the Eastern Mediterranean Region (6%), the European Region (5%) and the Region of the Americas (3%). The five countries that rank first to fifth in terms of total numbers of cases in 2007 are India (2.0 million), China (1.3 million), Indonesia (0.53 million), Nigeria (0.46 million) and South Africa (0.46 million). Of the 9.27 million incident TB cases in 2007, an estimated 1.37 million (15%) were HIV-positive; 79% of these HIV-positive cases were in the African Region and 11% were in the South-East Asia Region.

4. Although the total number of incident cases of TB is increasing in absolute terms as a result of population growth, the number of cases per capita is falling. The rate of decline is slow, at less than 1% per year. Globally, rates peaked at 142 cases per 100 000 population in 2004. In 2007, there were an estimated 139 incident cases per 100 000 population. Incidence rates are falling in five of the six WHO regions (the exception is the European Region, where rates are approximately stable).

5. There were an estimated 13.7 million prevalent cases of TB in 2007 (206 per 100 000 population), a decrease from 13.9 million cases (210 per 100 000 population) in 2006.

6. An estimated 1.3 million deaths occurred among HIV-negative incident cases of TB (20 per 100 000 population) in 2007. There were an additional 456 000 deaths among incident TB cases who were HIV-positive; these deaths are classified as HIV deaths in the International Statistical Classification of Diseases (ICD-10). The 456 000 deaths among HIV-positive incident TB cases equate to 33% of HIV-positive incident cases of TB and 23% of the estimated 2 million HIV deaths in 2007.

7. Prevalence and mortality rates are falling globally and in all six WHO regions. The Region of the Americas as well as the Eastern Mediterranean and South-East Asia regions are on track to achieve the Stop TB Partnership targets of halving prevalence and death rates by 2015, compared with a baseline of 1990. The Western Pacific Region is on track to halve the prevalence rate by 2015, but the mortality target may be narrowly missed. Neither the prevalence nor the mortality targets will be met in the African and European regions. The gulf between prevalence and mortality rates in 2007 and the targets in these two regions make it unlikely that 1990 prevalence and death rates will be halved by 2015 for the world as a whole.

8. The estimated numbers of HIV-positive TB cases and deaths in 2007 are approximately double the numbers published by WHO in previous years. This does not mean that the number of HIV-positive TB cases and the number of TB deaths among HIV-positive people doubled between 2006 and 2007. New data that became available in 2008, particularly from provider-initiated HIV testing in the African Region, were used (i) to estimate the numbers of cases and deaths in 2007 and (ii) to revise previous estimates of the numbers of cases and deaths that had occurred in earlier years. The numbers of HIV-positive TB cases and deaths are estimated to have peaked in 2005, at 1.39 million cases (15% of all incident cases) and 480 000 deaths.

9. The latest estimates of the numbers of HIV-positive TB cases and deaths were based, as usual, on estimates of HIV prevalence in the general population published by the Joint United Nations Programme on HIV/AIDS, or UNAIDS. The new data that became available in 2008 were direct measurements of the proportion of TB cases that are coinfected with HIV in 64 countries (up from 15 countries in 2007). These 64 direct measurements suggest that HIV-positive people are about 20 times more likely than HIV-negative people to develop TB in countries with a generalized HIV epidemic (compared with a previous estimate of six), and between 26 and 37 times more likely to develop TB in countries where HIV prevalence is lower (compared with a previous estimate of 30). These higher estimates were used to estimate the number of HIV-positive TB cases in countries for which direct measurements were not available.

10. There were an estimated 0.5 million cases of multidrug-resistant TB (MDR-TB) in 2007. There are 27 countries (of which 15 are in the European Region) that account for 85% of all such cases. The countries that rank first to fifth in terms of total numbers of MDR-TB cases are India (131 000), China (112 000), the Russian Federation (43 000), South Africa (16 000) and Bangladesh (15 000). By the end of 2008, 55 countries and territories had reported at least one case of extensively drug-resistant TB (XDR-TB).

11. The WHO Global Task Force on TB Impact Measurement has produced recommendations about how to measure progress in reducing rates of TB incidence, prevalence and mortality (the three major indicators of impact). These include systematic analysis of national and subnational notification data combined with improved surveillance systems to measure incidence, surveys of the prevalence of TB disease in 21 global focus countries between 2008 and 2015, and strengthening of vital registration systems to measure TB mortality among other causes of death. Implementation of Task Force recommendations is necessary to improve measurement of progress towards the global targets set for 2015 as well as to measure progress in TB control in subsequent years.

12. The Stop TB Strategy is WHO's recommended approach to reducing the burden of TB in line with global targets. The six major components of the strategy are: pursue high-quality DOTS expansion and enhancement; address TB/HIV, MDR-TB, and the needs of poor and vulnerable populations; contribute to health system strengthening based on primary health care; engage all care providers; empower people with TB, and communities through partnership; and enable and promote research. The Stop TB Partnership's Global Plan to Stop TB, 2006–2015 sets out the scale at which the interventions included in the Stop TB Strategy need to be implemented to achieve the 2015 targets.

13. In 2007, 5.5 million TB cases were notified by DOTS programmes (99% of total case notifications). This included 2.6 million smear-positive cases. The case detection rate of new smear-positive cases under DOTS (that is, the percentage of estimated incident cases that were notified and treated in DOTS programmes) was 63%, a small increase from 62% in 2006 but still 7% short of the target of ≥70% first set for 2000 (and later reset to 2005) by the World Health Assembly (WHA) in 1991. The target was met in 74 countries and in two regions – the Region of the Americas (73%) and the Western Pacific Region (77%). The South-East Asia Region (69%) almost met the target. The case detection rate was 60% in the Eastern Mediterranean Region, 51% in the European Region and 47% in the African Region.

14. Globally, the rate of treatment success for new smear-positive cases treated in DOTS programmes in 2006 reached the target of 85% first set by the WHA in 1991. Three regions – the Eastern Mediterranean (86%), Western Pacific (92%), and South-East Asia (87%) regions – met the target, as did 59 countries. The treatment success rate was 75% in the African Region and the Region of the Americas, and 70% in the European Region.

15. In 2006–2007, the Western Pacific Region and 36 countries met both the target of a case detection rate of at least 70% and the target of a treatment success rate of at least 85% for new smear-positive cases. The South-East Asia Region is close to achieving both targets. Kenya became the first country in sub-Saharan Africa to achieve both targets.

16. There has been major progress in implementing interventions such as testing TB patients for HIV and providing co-trimoxazole preventive therapy (CPT) and antiretroviral therapy (ART) to HIV-positive TB patients. Globally, 1 million TB patients (16% of notified cases) knew their HIV status in 2007. The greatest progress in HIV testing was in the African Region, where 0.5 million TB patients (37% of all notified cases) knew their HIV status in 2007. Of the 250 000 HIV-positive TB patients, 0.2 million were enrolled on CPT and 0.1 million were started on ART. In both cases, figures were higher than those reported to WHO in previous years.

17. Despite the progress that has been made with scaling up collaborative TB/HIV activities, progress in HIV testing is outpacing progress in the provision of CPT and ART. The number of HIV-positive TB patients being treated with CPT and ART is small compared with the 0.3 million TB patients known to be HIV-positive, and smaller still compared with the estimated 1.4 million HIV-positive TB cases (many of whom are not detected in DOTS programmes, given a case detection rate of 47%). Case detection in DOTS programmes as well as collaborative TB/HIV activities need to be expanded to ensure that (i) many more people know their HIV status and (ii) that those who are HIV-positive, with and without TB, have access to appropriate and timely treatment and care.

18. Globally, just under 30 000 cases of MDR-TB were notified to WHO in 2007, mostly by European countries and South Africa. This was 8.5% of the estimated global total of smear-positive cases of MDR-TB. Of the notified cases, 3681 were started on treatment in projects or programmes approved by the Green Light Committee (GLC), and are thus known to be receiving treatment according to international guidelines. This is equivalent to 1% of the estimated global total of smear-positive cases of MDR-TB. The number of patients started on treatment in GLC-approved projects and programmes is expected to increase to around 14 000 in 2009, equivalent to 4% of the smear-positive cases of MDR-TB estimated to exist globally. To meet the targets set in the Global Plan, diagnosis and treatment of MDR-TB need to be rapidly scaled up, especially in the three countries that account for 57% of global cases: China, India and the Russian Federation.

19. Diagnostic and treatment services for TB are integrated into primary health care in most countries.

20. National plans for TB control are aligned with national health strategies in more than half of the 22 high-burden countries (HBCs). Most NTPs are also involving other ministries, associations and institutions in the development of their plans. With renewed emphasis on health system strengthening, there is a strong basis for closer collaboration on key challenges such as sustainable financing, human resource development, infection control and health information systems.

21. The contribution of public–private mix (PPM) initiatives to detection and treatment of TB cases is difficult to quantify in most countries, but examples such as Pakistan and the Philippines (where public–private partnerships accounted for 19% and 8% of all notifications in 2007, respectively) illustrate their potential to contribute to increased case detection. The contribution of communities to diagnosis and treatment of TB is also hard to quantify. Many countries require guidance and support to design, implement and evaluate advocacy, communication and social mobilization activities (ACSM).

22. A total of US$ 3.0 billion is available for TB control in 2009 in 94 countries that reported data, and which account for 93% of the world's TB cases: of this total, 87% is funding from governments (including loans), 9% is funding from Global Fund grants and 4% is funding from donors other than the Global Fund. Most of the available funding is in the European Region (US$ 1.4 billion, mostly in the Russian Federation), followed by the African Region (US$ 0.6 billion) and the Western Pacific Region (US$ 0.3 billion). The funding gaps identified by these 94 countries amount to US$ 1.2 billion in 2009.

23. The total of US$ 4.2 billion required for full implementation of country plans in these 94 countries in 2009 is mostly for DOTS (US$ 3 billion, or 72%). The other major components are MDR-TB (US$ 0.5 billion, or 12%; 76% of the total for MDR-TB is accounted for by the Russian Federation and South Africa), collaborative TB/HIV activities (US$ 120 million, or 3%) and ACSM (US$ 100 million, or 2%). The remaining 11% includes PPM, surveys of the prevalence of TB disease, community-based TB care and a variety of miscellaneous activities.

24. In the 22 HBCs where 80% of the world's TB cases occur, a total of US$ 2.2 billion is available in 2009, a small increase of US$ 27 million compared with 2008 but substantially above the US$ 1.2 billion that was spent on

TB control in 2002 (when WHO began financial monitoring of TB control). Most of the increased funding since 2002 has come from domestic funding in Brazil, China and the Russian Federation, and external financing from the Global Fund. The HBCs reported a combined funding gap of US$ 0.5–0.7 billion in 2009 (the range reflects uncertainty about the level of funding from provincial governments in South Africa).

25. The total of US$ 2.9 billion required for full implementation of country plans in the 22 HBCs in 2009 is mostly for DOTS (US$ 2 billion, or 69%). The other major components are MDR-TB (US$ 0.4 billion, or 14%; 88% of this total is accounted for by the Russian Federation and South Africa), TB/HIV (US$ 90 million, or 3%) and ACSM (US$ 70 million, or 2%). The remaining 12% includes PPM, surveys of the prevalence of TB disease, community TB care and a variety of miscellaneous activities.

26. Of the US$ 2.2 billion available in the 22 HBCs in 2009, 88% is from HBC governments, 8% (US$ 169 million) is from the Global Fund and 4% (US$ 94 million) is from grants from sources other than the Global Fund. The distribution of funding sources is different when the Russian Federation and South Africa are excluded: the government contribution to available funding drops to 70%, the Global Fund contribution increases to 19% and grants from sources besides the Global Fund account for 11%.

27. The gap between the available funding reported by the 22 HBCs in 2009 and the funding requirements for these countries according to the Global Plan in 2009 is US$ 0.8 billion. The gap between the available funding reported by the 94 countries with 93% of global cases in 2009 and the funding required for these countries in 2009 according to the Global Plan is US$ 1.6 billion. Most of the extra funding required according to the Global Plan is for MDR-TB diagnosis and treatment in the South-East Asia and Western Pacific regions (mostly in India and China), and for DOTS and collaborative TB/HIV activities in Africa.

28. The global burden of TB is falling slowly, and at least three of six WHO regions are on track to achieve global targets for reducing the number of cases and deaths that have been set for 2015. However, while increasing numbers of TB cases have access to high-quality anti-TB treatment as well as to related interventions such as ART, an estimated 37% of incident TB cases are not being treated in DOTS programmes, up to 96% of incident cases with MDR-TB are not being diagnosed and treated according to international guidelines, the majority of HIV-positive TB cases do not know their HIV status and the majority of HIV-positive TB patients who do know their HIV status do not have access to ART. To accelerate progress in global TB control, these numbers need to be reduced using the range of interventions and approaches included in the Stop TB Strategy.

Introduction

This report is the 13th annual report on global control of tuberculosis (TB) published by the World Health Organization (WHO) in a series that started in 1997. Its main purpose is to provide a comprehensive and up-to-date assessment of the TB epidemic and to report on progress in controlling the disease at global, regional and country levels, in the context of global targets set for 2015. The principal targets are that the incidence of TB should be falling by 2015 (MDG Target 6.c), that TB prevalence and death rates should be halved by 2015 compared with their level in 1990, that at least 70% of incident smear-positive cases should be detected and treated in DOTS programmes, and that at least 85% of new sputum smear-positive cases should be successfully treated.[1,2,3,4] Results are based primarily on data reported to WHO via its standard TB data collection form in 2008 and on the data that were collected each year 1996–2007. The 196 countries and territories that reported data in 2008 account for 99.6% of the world's estimated TB cases and 99.7% of the world's population.

The report is structured in three major chapters.

CHAPTER 1 focuses on epidemiology. It includes WHO's latest estimates of the epidemiological burden of TB (incidence, prevalence and mortality), case notifications reported for 2007, estimates of the case detection rate for new smear-positive cases as well as for all types of case between 1995 (when reliable monitoring began) and 2007, and treatment outcomes between 1994 and 2006 for new and re-treatment cases. Particular attention is given to two topics. The first is updated estimates of the numbers of TB cases and deaths among HIV-positive people, which have been revised substantially upwards using new data that became available in 2008. The second is recent recommendations about how to improve measurement of the epidemiological burden of TB and monitoring of progress towards impact targets (i.e. reductions in incidence, prevalence and mortality) from 2009 onwards, which have been made by WHO's Global Task Force on TB Impact Measurement.

CHAPTER 2 analyses progress in implementing WHO's Stop TB Strategy, which is designed to achieve the global targets set for 2015.[5] The strategy was launched in 2006 and is built on the foundations of the DOTS strategy, the internationally-recommended approach to TB control advocated by WHO from the mid-1990s until 2005. The six major components of the strategy (DOTS implementation; addressing TB/HIV, MDR-TB and the needs of poor and vulnerable populations; contributing to health-system strengthening based on primary health care; engaging all care providers; empowering people with TB, and communities; and promoting research) are addressed in turn. Wherever possible, comparisons are made with the targets for scaling up interventions that were set in the Stop TB Partnership's Global Plan to Stop TB. Examples of how different components of the strategy can be implemented based on recent country experience and which have wider applicability are also highlighted. These include scaling up public–private collaboration in Pakistan, treatment of multidrug-resistant TB (MDR-TB) in Estonia and Latvia, introducing electronic recording and reporting in Myanmar, and provision of antiretroviral treatment (ART) in Africa.

CHAPTER 3 analyses financing for TB control. The data presented include the budgets of national TB control programmes (NTPs), and available funding and funding gaps for these budgets, between 2002 (when reliable monitoring began) and 2009; estimates of the total costs of TB control, which include NTP budgets plus the costs associated with use of general health-system staff and infrastructure that are usually not included in NTP budgets; comparisons of funding needs set out in the Global Plan with countries' assessments of their funding needs; per patient costs and budgets; and expenditures compared with available funding and changes in the number of patients treated. Progress with planning and budgeting for TB control and the possible consequences of the global financial crisis that developed in 2008 are also highlighted.

The main part of the report ends with a summary of the major conclusions from all three chapters (CONCLUSIONS). The remainder of the report consists of four annexes. These include country profiles for the 22 high-burden countries (ANNEX 1), an explanation of methods (ANNEX 2), country-specific data for 1990–2007 (ANNEX 3), and a summary of the countries where surveys of the prevalence of TB disease have been conducted or are planned and the countries for which mortality data from vital registration systems are available in a central WHO database (ANNEX 4).

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[1] The Millennium Development Goals are described in full at unstats.un.org/unsd

[2] 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).

[3] *Stop Tuberculosis Initiative. Report by the Director-General*. Fifty-third World Health Assembly. Geneva, 15–20 May 2000 (A53/5, 5 May 2000).

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

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

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

CHAPTER 1

Epidemiology

WHO has assessed the status of the TB epidemic and progress in control of the disease every year since 1997. This assessment has included estimates of TB incidence, prevalence and mortality (from 1990 onwards); analysis of case notifications (from 1995) and treatment outcomes (from 1994) in around 200 (of 212) countries and territories, following the start of reliable recording and reporting in 1995; and analysis of progress towards the global targets for case detection and treatment success established by the World Health Assembly (WHA) in 1991. Since 2006, WHO has also assessed progress towards achieving the impact targets related to incidence, prevalence and mortality that have been set for 2015 within the framework of the Millennium Development Goals (MDGs) and by the Stop TB Partnership.

This chapter provides WHO's latest assessment of the status of the TB epidemic and progress towards achieving the global targets using data reported by 196 countries and territories (accounting for 99.6% of the world's estimated number of TB cases and 99.7% of the world's population) in 2008 as well as data reported in previous years. It is structured in seven major sections. The first defines the global targets and indicators for TB control set for 2005, 2015 and 2050. The second section presents the latest estimates of TB incidence, prevalence and mortality, including estimates for 2007 and for the period since 1990, and discusses whether the world as a whole and specific regions are on track to reach the 2015 MDG and Stop TB Partnership targets. The estimates of TB incidence and mortality include important updates to previously published estimates of the numbers of HIV-positive TB cases and deaths. Building on the second section, the third section provides an overview of recent recommendations from the WHO Global Task Force on TB Impact Measurement about how to measure progress towards the 2015 impact targets. These recommendations focus on strengthening surveillance (of cases and deaths) in all countries and on implementing surveys of the prevalence of TB disease in 21 global focus countries. Recent examples of how the recommendations can be applied in practice are provided. The fourth section presents TB notification data for 2007, including for men and women separately. The fifth section includes the latest estimates of the case detection rate, the sixth section reports treatment outcomes in 2006, and the seventh section assesses regional and country progress towards achieving the targets for both case detection and treatment success. The chapter ends with a summary of the main results and conclusions.

The methods used to produce the results presented in this chapter are explained in ANNEX 2. Throughout this chapter, particular attention is given to the 22 high-burden countries (HBCs) that collectively account for 80% of incident TB cases globally. Additional data are provided for HBCs in ANNEX 1 and for all countries in ANNEX 3.

1.1 Goals, targets and indicators for TB control

The global targets and indicators for TB control were developed within the framework of the MDGs as well as by the Stop TB Partnership and the WHA (TABLE 1.1).[1,2] The impact targets are to halt and begin to reverse the incidence of TB by 2015 and to reduce by 50% prevalence and mortality rates by 2015 relative to 1990 levels. The incidence target is part of MDG Target 6.c, while the targets for reducing prevalence and death rates were based on a resolution of the year 2000 meeting of the Group of Eight (G8) industrialized countries, held in Okinawa, Japan. The outcome targets – to achieve a case detection rate of new smear-positive cases of at least 70% and to reach a treatment success rate of at least 85% for such cases – were first established by the WHA in 1991. Within the MDG framework, these indicators were defined as the proportion of cases detected and cured under DOTS. The ultimate goal of eliminating TB, defined as the occurrence of less than 1 case per million population per year by 2050, was set by the Stop TB Partnership.

The Stop TB Strategy,[3] launched by WHO in 2006, sets out the major interventions that should be implemented to achieve the MDG, Stop TB Partnership and WHA targets. These are divided into six broad components: (i) pursuing high-quality DOTS expansion and enhancement; (ii) addressing TB/HIV, MDR-TB and the needs of poor and vulnerable populations; (iii) contributing to health-system strengthening based on primary health care; (iv) engaging all care providers; (v) empowering people with TB, and communities through partnership; and (vi) enabling and promoting research. The Global Plan to Stop TB, launched by the Stop TB Partnership in 2006, sets out how, and at what scale, the Stop TB Strategy should be implemented over the decade 2006–2015, and the funding requirements.[2] This means that in addition to the targets shown in TABLE 1.1, the Global Plan also includes input targets (funding required per year) and output targets (for example, the number of patients with MDR-TB who should be

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

[2] *The Global Plan to Stop TB, 2006–2015: actions for life towards a world free of tuberculosis*. Geneva, World Health Organization, 2006 (WHO/HTM/STB/2006.35).

[3] *The Stop TB Strategy: building on and enhancing DOTS to meet the TB-related Millennium Development Goals*. Geneva, World Health Organization, 2006 (WHO/HTM/TB/2006.368).

TABLE 1.1
Goals, targets and indicators for TB control

HEALTH IN THE MILLENNIUM DEVELOPMENT GOALS

Goal 6: Combat HIV/AIDS, malaria and other diseases

Target 6c: Halt and begin to reverse the incidence of malaria and other major diseases

Indicator 6.9: Incidence, prevalence and death rates associated with TB

Indicator 6.10: Proportion of TB cases detected and cured under DOTS

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% successfully treated. The targets of a case detection rate of at least 70% and a treatment success rate of at least 85% were first set by the World Health Assembly of WHO in 1991.

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.

treated each year, number of TB patients to be tested for HIV, number of HIV-positive TB patients who should be enrolled on antiretroviral therapy (ART)).

This chapter focuses on the five principal indicators that are used to measure the impact and outcomes of TB control: incidence, prevalence and deaths (impact indicators), and case detection and treatment success rates (outcome indicators). An analysis of progress towards achieving other targets is provided in CHAPTER 2 and CHAPTER 3.

1.2 TB incidence, prevalence and mortality

1.2.1 Incidence

Based on surveillance and survey data (ANNEXES 2, 3 and 4), WHO estimates that 9.27 million new cases of TB occurred in 2007 (139 per 100 000 population), compared with 9.24 million new cases (140 per 100 000 population) in 2006. Of these 9.27 million new cases, an estimated 44% or 4.1 million (61 per 100 000 population) were new smear-positive cases (TABLE 1.2; FIGURE 1.1). India, China, Indo-

TABLE 1.2
Estimated epidemiological burden of TB, 2007

		INCIDENCE[a]				PREVALENCE[a]		MORTALITY				
		ALL FORMS		SMEAR-POSITIVE		ALL FORMS		HIV-NEGATIVE		HIV-POSITIVE		HIV PREV. IN INCIDENT TB CASES[b]
	POPULATION 1000s	NUMBER 1000s	PER 100 000 POP PER YEAR	NUMBER 1000s	PER 100 000 POP PER YEAR	NUMBER 1000s	PER 100 000 POP PER YEAR	NUMBER 1000s	PER 100 000 POP PER YEAR	NUMBER 1000s	PER 100 000 POP PER YEAR	%
1 India	1 169 016	1 962	168	873	75	3 305	283	302	26	30	2.5	5.3
2 China	1 328 630	1 306	98	585	44	2 582	194	194	15	6.8	0.5	1.9
3 Indonesia	231 627	528	228	236	102	566	244	86	37	5.4	2.4	3.0
4 Nigeria	148 093	460	311	195	131	772	521	79	53	59	40	27
5 South Africa	48 577	461	948	174	358	336	692	18	38	94	193	73
6 Bangladesh	158 665	353	223	159	100	614	387	70	44	0.4	0.3	0.3
7 Ethiopia	83 099	314	378	135	163	481	579	53	64	23	28	19
8 Pakistan	163 902	297	181	133	81	365	223	46	28	1.4	0.9	2.1
9 Philippines	87 960	255	290	115	130	440	500	36	41	0.3	0.3	0.3
10 DR Congo	62 636	245	392	109	174	417	666	45	72	6.0	10	5.9
11 Russian Federation	142 499	157	110	68	48	164	115	20	14	5.1	3.6	16
12 Viet Nam	87 375	150	171	66	76	192	220	18	20	3.1	3.5	8.1
13 Kenya	37 538	132	353	53	142	120	319	10	26	15	39	48
14 Brazil	191 791	92	48	49	26	114	60	5.9	3.1	2.5	1.3	14
15 UR Tanzania	40 454	120	297	49	120	136	337	12	29	20	49	47
16 Uganda	30 884	102	330	42	136	132	426	13	41	16	52	39
17 Zimbabwe	13 349	104	782	40	298	95	714	6.9	52	28	213	69
18 Thailand	63 884	91	142	39	62	123	192	10	15	3.9	6.0	17
19 Mozambique	21 397	92	431	37	174	108	504	10	45	17	82	47
20 Myanmar	48 798	83	171	37	75	79	162	5.4	11	0.9	1.9	11
21 Cambodia	14 444	72	495	32	219	96	664	11	77	1.8	13	7.8
22 Afghanistan	27 145	46	168	21	76	65	238	8.2	30	0.0	0	0
High-burden countries	**4 201 761**	**7 423**	**177**	**3 245**	**77**	**11 301**	**269**	**1 058**	**25**	**339**	**8.1**	**14**
AFR	792 378	2 879	363	1 188	150	3 766	475	357	45	378	48	38
AMR	909 820	295	32	157	17	348	38	33	3.6	7.9	0.9	11
EMR	555 064	583	105	259	47	772	139	97	17	7.7	1.4	3.5
EUR	889 278	432	49	190	21	456	51	56	6.3	8.1	0.9	9.8
SEAR	1 745 394	3 165	181	1 410	81	4 881	280	497	28	40	2.3	4.6
WPR	1 776 440	1 919	108	859	48	3 500	197	276	16	15	0.8	2.7
Global	**6 668 374**	**9 273**	**139**	**4 062**	**61**	**13 723**	**206**	**1 316**	**20**	**456**	**6.8**	**15**

[a] Incidence and prevalence estimates include TB in people with HIV.

[b] Prevalence of HIV in incident TB cases of all ages.

FIGURE 1.1
Estimated number of new TB cases, by country, 2007

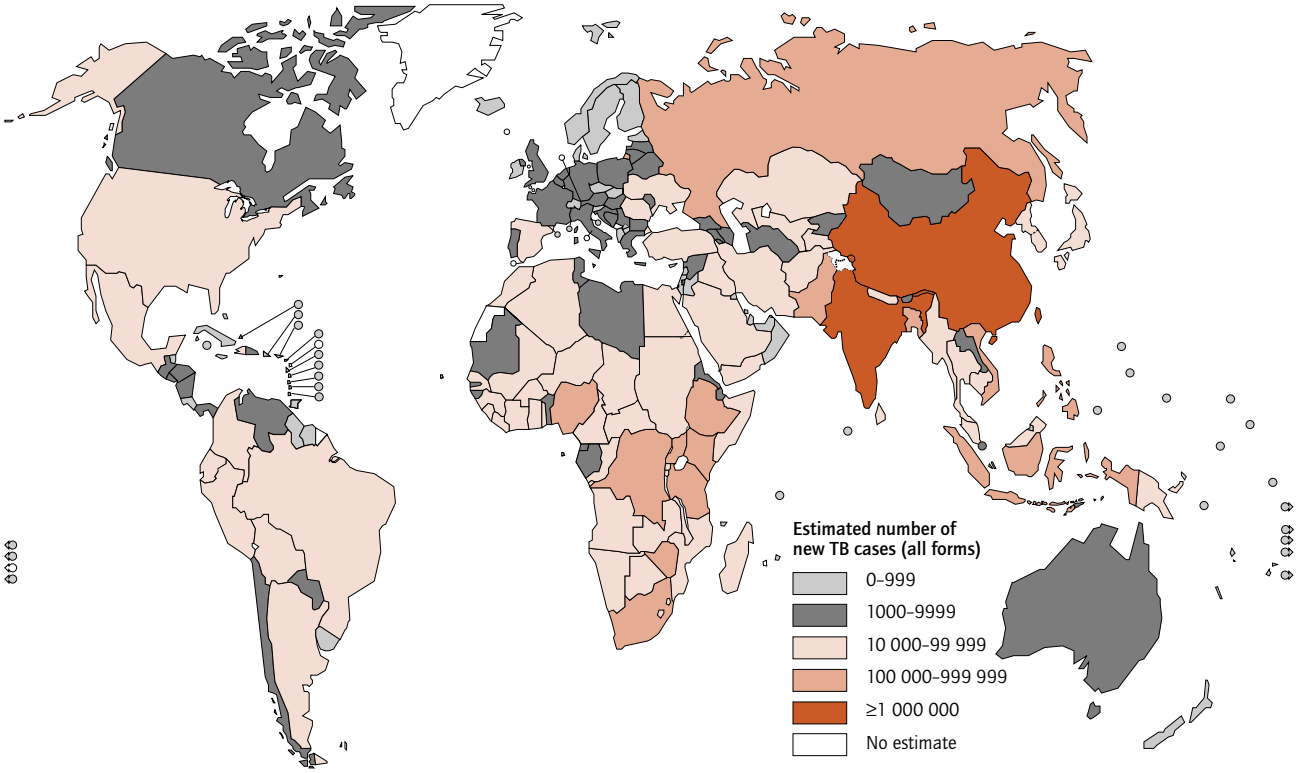


FIGURE 1.2
Estimated TB incidence rates, by country, 2007

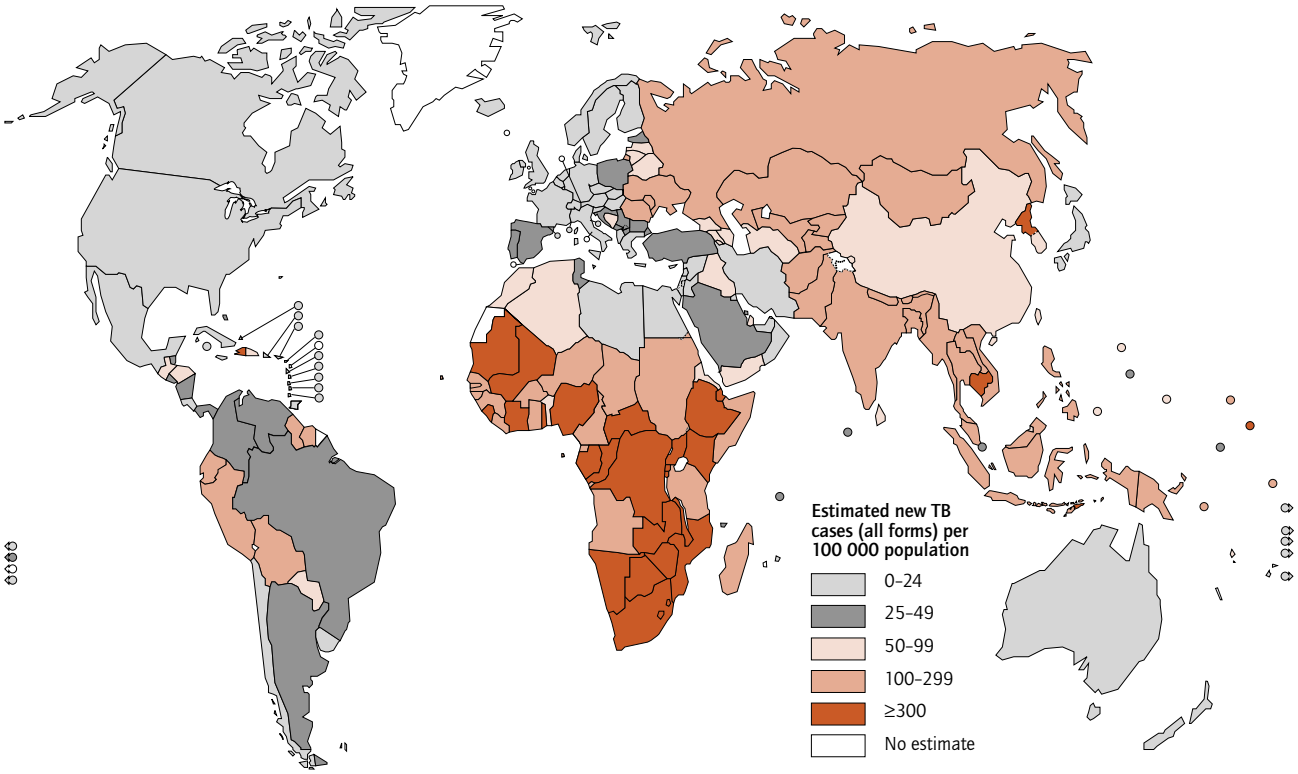
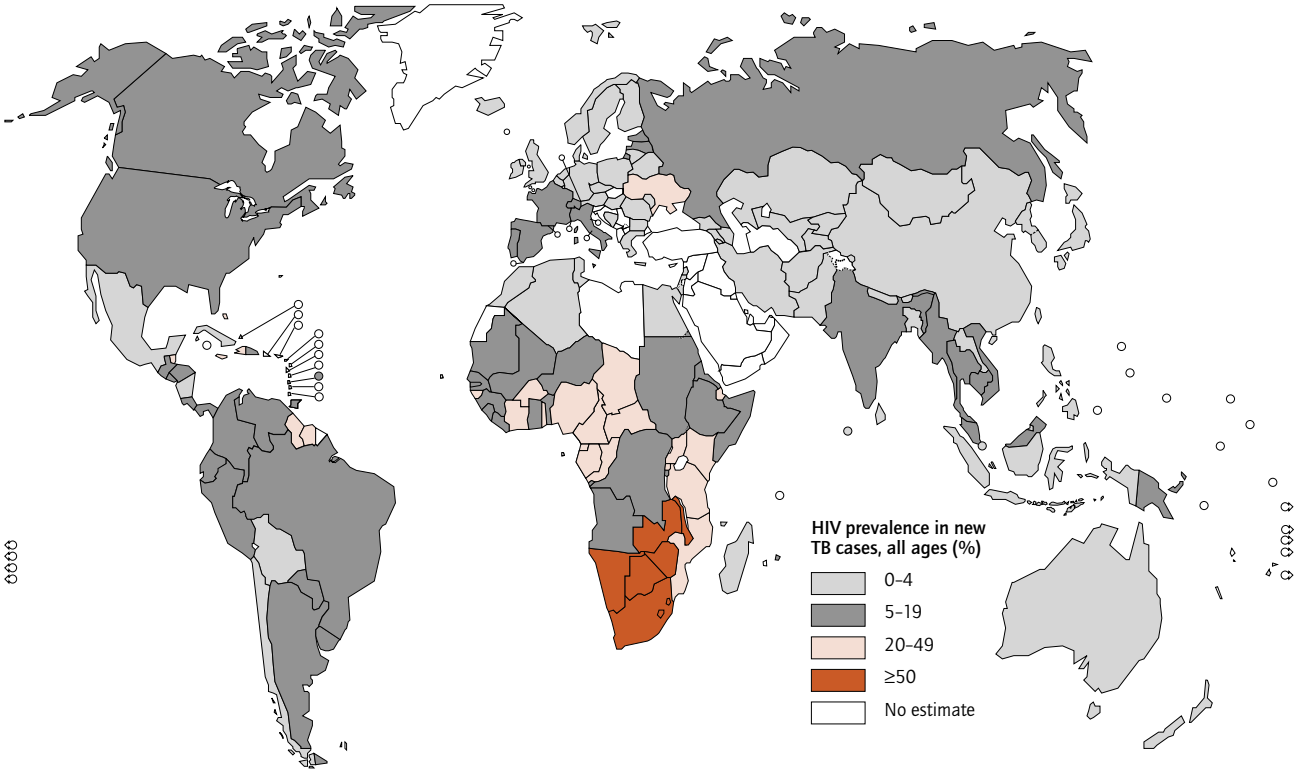


FIGURE 1.3
Estimated HIV prevalence in new TB cases, 2007

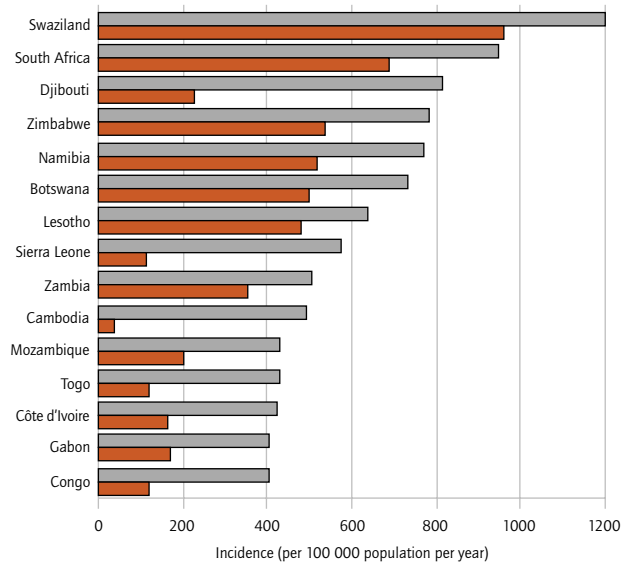


nesia, Nigeria and South Africa rank first to fifth in terms of the total number of incident cases; the estimated numbers of cases in these and other HBCs in 2007 are also shown in TABLE 1.2. Asia (the South-East Asia and Western Pacific regions) accounts for 55% of global cases and the African Region for 31%; the other three regions (the Americas, European and Eastern Mediterranean regions) account for small fractions of global cases. The magnitude of the TB burden within countries can also be expressed as the number of incident cases per 100 000 population (FIGURE 1.2). Among the 15 countries with the highest estimated TB incidence rates, 13 are in Africa, a phenomenon linked to high rates of HIV coinfection (FIGURE 1.3; FIGURE 1.4).

Incidence of TB among people infected with HIV

Among the 9.27 million incident cases of TB in 2007, an estimated 1.37 million (14.8%) were HIV-positive (TABLE 1.2). This number, although double the estimate of 0.7 million cases in 2006 that WHO published in 2008,[1] does not mean that the number of HIV-positive cases of TB doubled between 2006 and 2007; rather, new data that became available during 2008 have been used to estimate both the number of HIV-positive TB cases in 2007 and to revise estimates of the number of such cases that occurred in previous years. The global number of incident HIV-positive TB cases is estimated to have peaked in 2005, at 1.39 million. In 2007, as in previous years, the African Region accounted for most (79%)

FIGURE 1.4
Fifteen countries with the highest estimated TB incidence rates per capita (all forms; grey bars) and corresponding incidence rates of HIV-positive TB cases (red bars), 2007



[1] *Global tuberculosis control: surveillance, planning, financing. WHO report 2008*. Geneva, World Health Organization, 2008 (WHO/HTM/TB/2008.393).

BOX 1.1

Revising estimates of the numbers of TB cases and deaths among HIV-positive people

This report includes estimates of the numbers of HIV-positive TB cases and deaths that are substantially higher than those published in previous years. It is estimated that, in 2007, there were 1.37 million incident cases of HIV-positive TB (14.8% of total incident cases) and 456 000 deaths from TB among HIV-positive people (equivalent to 26% of deaths from TB in HIV-positive and HIV-negative people, and 23% of an estimated 2 million HIV-related deaths).[1]

These estimated numbers of TB cases and deaths among HIV-positive people in 2007 are approximately double those published in previous reports. This does not mean that the numbers of HIV-positive TB cases and TB deaths among HIV-positive people doubled between 2006 and 2007. Instead, new data that became available during 2008 have been used to estimate both (i) the numbers of HIV-positive TB cases and deaths in 2007 and (ii) to revise previous estimates of the numbers of cases and deaths that occurred in earlier years. The revised estimates suggest that the number of HIV-positive TB cases and deaths peaked in 2005 at 1.39 million incident cases (15.1% of total incident cases) and 480 000 deaths.

As for previous reports in this series, the estimates are based on the latest global estimates of HIV prevalence among the general population (all ages) published by the Joint United Nations Programme on HIV/AIDS (UNAIDS).[1] What is new for this report is that direct measurements of the prevalence of HIV in TB patients were available from a much larger number of countries. These direct measurements were mostly from provider-initiated HIV testing of TB patients (49 countries, up from 13 countries in the previous year). Provider-initiated HIV testing has been rapidly expanded since 2005–2006, notably in African countries (see also CHAPTER 2). For a further 15 countries, direct measurements were available from surveys or sentinel surveillance (up from two countries in the previous year). These 64 direct measurements were used to estimate the number of incident HIV-positive TB cases in 64 countries that account for 32% of the estimated total of 1.37 million HIV-positive TB cases.

These direct measurements provide strong evidence that the relative risk of developing TB in HIV-positive people as compared with HIV-negative people (the incidence rate ratio, or IRR) is higher than previously estimated. The IRR was estimated as 20.6 (95% confidence interval (CI) 15.4–27.5) in 2007 in countries with a generalized HIV epidemic (i.e. countries where the prevalence of HIV is above 1% in the general population), as 26.7 (95% CI 20.4–34.9) in countries where the prevalence of HIV in the general population is between 0.1% and 1%, and 36.7 (95% CI 11.6–116) in countries where the prevalence of HIV in the general population is less than 0.1%. These IRR estimates compare with previous estimates of 6, 6 and 30, respectively.[2] Higher estimates are consistent with reductions in the estimates of HIV prevalence in the general population published in 2007 by UNAIDS (which by definition lead to an increase in previous IRR estimates for any given level of HIV prevalence among TB patients) and with evidence that the IRR increases as the HIV epidemic matures. The wide confidence intervals around these IRRs illustrate that large uncertainty remains, although the greatest uncertainty is for countries with a low HIV prevalence that have only a small impact on global estimates. The new IRR figures were used to produce indirect estimates of the number of HIV-positive TB cases in 104 countries for which direct measurements of the prevalence of HIV in TB patients were not available.

To increase the reliability of these estimates, the coverage of HIV surveillance among TB patients needs to be improved. Furthermore, indirect methods will become more problematic as the coverage and impact of antiretroviral therapy (ART) increases. More data are needed, particularly from national HIV programmes, to better understand the impact of ART on the incidence of TB.

[1] http://www.unaids.org/en/KnowledgeCentre/HIVData/Epidemiology/latestEpiData.asp

[2] These earlier estimates of the IRR were based on a thorough review of the evidence conducted in 2000–2001. See 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.

HIV-positive TB cases, followed by the South-East Asia Region (mainly India) with 11% of total cases (FIGURE 1.5). South Africa accounted for 31% of cases in the African Region.

As for earlier reports in this series, the new estimates were produced using the latest global estimates of HIV prevalence among the general population (all ages) published by the Joint United Nations Programme on HIV/AIDS (UNAIDS).[1] There are two new and related changes to the data and methods used for this report. First, direct measurements of the prevalence of HIV in TB patients were available from a much larger number of countries (from provider-initiated HIV testing in 49 countries and surveys or sentinel surveillance in 15 countries). Second, these direct measurements suggest that the risk of developing TB in HIV-positive people compared with HIV-negative people (the incidence rate ratio, or IRR) is higher than previously estimated (for example, 20.6 compared with the previous estimate of 6 in countries with a high prevalence of HIV in the general population). New and higher estimates of the IRR were used to produce indirect estimates of the number of HIV-positive TB cases in 104 countries for which direct measurements of the prevalence of HIV in TB patients were not available.[2] The new estimates and associated data and methods are summarized in BOX 1.1 and explained in more detail in ANNEX 2. Estimates for all countries are included in ANNEX 3.

Estimated incidence of MDR-TB

Estimates of the burden of multidrug resistant TB (MDR-TB) are presented by country, disaggregated by smear status, in ANNEX 3. Most of the current information about the proportion of TB cases with MDR-TB comes from drug susceptibility testing (DST) of samples from patients in whom MDR-TB is diagnosed in public health facilities under conditions defined by the WHO/IUATLD Global Project on Drug Resistance Surveillance (DRS).[3] These conditions include documented satisfactory performance of laboratories based on external quality assurance (EQA) and an adequate record of every patient's treatment history. Such data are available for new and re-treatment cases for 113 and 102 countries, respectively. Using a set of widely measurable, independent variables that are predictive of the frequency of MDR-TB (such as gross national income (GNI)

[1] http://www.unaids.org/en/KnowledgeCentre/HIVData/Epidemiology/latestEpiData.asp

[2] UNAIDS does not produce estimates of HIV prevalence in the general population for the remaining 44 countries and territories. For this reason, estimates of the number of HIV-positive TB cases in these countries and territories were not produced.

[3] *Anti-tuberculosis drug resistance in the world, 4th report: the WHO/IUATLD Global Project on Anti-tuberculosis Drug Resistance Surveillance*. Geneva, World Health Organization, 2008 (WHO/HTM/TB/2008.394).

FIGURE 1.5
Geographical distribution of estimated number of HIV-positive TB cases, 2007. For each country (red circles) and WHO region (grey circles), the number of incident TB cases arising in people with HIV is shown as a percentage of the global total of such cases.

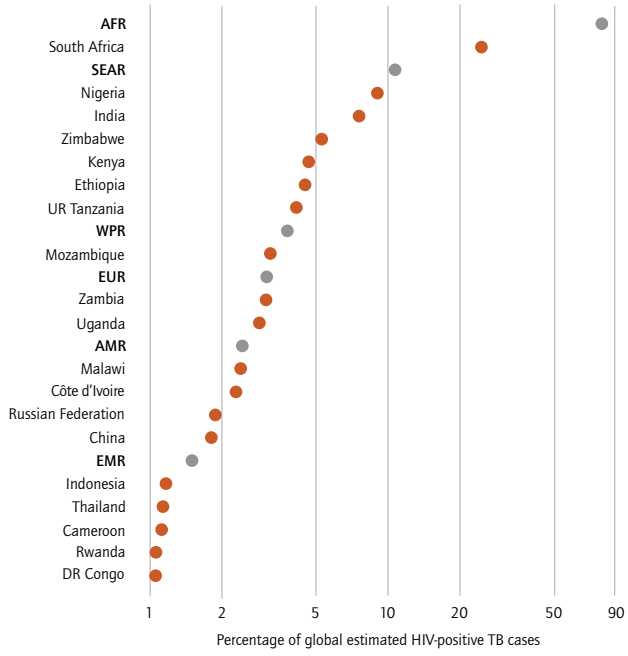
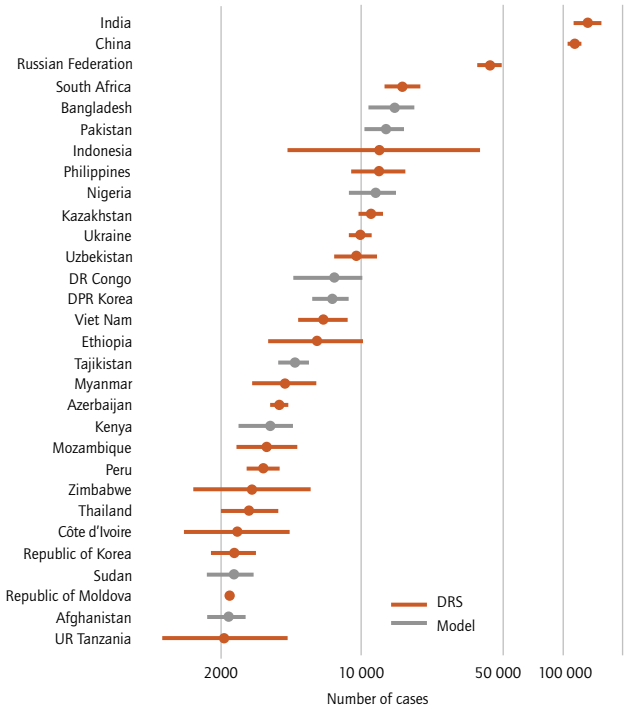


FIGURE 1.6
Countries with the highest numbers of estimated MDR-TB cases, 2007. Horizontal lines denote 95% confidence intervals. The source of estimates is drug resistance surveillance or surveys (DRS, in red) or modelling (in grey).



per capita, the ratio of re-treatment to new patients, and the failure rate associated with first-line treatments), it is possible to estimate the frequency of MDR-TB in countries where it has not been measured directly. The general methods used to produce these estimates are presented in ANNEX 2, while ANNEX 3 defines whether the direct or indirect method was used for each country.

In 2007, there were an estimated 9.27 million first episodes of TB and an additional 1.16 million subsequent episodes of TB (episodes occurring in patients who had already experienced at least one previous episode of TB in the past and who had received at least one month of anti-TB treatment). Among these, 10.4 million episodes of TB (first and subsequent), an estimated 4.9% or 511 000 were cases of MDR-TB. Of these, 289 000 were among new cases (3.1% of all new cases) and 221 000 were among cases that had been previously treated for TB (19% of all previously treated cases). Of the 511 000 incident cases of MDR-TB in 2007, 349 000 (68%) were smear-positive. The countries with the largest number of cases of MDR-TB, ranked in decreasing order, are shown in FIGURE 1.6.

Trends in incidence since 1990 and progress towards MDG Target 6.c

From series of notification data and surveys (ANNEXES 2, 3 and 4), the global incidence of TB per capita appears to have peaked in 2004 and is now in decline (FIGURE 1.7; FIGURE 1.8). This peak and subsequent decline follow a similar pattern to the trend in HIV prevalence in the general population (FIGURE 1.7). The reason why the number of incident cases

FIGURE 1.7
Estimated incidence of TB and prevalence of HIV for the African subregion most affected by HIV (Africa high-HIV), 1990–2007

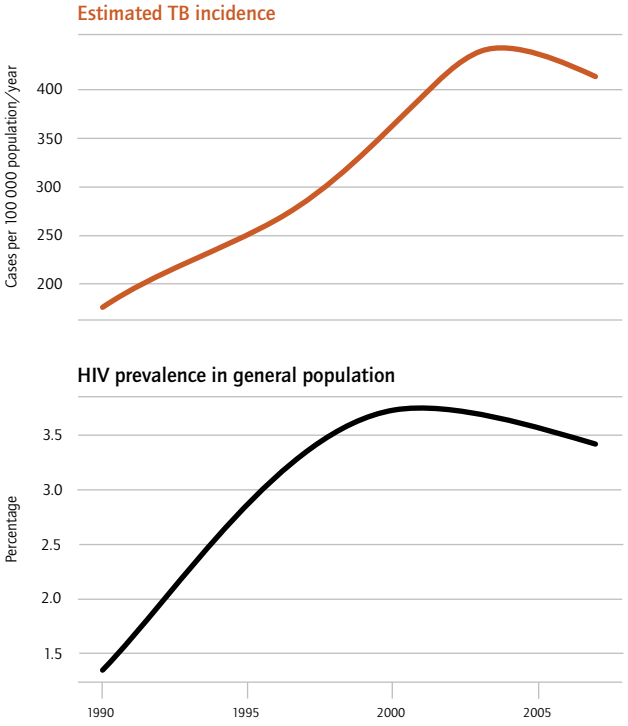
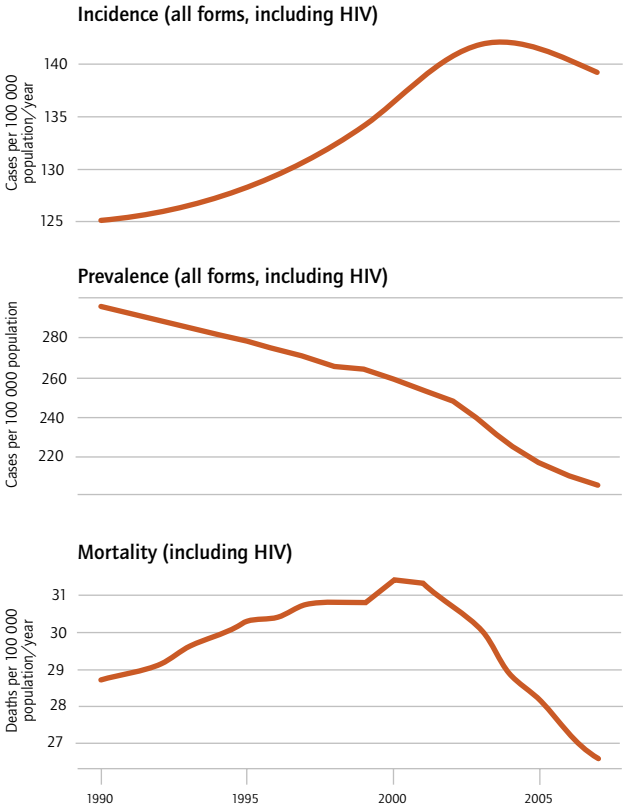


FIGURE 1.8
Global rates of TB incidence, prevalence and mortality, including in people with HIV, 1990–2007



in absolute terms is increasing (see above), while incidence rates per capita are falling, is population growth. In the African, Eastern Mediterranean, European and South-East Asia regions, the decline in incidence per capita is more than compensated for by increases in population size.

Trends in incidence rates vary among regions (FIGURE 1.9). Rates are falling in seven of nine epidemiological subregions (see ANNEX 2 for definition of the countries in each subregion), stable in Eastern Europe and increasing in African countries with a low prevalence of HIV. Among the WHO regions, incidence is falling slowly in all regions except the European Region, where it is approximately stable. When the time periods 1995–1999 and 2005–2007 are compared, the estimated average rate of change in TB incidence (all forms) per 100 000 population was fastest in African countries with high HIV prevalence and in the Eastern European subregion (FIGURE 1.10). The rate at which incidence was declining slowed in the Central European subregion and, to a lesser extent, in the Eastern Mediterranean subregion. In the other subregions, incidence was falling at a similar rate in both time periods.

The continued fall in the global incidence rate reinforces data presented in the last two reports in this series.[1] If verified by further monitoring, the data show that MDG target 6.c was met by 2005 (incidence rates peaked in 2004), well ahead of the target date of 2015.

1.2.2 Prevalence

There were an estimated 13.7 million prevalent cases in 2007 (206 per 100 000 population), a slight decrease from 13.9 million in 2006 (TABLE 1.2). Of these 13.7 million prevalent cases, an estimated 687 000 (5%) were HIV-positive. From trends in TB incidence combined with assumptions about the duration of disease in different categories of case (ANNEX 2), the global prevalence of TB is estimated to have been in decline since 1990 (FIGURE 1.8). This decline is in contrast to the rise in TB incidence in the 1990s, which can be explained by a decrease in the average duration of disease as the fraction of cases treated in DOTS programmes increased, combined with a comparatively short duration of disease among HIV-positive cases (which has partly compensated for an increase in the incidence of HIV-positive TB cases).

Regional trends in TB prevalence from 1990 to 2007 as well as projections up to 2015 (based on extrapolation of the trend in 2005–2007) are shown in FIGURE 1.11. Prevalence has been declining in the Eastern Mediterranean Region, the Region of the Americas, the South-East Asia Region and the Western Pacific Region since 1990, and all four regions are on track to at least halve prevalence rates by 2015 (prevalence has already halved compared with the 1990 level in the Region of the Americas). In the African and European regions, prevalence rates increased substantially during the 1990s, and by 2007 were still far above the 1990 level in the African Region and just back to the 1990 level in the European Region. Projections indicate that neither region will reach the target of halving the 1990 prevalence rate by 2015, and in the African Region it is unlikely that prevalence will be back to 1990 levels by 2015. The gap between the 2015 targets and current prevalence rates in these two regions mean that the world as a whole is unlikely to meet the Stop TB Partnership target of halving the prevalence rate by 2015.

1.2.3 Mortality

An estimated 1.32 million HIV-negative people (19.7 per 100 000 population) died from TB in 2007, and there were an additional 456 000 TB deaths among HIV-positive people (TABLE 1.2).[2] Revisions in the estimated number of incident cases of TB that are coinfected with HIV (SECTION 1.2.1; BOX 1.1) explain why the estimates of TB deaths among HIV-positive people are higher than those published in 2008.[3] Deaths from TB among HIV-positive people account for 23% of the estimated 2 million HIV deaths that occurred in 2007 (BOX 1.1).[4]

Revisions to estimates of the number of incident cases of TB that are HIV-positive before 2007 have also led to upward

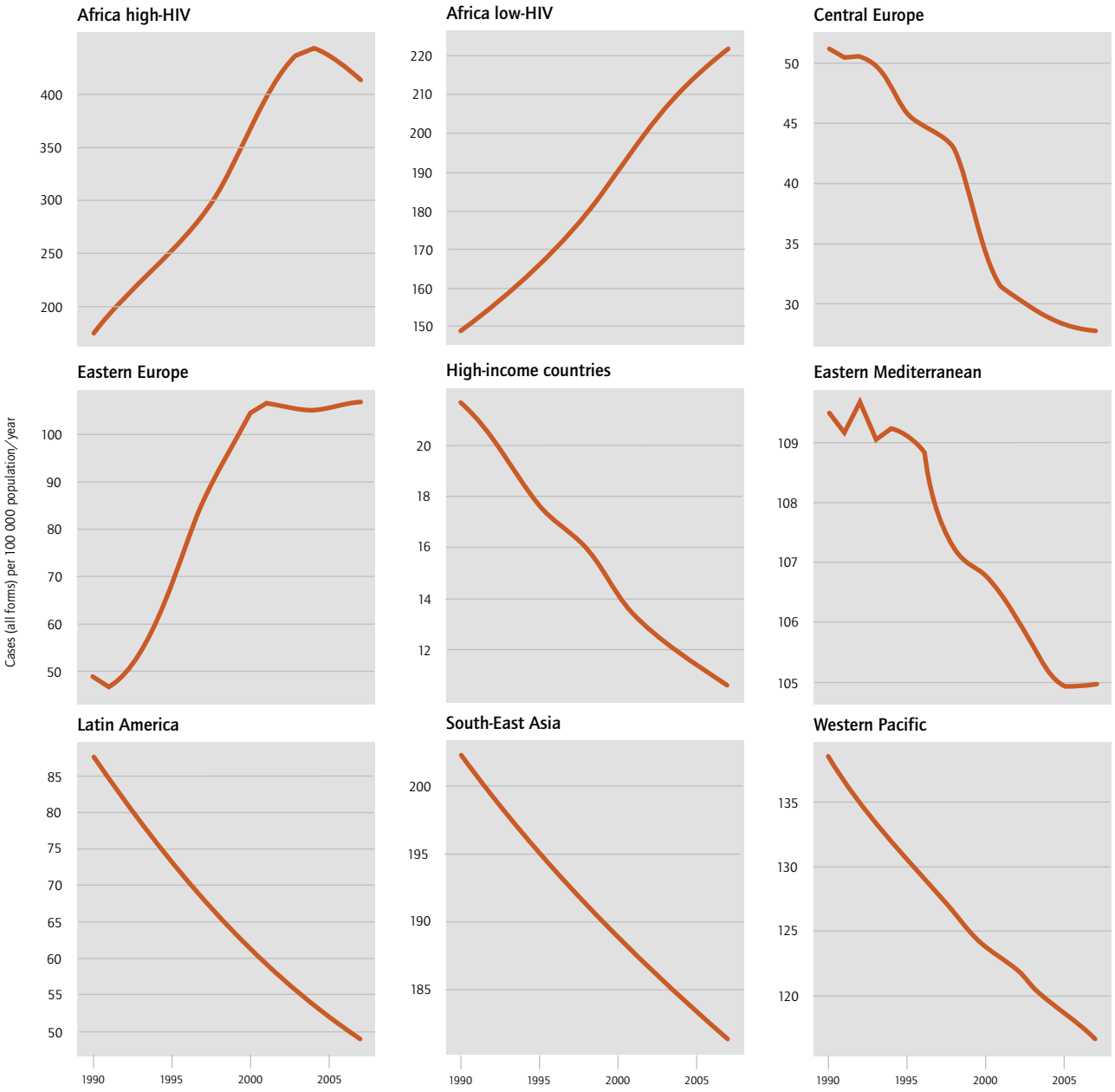
[1] *Global tuberculosis control: surveillance, planning, financing. WHO report 2007. Geneva, World Health Organization, 2007* (WHO/HTM/TB/2007.376); *Global tuberculosis control: surveillance, planning, financing. WHO report 2008*. Geneva, World Health Organization, 2008 (WHO/HTM/TB/2008.393).

[2] Estimates of TB deaths in HIV-positive and HIV-negative people are presented separately because TB deaths in HIV-positive people are classified as HIV deaths in the International Statistical Classification of Diseases (ICD-10).

[3] Of the 456 000 TB deaths among HIV-positive people in 2007, an estimated 226 000 were cases that were treated and 230 000 were untreated cases.

[4] http://www.unaids.org/en/KnowledgeCentre/HIVData/Epidemiology/latestEpiData.asp

FIGURE 1.9
Trends in estimated incidence rates in nine subregions, 1990–2007

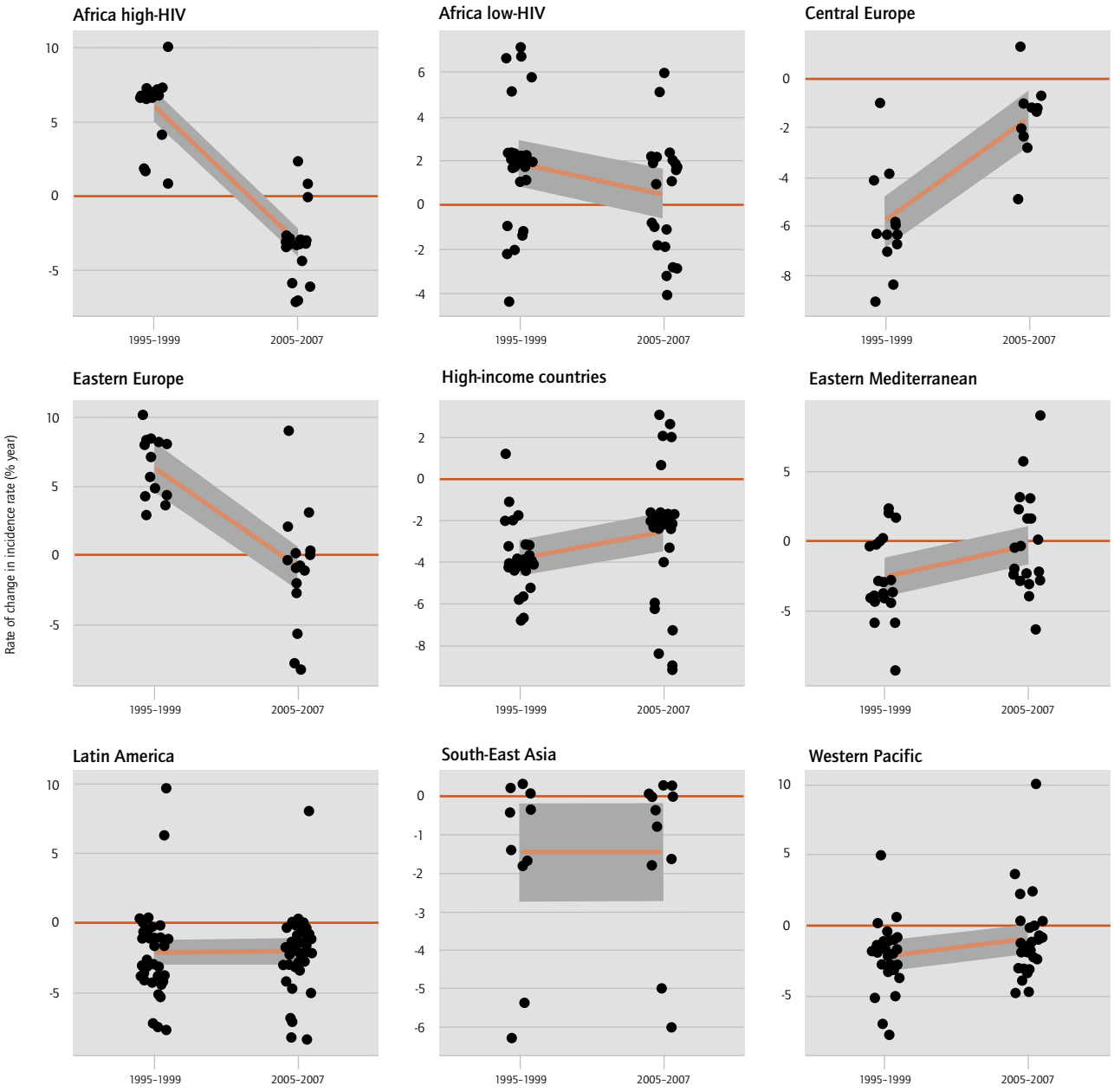


revisions to estimates of mortality rates before 2007 (BOX 1.1). From trends in TB incidence combined with assumptions about case fatality rates among different categories of case (ANNEX 2), the global TB mortality rate (including TB deaths in HIV-positive people) is estimated to have increased during the 1990s; this trend was reversed around the year 2000, and mortality rates are now in decline (FIGURE 1.8).

Regional trends in TB mortality rates from 1990 to 2007 as well as projections up to 2015 (based on extrapolation of the trend in 2005–2007) are shown in FIGURE 1.12. Mortality rates have been declining in the Eastern Mediterranean Region, the Region of the Americas, the South-East Asia Region and the Western Pacific Region since 1990. The decline has been relatively steady in the Region of the Americas and the Western Pacific Region, while the decline was faster in the Eastern Mediterranean and South-East Asia regions after 2000. Of these four regions, three are on track to at least halve mortality rates by 2015. In the Western Pacific Region, the mortality target will be narrowly missed unless the current rate of decline accelerates from 2008. In the African and European regions, mortality rates increased substantially during the 1990s. Although this trend has been reversed (around 2000 in the European Region and around 2005 in the African region), mortality rates in 2007 were still far above the 1990 level in the African Region and just back to the 1990 level in the European Region. Projections indicate that neither region will reduce mortality rates back to even 1990 levels by 2015, and will certainly not halve mortality rates compared with 1990. The gulf between the 2015 targets and current mortality rates in these two regions mean that the world as a whole is unlikely to meet the Stop TB Partnership target of halving the mortality rate by 2015.

■ FIGURE 1.10

Changes in annual rates of incidence during 1995–1999 and 2005–2007, nine epidemiological subregions. Data points were randomly jittered horizontally to avoid over-plotting. The horizontal red line indicates no change in incidence. Data points above the red line indicate that incidence increased; the further from the line, the faster the increase. In subregion Africa high-HIV, incidence increased during 1995–1999 and decreased during 2005–2007. In central Europe, the rate of decline decreased between 1995–1999 and 2005–2007. A linear model was fitted to the data and fitted lines with uncertainty bounds were added to provide a visual aid.



1.2.4 Summary of progress towards MDG and Stop TB Partnership impact targets

The three major indicators of impact – incidence, prevalence and mortality rates per 100 000 population – are falling globally. If verified by further monitoring, MDG target 6.c was met globally by 2005 (incidence rates peaked in 2004), and in five of six WHO regions (the exception being the European Region, where rates are approximately stable).

The targets to halve prevalence and death rates by 2015 compared with 1990, set by the Stop TB Partnership, are more demanding. If the average rates of change in 2005–2007 persist, prevalence and death rates will fall quickly enough to meet the 2015 targets in the Region of the Americas and in the Eastern Mediterranean and South-East Asia regions. The Western Pacific Region will reach the target of halving the prevalence rate, but the mortality target may be narrowly missed unless the current rate of decline accelerates. Neither the prevalence nor the mortality targets will be met in the African and European regions. The gap between prevalence and mortality rates in 2007 and the targets in these two regions suggest that 1990 prevalence and death rates will not be halved by 2015 for the world as a whole.

FIGURE 1.11

Progress towards achieving the target of halving prevalence by 2015 compared with the level of 1990, by WHO region. The y-axis displays standardized prevalence rates, with the baseline set at the 1990 level in each region (black horizontal line) and regional targets set at 50% of the 1990 level (red horizontal line). Trends for 2008–2015 are forecast using an exponential regression of estimated prevalence rates over the period 2005–2007.

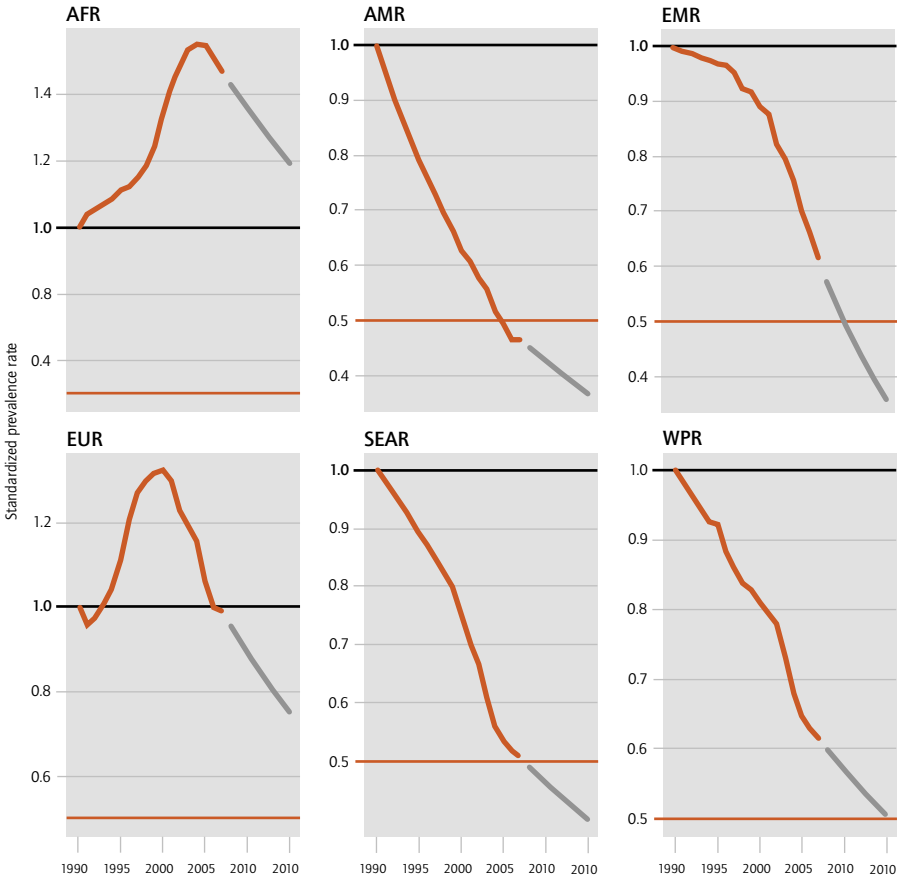
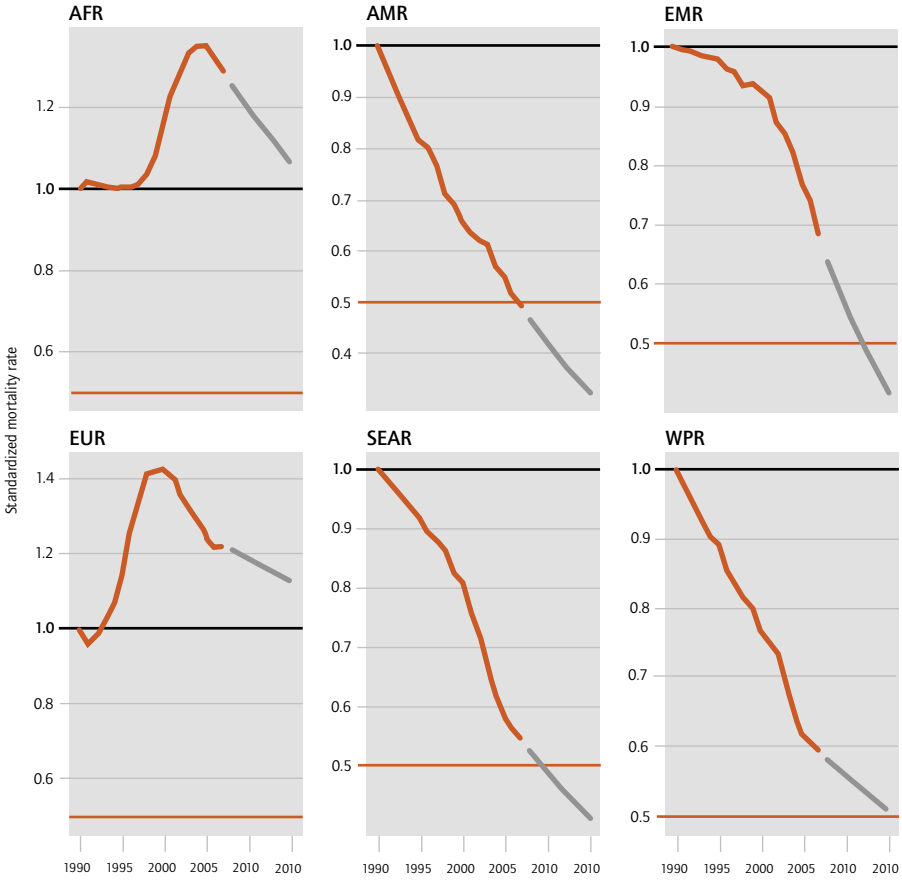


FIGURE 1.12

Progress towards achieving the target of halving mortality from TB by 2015 compared with the level of 1990, by WHO region. The y-axis displays standardized mortality rates, with the baseline set at the 1990 level in each region (black horizontal line) and regional targets set at 50% of the 1990 level (red horizontal line). Trends for 2008–2015 are forecast using an exponential regression of estimated mortality rates over the period 2005–2007. Mortality rates represented in these graphs are excluding deaths from TB in HIV-positive people.



1.3 Improving measurement of progress towards the 2015 impact targets: the WHO Global Task Force on TB Impact Measurement

As explained in SECTION 1.1, the impact targets for reducing rates of TB incidence, prevalence and mortality are the focus of international and national efforts to control TB. Demonstrating whether or not they are achieved is of major importance for individual countries, the United Nations, WHO and the Stop TB Partnership, and a variety of technical, financial and development agencies. The estimates of TB incidence, prevalence and mortality and their trends presented in SECTION 1.2 are based on the best available data and analytical methods, both of which were reviewed and endorsed by a group of experts in mid-2008.[1] Nonetheless, with better surveillance systems, additional survey data, more in-depth analysis of existing surveillance and programmatic data and further refinement of analytical methods, these estimates could be improved in the period up to 2015 (and beyond).

With the exception of Eritrea in 2005, the last nationwide and population-based surveys of the prevalence of TB disease in the African Region were undertaken between 1957 and 1961; in many countries, such surveys have never been done (ANNEX 4). Notification systems are estimated to capture only around 50–70% of incident cases in most countries (SECTION 1.5), and within these systems reporting can be incomplete (CHAPTER 2, SECTION 2.2.7). Only 10% of the estimated 1.5 million TB-attributable deaths (in HIV-negative people) in 2005 were recorded in vital registration systems and reported to WHO by August 2008.[2] The figures for the South-East Asia and Western Pacific regions, which account for 55% of the world's TB cases, were <0.1% and 2.6% respectively. These observations show how much progress is needed to achieve the ultimate goal of measuring TB incidence and mortality directly from surveillance data (that is, that ultimately all TB cases are included in case notification data and that vital registration systems account for all (or almost all) TB deaths).

In this context, WHO established a Global Task Force on TB Impact Measurement (hereafter the Task Force) in June 2006. The Task Force includes experts in TB epidemiology, representatives from major technical and financial agencies, and representatives from countries with a high burden of TB. Its mandate is to produce a robust, rigorous and widely-endorsed assessment of whether the 2015 targets for reductions in TB incidence, prevalence and mortality are achieved at global level, for each WHO region and in individual countries; to regularly report on progress towards these targets in the years leading up to 2015; and to strengthen national capacity in monitoring and evaluation of TB control. Better data and better analysis of these data can be used to identify where and why cases are not being detected, and form the basis for implementing appropriate components of the Stop TB Strategy (CHAPTER 2).

Following three Task Force meetings (June 2006, December 2007 and September 2008) and two years of work by the secretariat in WHO, clear policies and recommendations for how to measure incidence, prevalence and mortality from 2008 onwards, with a focus on the 2015 impact targets, have been agreed upon. These are explained in full in a forthcoming WHO policy paper,[3] with the key elements summarized in the form of a policy package (TABLE 1.3).

TABLE 1.3
WHO policy package for measuring rates of TB incidence, prevalence and mortality, 2008–2015 and beyond

General

1. Improve surveillance systems to include all (or almost all) incident cases in TB case notification data and to account for all (or almost all) TB deaths in vital registration systems.
2. Strengthen national capacity to monitor and evaluate the TB epidemic and to measure progress in TB control.
3. Review and update periodically the data, assumptions and analytical methods used to produce WHO estimates of TB incidence, prevalence and mortality rates.
4. Report by Task Force on whether 2015 MDG and Stop TB Partnership targets are achieved (or not), shortly after 2015.

Measuring TB incidence rates

5. Analyse periodically the reliability and coverage of case notification data using a standard framework, in order to estimate the total number of incident TB cases and trends in incidence rates.
6. Certify and/or validate TB notification data for countries where analyses using the standard framework show that TB notification data are a close proxy (direct measure) of TB incidence.
7. Cross-validate estimates of TB incidence using TB mortality data from vital registration systems.

Measuring TB prevalence rates

8. Survey the prevalence of TB disease in 21 global focus countries according to WHO guidelines and Task Force recommendations.
9. Produce indirect estimates of TB prevalence based on estimates of TB incidence and the duration of TB disease for countries where surveys of the prevalence of TB disease are not implemented.

Measuring TB mortality rates

10. Develop national vital registration systems to reliably record all TB deaths.
11. Initiate sample vital registration where national vital registration systems are not yet available.
12. Produce indirect estimates of TB mortality using estimates of TB incidence and case fatality rates for countries without reliable national or sample vital registration systems.

Evaluating the impact of TB control

13. Conduct studies periodically to evaluate the impact of control on rates of TB incidence, prevalence and mortality.

1.3.1 Measurement of incidence

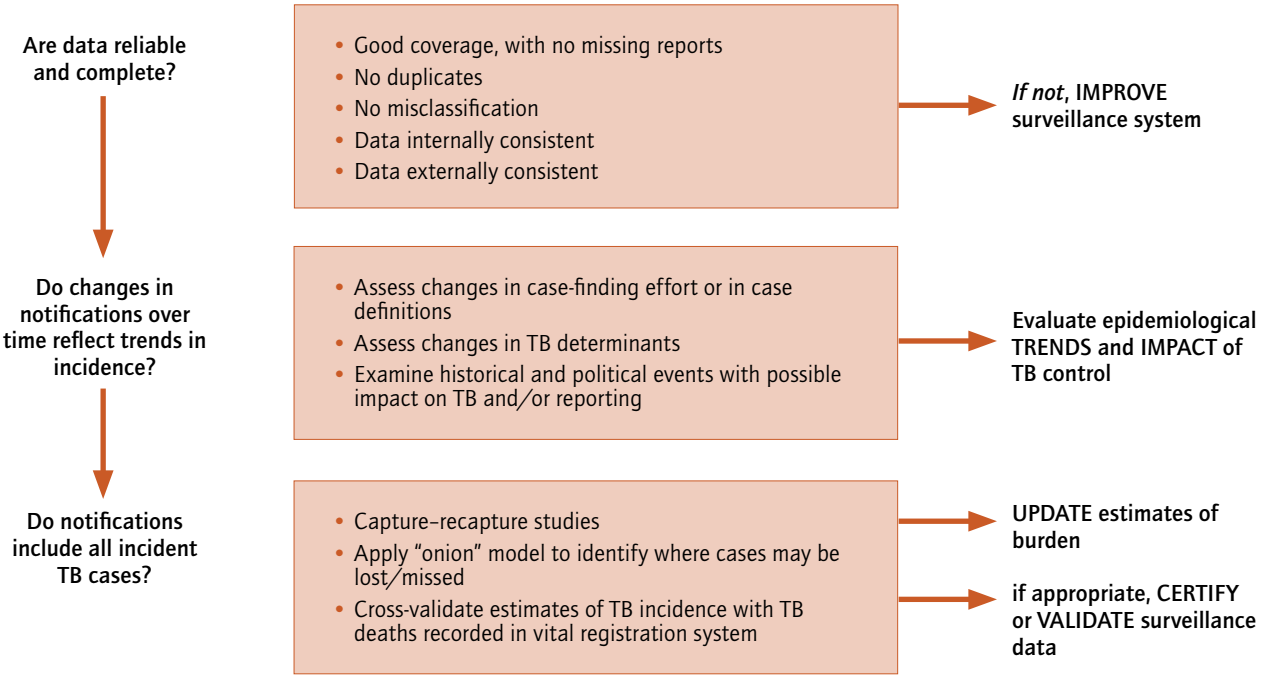
For improved measurement of incidence (its absolute value and trend), the policy package focuses on a systematic approach

[1] These experts were members of the WHO Global Task Force on TB Impact Measurement and external experts in epidemiology and statistics. The review also formed part of the TB component of the forthcoming update to the Global Burden of Disease, due for publication in 2010.

[2] Korenromp EL et al. State of the Art Review. The measurement and estimation of tuberculosis mortality. *International Journal of Tuberculosis and Lung Disease*, 2009 (in press).

[3] *Measuring progress in TB control: WHO policy and recommendations* [policy paper]. Geneva, World Health Organization, 2009 (in press). The policy paper is based on (i) a comprehensive review of methods to measure incidence, prevalence and mortality (Dye C et al. Measuring tuberculosis burden, trends and the impact of control programmes. *Lancet Infectious Diseases*; published online 16 January 2008 (available at http://infection.thelancet.com) and (ii) background papers prepared for Task Force meetings and associated discussions. The policy paper was endorsed by the Task Force during its meeting in September 2008. It was also reviewed by WHO's Strategic and Technical Advisory Group on TB (STAG-TB) in June 2008.

FIGURE 1.13
Framework for estimation and measurement of TB incidence using surveillance data



to assessing the quality and coverage of TB notification data. This approach consists of three core components (FIGURE 1.13). The first is an assessment of the quality of available TB notification data; this includes checking the completeness of reporting (with a benchmark that 100% of reporting units should report data each quarter) and assessing whether there are duplicate or misclassified records. It also includes analysis of the internal and external consistency of data using national and subnational data. Internal consistency means that data are consistent over time and space (or, if not, that variation can be explained), while external consistency means that data are consistent with existing evidence about the epidemiology of TB (for example, the proportion of pulmonary cases that are smear-positive, and the ratio of male to female cases). The results of the analysis of completeness, duplications, misclassifications and internal or external consistency can be used as the basis for identifying where and how surveillance needs to be strengthened.

The second component of the framework concerns analysis of trends in notification data, with the aim of assessing the extent to which they reflect trends in rates of TB incidence and the extent to which they reflect changes in other factors (such as programmatic efforts to find and treat more cases). Distinguishing between changes that are due to incidence and changes that are due to other factors is crucial when using notification data to estimate trends in the rates of TB incidence and case detection. The analysis in the second component of the framework should be used to determine whether time series of TB notifications are a good proxy for trends in TB incidence, or the extent to which they need to be adjusted for other factors before using them as a measure of trends in TB incidence. If TB notifications are a good proxy for trends in TB incidence, they can be used reliably to assess whether incidence is falling (MDG Target 6.c) or not.

Even when available notification data are complete and of high quality, and when they appear to be a good proxy of trends in TB incidence, they are not sufficient to estimate TB incidence in absolute terms. To do this, analysis of whether all TB cases are being captured in official notification systems is required (as was done for most countries when the first estimates of the global burden of TB were produced in 1997; see ANNEX 2). The major reasons why cases are missed from official notification data have been defined in the so-called "onion" model,[1] and include laboratory errors, lack of notification of cases by public and private providers, failure of cases accessing health services to be identified as TB suspects and lack of access to health services. Operational research (such as capture–recapture studies) as well as supporting evidence (such as the knowledge and practices of health-care staff related to definition of TB suspects, the extent to which regulations about notification of cases are observed and population access to health services) can be used to estimate the fraction of cases that are missing from official notification data. It is also possible to assess the coverage of notification data, and to cross-validate estimates of TB incidence produced using other methods, by analysing the number of TB deaths recorded in vital registration systems.

The objective is that the results from using this framework are used in one of two ways. If a country's TB surveillance data are shown to be a close proxy for TB incidence, the data will be "certified" or "validated" as a direct measure of TB inci-

[1] As referred to in FIGURE 1.13. For a full explanation, see *Measuring progress in TB control: WHO policy and recommendations* [policy paper]. Geneva, World Health Organization, 2009 (in press).

BOX 1.2

Estimating TB incidence following in-depth analysis of surveillance and programmatic data during the period 1996–2006: an example from Kenya

The incidence of TB in Kenya was indirectly estimated from TB notification data in 1997, as part of a global effort to estimate the global epidemiological burden of TB. The estimate was based on an expert assessment that the percentage of incident smear-positive cases being notified was 57% (i.e. 57% case detection rate). Until 2006, the trend in TB incidence before and after 1997 was assumed to be the same as the trend in TB notifications (of all forms of TB case).

Kenya has experienced a generalized HIV epidemic since the early 1980s and substantial efforts to improve the quality and coverage of TB diagnosis and treatment services were made from 2001 onwards. This made it difficult to disentangle the effect of HIV (which affects TB incidence) from the effect of programme performance on TB notifications, which in turn made it difficult to estimate the trend in TB incidence. Between September 2006 and December 2007, estimates of the absolute value of TB incidence and the trend in TB incidence were jointly reviewed by WHO and the NTP. This was done in the context of new evidence and new analysis. The major new sources of evidence were (i) data on trends in HIV-positive and HIV-negative TB notifications separately (ii) a direct measure of the prevalence of HIV among TB patients (iii) a recent survey of the prevalence of HIV in the general population and (iv) evidence about how programme performance had changed during the period 1996–2006. Both (i) and (ii) became available following the introduction and rapid expansion of provider-initiated HIV testing for TB patients in 2005. Evidence about programme performance during the period 1996–2006 was compiled during 2007. The four principal indicators used were: the number of health units where TB diagnosis was available, the number of health units where TB treatment was available, the number of NTP staff at national, provincial and district level, and NTP funding. For all four of these indicators, there was a clear relationship with trends in TB notifications from 2001 to 2006, while HIV-related data suggested that the HIV epidemic peaked around 2000 and had not caused any increase in TB incidence from 2001 to 2006. In combination, these new data provided strong evidence that the increase in TB notifications after 2001 was due to programmatic improvements (and not increases in TB incidence). This led to a downward revision in the estimate of TB incidence in 2006, an adjustment of the estimated trend in TB incidence, and an upward revision in the estimated case detection rate (to 70%). The original estimate of TB incidence (and case detection) in 1997 was left unchanged.

To allow reliable measurement of trends in TB incidence from 2007 onwards, maintaining high rates of HIV testing for TB patients is essential. This will allow trends in HIV-positive and HIV-negative TB notifications to be separated. Trends in HIV-negative TB notifications can be used to measure changes in case-finding. Comparison of trends in HIV-positive and HIV-negative TB notifications can be used to assess the impact of HIV on TB incidence. Efforts to strengthen routine surveillance, including the introduction of new recording and reporting forms and expanded use of electronic recording and reporting systems, have begun.

For further details, see Mansoer J et al. New methods for estimating the tuberculosis case detection rate. *Bulletin of the World Health Organization*, 2009 (in press).

BOX 1.3

Estimating TB incidence using capture-recapture methods: an example from Egypt

The NTP in Egypt compiled evidence that most TB cases have access to health-care services provided by public or private facilities as part of a multi-country operational research project in the Eastern Mediterranean. The number of TB cases experiencing symptoms and seeking care but not being diagnosed is therefore expected to be low. Nonetheless, when patients are diagnosed and treated by providers that are not linked to the NTP, it is unlikely that they are recorded in official notification data. Quantifying the proportion of cases that are diagnosed by non-NTP providers (the extent to which there is under-notification) may therefore allow a more accurate estimate of the total number of cases in the country as well as the proportion that are being detected by the NTP (the case detection rate).

To assess the extent to which cases were being missed in official notification data and in turn to update estimates of TB incidence and the case detection rate, the Ministry of Health in Egypt together with the WHO Office for the Eastern Mediterranean implemented a capture–recapture study in 2008. Study registers for listing TB cases were introduced in a nationally representative sample of non-NTP health facilities in the private and public sectors. The list of cases in these registers was then compared with the list of notified cases for the same period. Using capture–recapture log-linear models, the number of cases missed by all sources was estimated by comparing (i) the number of cases observed in each source of data independently with (ii) the number of common cases among all sources (that is, the overlap in cases). Analyses were undertaken for the whole sample and for sputum smear-positive cases only.

Revised estimates of TB incidence in Egypt based on capture–recapture analysis

	NOTIFICATION DATA (2007)		WHO ORIGINAL ESTIMATES (2007)		WHO REVISED ESTIMATES (2007)	
	ALL CASES	SS+ CASES	ALL CASES	SS+ CASES	ALL CASES	SS+ CASES
New TB cases	9 459	4 887	17 517	7 882	15 873	6 765
Rates (per 100 000 population/year)	13	6.5	24	10.5	21	9
Case detection rate (%)	–	–	54	62	60	72

For capture–recapture estimates to be valid, certain conditions must be met. In particular, three or more sources of data should be available to allow adjustment for dependencies among the sources of data. This was the case in Egypt: the three available sources were the NTP registry, the study registers of private non-NTP providers and the study registers of public non-NTP providers.

Based on the study results, the case detection rate for smear-positive cases was revised upwards to 72% (from 62%). The case detection rate for all cases was revised upwards to 60% (from 54%). Similar studies in other countries where all (or almost all) cases have access to health services could also help to revise existing TB estimates.

dence. If a country's surveillance data are found to include only a fraction of cases, this fraction will be estimated and used to update estimates of incidence (and by extension the case detection rate). Findings will also be used to identify the measures needed to strengthen surveillance so that the standards required for data to be certified or validated can be met. Recent examples of how different components of the framework can be implemented in practice are provided in BOX 1.2, BOX 1.3 and BOX 1.4.

1.3.2 Measurement of prevalence

There are two methods for estimating the prevalence of TB. The first is direct measurement using a cross-sectional population-based survey. Such surveys are only feasible if the estimated prevalence of smear-positive TB is around 100 per 100 000 population or more (otherwise the sample size required to measure prevalence with sufficient precision is so large that a survey is impractical in terms of cost and logistics). Even with the global average of around 100 cases per 100 000 population, a sample size of around 200 000 and a budget of US$ 1–2 million is usually required. Since prevalence typically falls more quickly than TB incidence in response to control efforts, a series of surveys conducted at relatively wide intervals (for example, 10 years) can be very useful for capturing large changes in the epidemiological burden of TB in high-burden or high-incidence countries (recent examples from HBCs include China, where surveys were implemented in 1990 and 2000, with a third planned for 2010; and the Philippines, where surveys were implemented in 1997 and 2007, with a third planned for 2017). In countries where the burden of TB is lower, prevalence can also be estimated indirectly as TB incidence multiplied by the average duration of disease (ANNEX 2).

Although the ultimate goal for all countries is to measure progress in TB control using routinely-collected surveillance data, the Task Force has identified 21 countries where nationwide population-based surveys of the prevalence of TB disease during the period 2008–2015 are a priority for the

BOX 1.4

Estimating TB incidence using mortality data from a vital registration system: an example from Brazil

WHO estimates of TB incidence are based on notification data, surveys of the annual risk of infection, surveys of the prevalence of TB disease combined with estimates of the average duration of disease, and mortality data from vital registration systems combined with estimates of the case fatality rate. Where several sources of evidence exist, greatest weight is attached to the most reliable data. For most countries, incidence is indirectly estimated from TB case notification data and an expert assessment of the percentage of incident TB cases being notified. When case-finding efforts do not change much over time, trends in TB incidence are often assumed to mirror trends in TB case notification rates (ANNEX 2). Until 2005, these methods were used to estimate TB incidence and its trend in Brazil.

By 2005, the Ministry of Health of Brazil had greatly improved the TB notification system and the death registration component of the vital registration system. This included extending coverage of both systems throughout the country, validating data and systematically linking records within and between the two databases. Linkage of records within the TB notification database and implementation of procedures to distinguish between new and re-treatment or transfer-in records were used to identify duplicate records. This showed that notifications had been artificially inflated and that the cure rate had been underestimated (see table below). Removal of duplicate records increased the gap between the number of new TB cases notified and the number of new TB cases estimated by WHO, highlighting the need for a review of existing estimates.

The effect of removing duplicate records from the database of TB case notifications, 2005

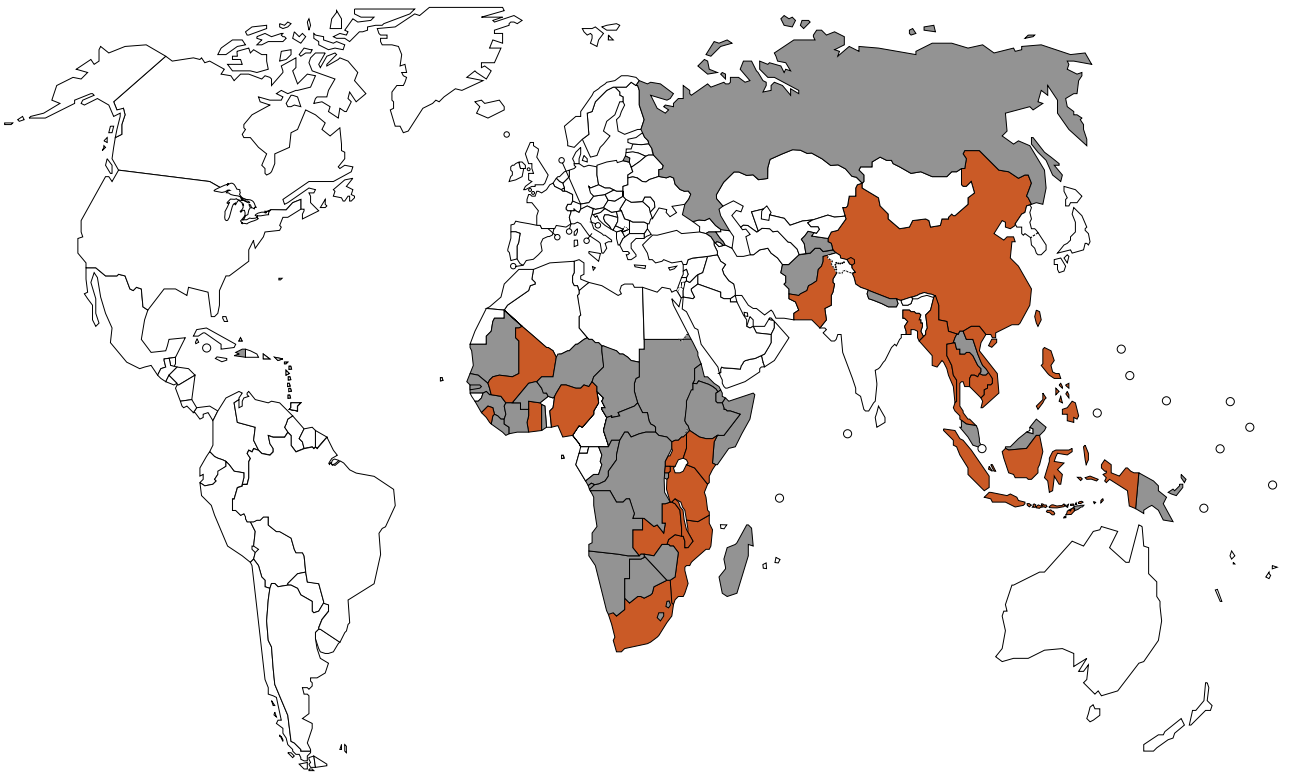
DUPLICATES REMOVED	NEW NOTIFIED CASES		NOTIFICATION RATE		CHANGE (%)	CURED (%)		CHANGE (%)
	BEFORE	AFTER	BEFORE	AFTER		BEFORE	AFTER	
19 064	81 330	74 113	44.2	40.2	-9.7	60.5	64.5	+6.7

Estimates of TB incidence in Brazil are now based on an analysis of TB deaths recorded in the vital registration system. The case fatality rate was calculated by cross-linking the case-based TB notification database and the mortality database. Incidence in 2005 was then estimated as the number of TB deaths in the mortality database divided by the case fatality rate (estimated as the number of deaths in the mortality database divided by the number of cases in the notification database, with appropriate adjustments for the proportion of records in both systems that could be linked and a minor adjustment for the coverage of TB mortality records). Since the mortality information system was judged by the local authorities to have higher coverage than the TB notification system, and since it is unlikely that the case fatality rate had changed markedly in recent years, the trend in incidence over time was estimated by assuming that the trend in the TB incidence rate was the same as the trend in the TB mortality rate from 2001 to 2005. This suggested that incidence was falling at a rate of 3.3% per year. Incidence in absolute terms for years before 2005 was also based on this trend (see table below).

Original and revised WHO estimates of TB incidence using TB mortality data, 2005

	NOTIFICATIONS	ORIGINAL ESTIMATE OF INCIDENCE	REVISED ESTIMATE OF INCIDENCE
New TB cases	74 113	111 050	95 408
Incidence or notification rate (per 100 000 population/year)	40	60	51
Case detection rate	–	69%	78%

FIGURE 1.14
The 21 global focus countries where a national prevalence of TB disease survey is recommended in the period 2008–2015 (red), and extended list of countries meeting the criteria (grey)



purposes of global and regional measurements of progress in TB control (FIGURE 1.14). The list includes 12 African countries plus Pakistan and all but one of the nine HBCs in the South-East Asia and Western Pacific regions (the exception is India, where subnational surveys have already been implemented and further such surveys are planned). Countries were selected according to various criteria,[1] including their estimated prevalence of smear-positive TB, their share of the global and regional numbers of estimated TB cases, their case detection rate, HIV prevalence in the general population and the availability (or not) of data from an earlier survey. Existing plans and funding for surveys and the capacity of technical agencies to provide assistance were also considered. Most of these countries were already committed to the planning and implementation of surveys before their inclusion on the list developed by the Task Force. However, this inclusion means that particular efforts to support the successful design and implementation of surveys in these countries are being made by the Task Force and its partners. To date, these efforts have included workshops to support 10 countries (eight African countries plus Pakistan and Thailand) to develop survey protocols consistent with recent guidelines,[2] expert review of protocols, facilitating the provision of advice about Global Fund applications or reprogramming of existing grants, and country missions.

1.3.3 Measurement of mortality

The best way to measure the number of deaths from TB is via a national vital registration system in which deaths are coded according to the International Statistical Classification of Diseases (ICD-10), and data are of proven completeness and accuracy (see BOX 1.4 for an example from Brazil). To make this possible, many countries will need to develop a vital registration system, or substantially strengthen an existing system (see also ANNEX 4). In the meantime, sample vital registration combined with verbal autopsy may provide an interim solution. Where neither national nor sample vital registration systems exist, TB mortality can be estimated using estimates of TB incidence and the case fatality rate (ANNEX 2).

1.3.4 Status of impact measurement in HBCs at the end of 2008

The status at the end of 2008 of the three major components of impact measurement highlighted above – in-depth analysis of routine surveillance data; surveys of the prevalence of TB disease; and analysis of mortality records from vital registration data or surveys – is shown for the 22 HBCs in TABLE 1.4.[3] An in-depth analysis of surveillance data was reported to have been undertaken by 12 countries in the past five years, although the extent to which these analyses were in

[1] For a full explanation, see the *Report of the second meeting of the WHO Task Force on TB Impact Measurement. Geneva, 6–7 December 2007.* Geneva, World Health Organization, 2007 (unpublished).

[2] World Health Organization (17 authors). *Assessing tuberculosis prevalence through population-based surveys*. Manila, World Health Organization, 2007.

[3] Data for other countries were reported but require further validation by the Task Force secretariat.

TABLE 1.4
Measurement of incidence, prevalence and mortality carried out (2000–2007) and planned (2008–2015)

	IN-DEPTH ANALYSIS OF ROUTINE SURVEILLANCE DATA		PREVALENCE OF DISEASE SURVEY[a]		ANALYSIS OF VITAL REGISTRATION DATA (MORTALITY RECORDS)	
	CARRIED OUT	PLANNED	CARRIED OUT	PLANNED	CARRIED OUT	PLANNED
1 India	Y	Y	Y, subnational	Y, subnational	N	N
2 China	Y	Y	Y	Y	N	N
3 Indonesia	Y	Y	Y	Y	Y	Y
4 Nigeria	Y	Y	–	Y	N	N
5 South Africa	–	Y	–	Y	Y	Y
6 Bangladesh	N	N	Y	–	N	N
7 Ethiopia	N	N	–	Y	N	N
8 Pakistan	N	N	–	Y	–	–
9 Philippines	N	N	Y	–	N	N
10 DR Congo	Y	Y	N	N	N	N
11 Russian Federation	Y	Y	Y	Y	Y	Y
12 Viet Nam	–	–	Y	–	–	–
13 Kenya	Y	Y	N	Y	N	N
14 Brazil	–	Y	N	N	Y	Y
15 UR Tanzania	Y	Y	–	Y	N	N
16 Uganda	–	–	–	Y	N	N
17 Zimbabwe	Y	Y	N	N	N	Y
18 Thailand	Y	Y	Y, subnational	Y	N	N
19 Mozambique	Y	Y	N	N	N	N
20 Myanmar	Y	Y	Y, subnational	Y	N	N
21 Cambodia	N	N	Y	Y	N	N
22 Afghanistan	N	N	N	N	N	N
High-burden countries[b]	**12**	**14**	**10**	**14**	**4**	**5**

– Indicates information not provided.
[a] National survey unless otherwise specified.
[b] The last row of the table shows the number of countries answering "yes" to each question.

line with the framework developed by the Task Force in 2008 (FIGURE 1.13) is not known. Such analyses are planned by a further 14 countries, offering an excellent opportunity to apply (and test) this framework in practice.

Surveys of the prevalence of TB disease have been undertaken in all of the five HBCs in the South-East Asia Region (two nationwide surveys and three subnational surveys) and in all four HBCs in the Western Pacific Region (all of which were nationwide surveys) between 2000 and 2007. With further surveys already planned in seven of these nine HBCs,[1] all of which are among the 21 global focus countries selected by the Task Force, the South-East Asia and Western Pacific regions are particularly well placed to measure impact between 2000 and 2015. China is best placed to measure whether or not the Stop TB Partnership target of halving prevalence between 1990 and 2015 is achieved, since it has already conducted surveys in 1990 and 2000, with a third survey planned for 2010. Besides the nine HBCs in the South-East Asia and Western Pacific regions, no other HBCs have conducted a survey of the prevalence of TB disease since 2000. Nonetheless, six of the African HBCs as well as Pakistan are planning to implement surveys between 2008 and 2010. This includes Ethiopia; while not on the original list of 21 countries, a survey in this country would considerably increase the share of the population and estimated TB cases surveyed in the African Region. Among the remaining countries shown in FIGURE 1.14 (Ghana, Malawi, Mozambique, Rwanda, Sierra Leone and Zambia), all except Mozambique and Sierra Leone have plans to implement surveys starting in 2009 or 2010. If these planned surveys are to be successfully implemented, there are several major challenges that need to be overcome. These include closing funding gaps[2] and delays in procuring X-ray equipment.

As already highlighted above, few HBCs have analysed TB mortality using data from vital registration systems or mortality surveys. The countries where mortality data from vital registration systems have been used to quantify TB deaths are Brazil, the Russian Federation and South Africa, while Indonesia has conducted a mortality survey. This clearly demonstrates the need for general strengthening of national information and general health information systems in many countries.

[1] This includes a survey planned in the Philippines in 2017. The exceptions where future surveys are not yet planned are Bangladesh and Viet Nam, where implementation of nationwide surveys was only recently completed.
[2] Most countries have included surveys in Global Fund proposals. However, development of study protocols has shown that the funding requested is often too low. Reprogramming of existing grants or application for supplementary funding is required. A few countries have not yet secured funding and plan to apply to the Global Fund in round 9. The deadline for round 9 applications is July 2009.

1.4 Case notifications

1.4.1 Total case notifications

The 196 countries reporting to WHO in 2008 notified 5.6 million new and relapse cases in 2007, of which 2.6 million (46%) were new smear-positive cases (TABLE 1.5; FIGURE 1.15). Of these notifications, 5.5 million (99%) were from DOTS programmes, including 2.6 million (47%) new smear-positive cases (also 99% of total notifications of smear-positive cases). The African Region (22%), South-East Asia Region (36%) and Western Pacific Region (25%) together accounted for 83% of all notified new and relapse cases and for similar proportions of new smear-positive cases in 2007. Among new pulmonary cases reported by DOTS programmes (TABLE 1.5), 57% were new smear-positive (a minimum of 65% expected).

A total of 37.3 million new and relapse cases, and 18.1 million new smear-positive cases, were notified by DOTS programmes in the 13 years between 1995 (when reliable recording began) and 2007.

1.4.2 Case notifications disaggregated by sex

Notifications disaggregated by sex were reported for new pulmonary smear-positive TB cases from DOTS programmes by 170 countries. Of 2.55 million notifications (99.2% of total notifications in DOTS areas and 98.3% of all notifications), 1.65 million were male and 0.9 million were female, giving a male:female ratio of 1:8.

The distribution of the male:female ratio across age groups in the nine epidemiological subregions is shown in FIGURE 1.16. For those aged ≥14 years, more men than women were detected with TB globally. The male:female ratio was consistently <1 in the 0–14 year-old age group, but increased in older age groups in most subregions. In the subregions of Central Europe, Eastern Europe, the Eastern Mediterranean and Latin America, the shape of the male:female ratio curve is concave. Reasons for this pattern and for differences compared with other regions are not well understood.

One of the factors associated with the male:female ratio in smear-positive TB patients is the prevalence of HIV in the general population. Relatively more women than men are

TABLE 1.5
Case notifications, 2007

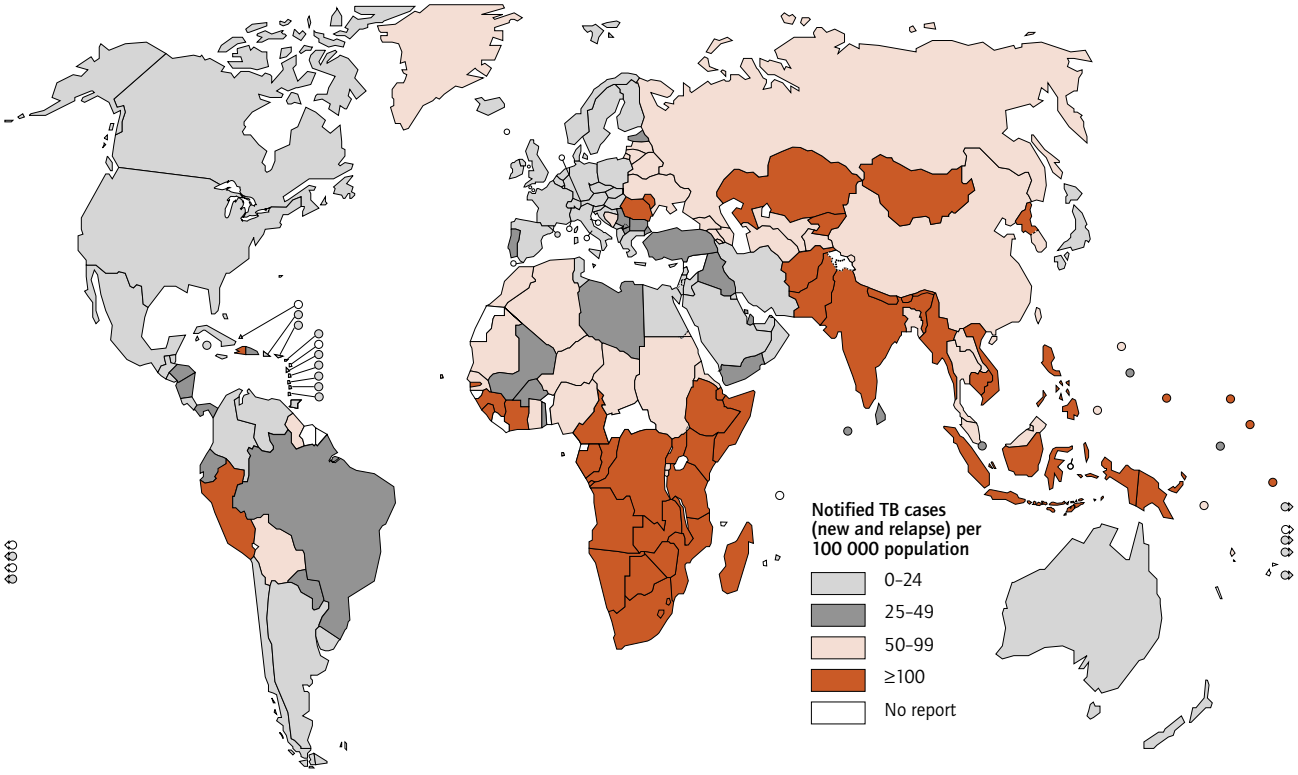
	NEW AND RELAPSE CASES		NEW CASES						RE-TREATMENT CASES EXCLUDING RELAPSE		OTHER[a]		% OF NEW PULMONARY CASES SMEAR-POSITIVE[b]	
			SMEAR-POSITIVE		SMEAR-NEGATIVE/ UNKNOWN		EXTRA-PULMONARY							
	DOTS	WHOLE COUNTRY	DOTS	WHOLE COUNTRY	DOTS	WHOLE COUNTRY	DOTS	WHOLE COUNTRY	DOTS	WHOLE COUNTRY	DOTS	WHOLE COUNTRY	DOTS	WHOLE COUNTRY
1 India	1 295 943	–	592 587	–	398 862	–	206 840	–	179 686	–	–	–	60	–
2 China	979 502	–	465 877	–	430 634	–	36 612	–	66 437	–	–	–	52	–
3 Indonesia	275 193	–	160 617	–	102 613	–	8 048	–	467	–	–	–	61	–
4 Nigeria	82 417	–	44 016	–	32 088	–	4 044	–	3 824	–	–	–	58	–
5 South Africa	315 315	–	135 604	–	105 631	–	45 738	–	38 304	–	–	–	56	–
6 Bangladesh	147 342	–	104 296	–	23 152	–	16 106	–	–	–	–	–	82	–
7 Ethiopia	128 844	–	38 040	–	43 500	–	45 269	–	899	–	–	–	47	–
8 Pakistan	230 468	–	88 747	–	103 629	–	33 986	–	3 632	–	–	–	46	–
9 Philippines	140 588	–	86 566	–	49 422	–	1 513	–	1 988	–	–	–	64	–
10 DR Congo	99 810	–	66 099	–	10 968	–	18 737	–	2 406	–	548	–	86	–
11 Russian Federation	127 338	–	33 103	–	73 560	–	11 704	–	87 586	–	–	–	31	–
12 Viet Nam	97 400	–	54 457	–	17 554	–	18 675	–	944	–	–	–	76	–
13 Kenya	106 438	–	38 360	–	49 869	–	18 032	–	10 285	–	–	–	43	–
14 Brazil	66 759	74 757	34 211	38 444	20 566	23 065	9 318	10 318	5 224	5 704	–	–	62	63
15 UR Tanzania	59 371	–	24 520	–	20 521	–	12 526	–	2 721	–	–	–	54	–
16 Uganda	40 909	–	21 303	–	13 713	–	4 460	–	703	–	–	–	61	–
17 Zimbabwe	40 277	–	10 583	–	21 964	–	6 381	–	1 137	–	–	–	33	–
18 Thailand	54 793	–	28 487	–	17 156	–	7 485	–	–	–	–	–	62	–
19 Mozambique	37 651	–	18 214	–	13 064	–	5 020	–	393	–	–	–	58	–
20 Myanmar	129 081	–	42 588	–	41 826	–	40 002	–	4 466	–	–	–	50	–
21 Cambodia	35 601	–	19 421	–	7 120	–	8 412	–	894	–	–	–	73	–
22 Afghanistan	28 769	–	13 213	–	8 251	–	6 227	–	–	–	–	–	62	–
High-burden countries	**4 519 809**	**4 527 807**	**2 120 909**	**2 125 142**	**1 605 663**	**1 608 162**	**565 135**	**566 135**	**411 996**	**412 476**	**548**	**–**	**57**	**57**
AFR	1 251 642	1 251 735	561 091	561 149	408 936	408 964	223 320	223 322	74 165	–	792	–	58	58
AMR	208 419	218 426	114 307	119 838	52 053	55 041	31 389	32 564	10 462	11 045	688	704	69	69
EMR	375 857	378 895	155 558	155 572	135 441	136 865	75 299	76 898	4 338	–	131	–	53	53
EUR	322 132	350 529	97 156	105 288	154 365	165 777	45 094	53 623	121 936	127 354	57	416	39	39
SEA	2 007 111	2 007 193	972 390	972 441	622 776	622 795	295 857	295 866	194 733	194 736	218	220	61	61
WPR	1 325 173	1 365 284	656 883	666 412	529 296	548 024	78 479	88 538	73 005	77 144	951	4 438	55	55
Global	**5 490 334**	**5 572 062**	**2 557 385**	**2 580 700**	**1 902 867**	**1 937 466**	**749 438**	**770 811**	**478 639**	**488 782**	**2 837**	**6 701**	**57**	**57**

– Indicates zero or all cases notified under DOTS; no additional cases notified under non-DOTS.

[a] Cases not included elsewhere in table.

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

FIGURE 1.15
Tuberculosis notification rates, by country, 2007



detected with TB in countries where the prevalence of HIV in the general population exceeds 1% (FIGURE 1.17).

The reasons for higher TB notification rates in men are poorly understood. Possible explanations include biological differences between men and women in certain age groups that affect the risk of being infected as well as the risk of infection progressing to active disease, and/or differences in the societal roles of men and women that influence their risk of exposure to TB and access to care (gender differences). The observation that TB notification rates tend to be more equal between men and women in countries with a high prevalence of HIV supports the hypothesis of biological differences (that can be lessened by immunological suppression due to HIV), but other non-biological factors may play an important role.

A total of 101 countries reported notifications of new cases of extrapulmonary TB disaggregated by age and sex (these countries accounted for 50% of total notifications of extrapulmonary TB). There were 195 002 male cases and 180 310 female cases, giving a male:female ratio of 1:1. The ratio among new extrapulmonary patients is much lower than the ratio for smear-positive TB patients (FIGURE 1.18); understanding the reasons for this difference and their programmatic implications requires further investigation and research.

In general, there is a need for gender-based analysis to investigate the range of biological, epidemiological, demographic, social and economic variables that affect gender differentials in the incidence and notification of TB.

1.5 Case detection rates

1.5.1 Case detection rate, all sources (DOTS and non-DOTS programmes)

The 2.6 million new smear-positive cases notified in 2007 from all sources (that is, from DOTS and non-DOTS programmes) represent 64% of the 4.1 million estimated cases (TABLE 1.2; TABLE 1.6). This is a small increase from a figure of 63% in 2006, following a slow increase from 35% to 43% between 1995 and 2001 and a more rapid increase from 43% to 60% between 2001 and 2005 (FIGURE 1.19). The improvement that occurred between 2001 and 2007 was attributable mostly to increases in the numbers of new smear-positive cases reported in the Eastern Mediterranean, South-East Asia and Western Pacific regions (TABLE 1.6).

The case detection rate of smear-positive cases in 2007 (for DOTS and non-DOTS programmes) was ≥70% in the Western Pacific Region (78%) and the Region of the Americas (76%), followed by the South-East Asia Region (69%). The African Region had the lowest case detection rate (47%) (TABLE 1.6; FIGURE 1.20). The Region of the Americas and the European Region reported the largest numbers of new smear-positive cases from outside DOTS programmes (FIGURE 1.20).

The 5.3 million new TB cases (all forms) that were notified in 2007 represent 57% of the 9.3 million estimated new cases. The case detection rate for all new cases was highest in the European Region (75%), followed by the Region of the Americas (71%) and the Western Pacific Region (68%) (FIGURE 1.20).

FIGURE 1.16
Sex ratio (M/F) by age group in nine epidemiological subregions, 2007

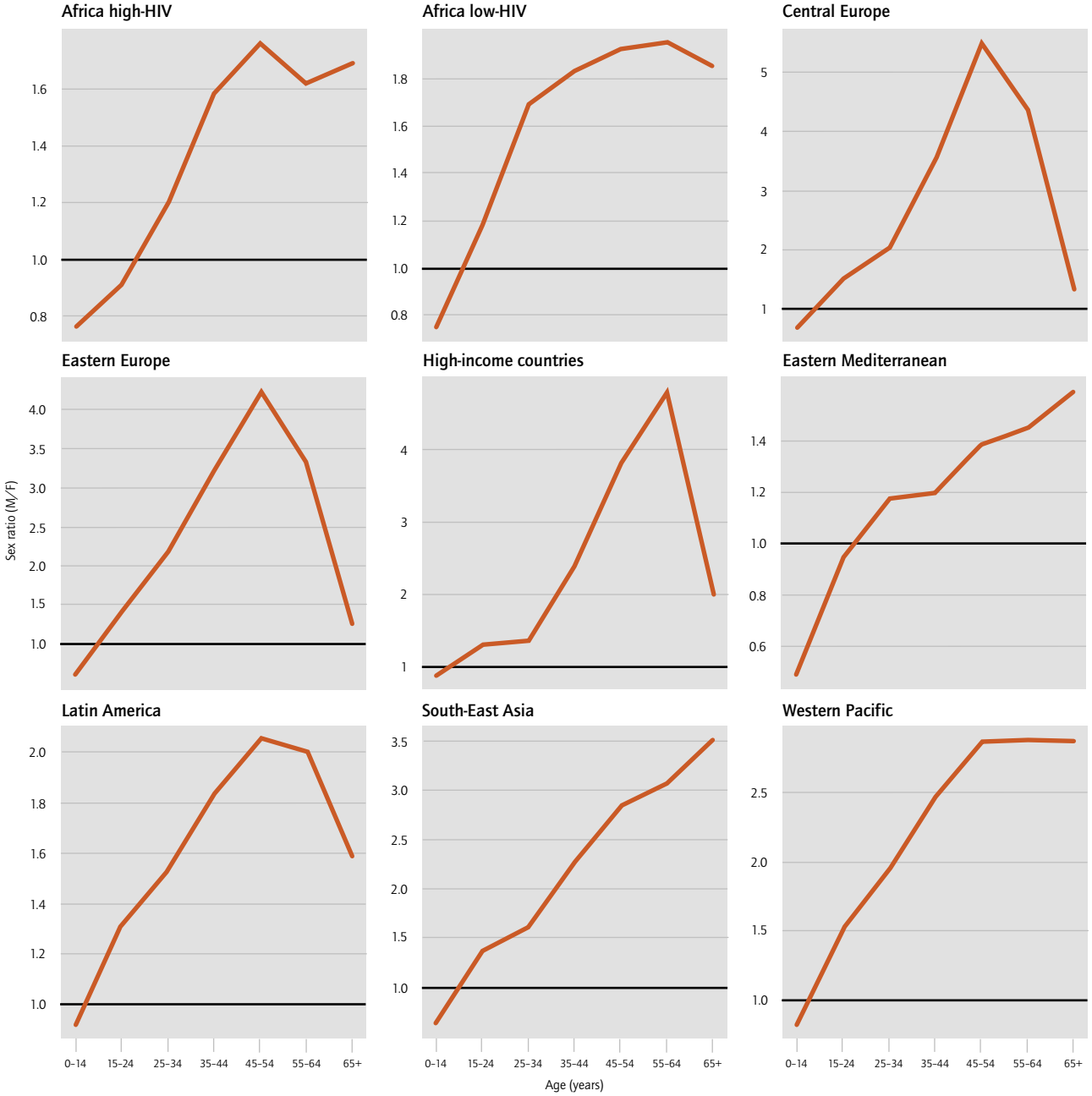


FIGURE 1.17

Distribution of sex ratios (M/F) in notified new smear-positive TB cases, by HIV epidemic level in the general population. The error bars denote 95% confidence intervals of the mean sex ratio within each HIV epidemic level. Horizontal random jitter was applied to data points to reduce over-plotting.

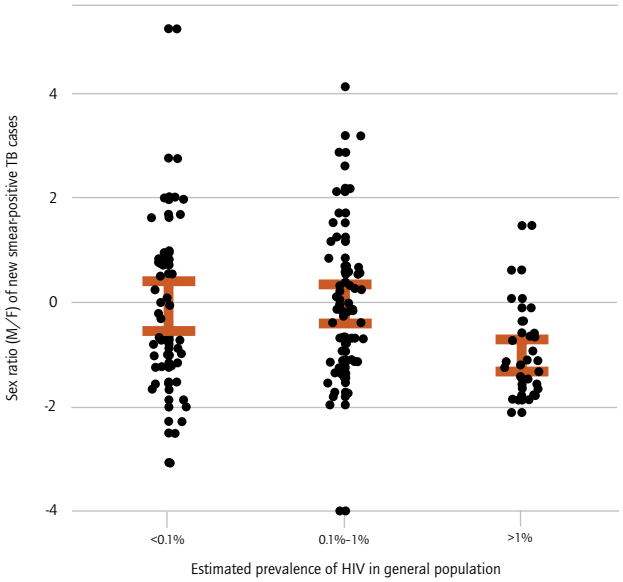


FIGURE 1.18

Distribution density of sex ratios (M/F) in new smear-positive TB cases (red) and in new extrapulmonary TB cases (grey). The vertical lines denote the mean sex ratio.

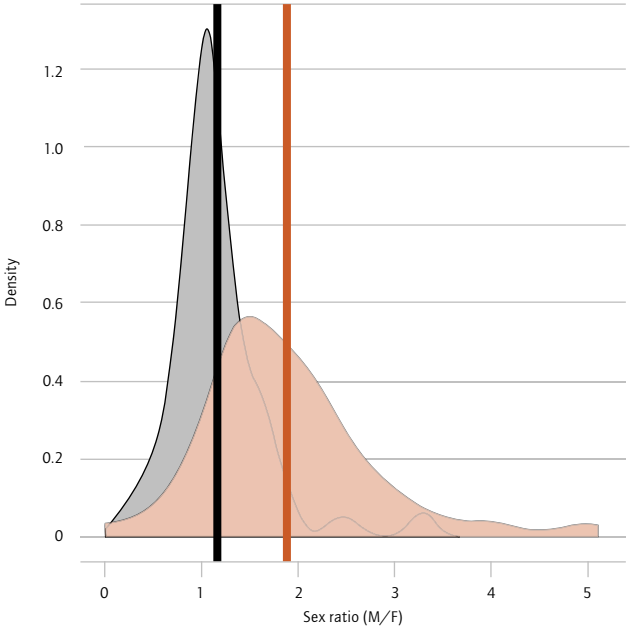


TABLE 1.6

Case detection rate for new smear-positive cases (%), 1995–2007[a]

	DOTS PROGRAMMES													WHOLE COUNTRY											
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
1 India	0.3	0.9	1.0	1.7	6.9	12	23	30	44	56	60	64	68	37	40	37	38	46	45	49	49	53	59	60	64	*
2 China	15	29	32	32	30	31	31	30	43	64	80	80	80	22	34	39	34	34	34	34	33	45	65	*	*	*
3 Indonesia	1.3	4.4	7.4	12	19	20	21	30	37	53	66	73	68	12	*	*	*	*	*	*	*	*	*	*	*	*
4 Nigeria	11	11	11	11	12	12	12	11	15	17	18	20	23	*	*	*	*	*	*	15	13	*	*	*	*	*
5 South Africa	–	–	6.8	23	66	63	60	71	77	75	72	77	78	3	75	90	119	95	78	70	72	77	78	75	*	*
6 Bangladesh	6.4	14	18	23	23	24	26	30	35	40	54	65	66	14	21	23	26	25	26	27	31	*	*	*	*	*
7 Ethiopia	15	20	22	24	25	31	30	30	31	31	28	27	28	*	24	*	*	*	*	*	*	*	*	*	*	*
8 Pakistan	1.0	1.7	–	3.7	2.0	2.8	5.2	13	17	25	38	50	67	2.5	*	–	13	5.4	*	9.1	13	*	*	*	*	*
9 Philippines	0.4	0.4	2.9	9	18	44	52	57	64	69	71	75	75	85	78	75	64	65	59	*	*	*	*	*	*	*
10 DR Congo	40	47	43	53	50	47	49	47	53	59	60	59	61	42	*	*	*	*	*	*	*	*	*	*	*	*
11 Russian Federation	–	0.5	1.1	1.0	1.8	5.0	5.6	7.5	9.5	15	34	45	49	77	74	67	63	31	37	37	40	43	47	49	48	*
12 Viet Nam	30	59	78	83	83	82	84	87	86	89	84	86	82	59	77	84	85	83	*	*	*	*	*	*	*	*
13 Kenya	58	60	56	60	60	53	61	63	65	68	70	72	72	*	*	*	*	*	58	*	*	*	*	*	*	*
14 Brazil	–	–	–	3.8	3.7	7.0	7.4	8.9	17	43	51	64	69	73	73	73	66	72	73	70	76	75	82	82	82	78
15 UR Tanzania	61	60	57	58	56	52	51	48	49	51	50	50	51	*	*	*	*	*	*	*	*	*	*	*	*	*
16 Uganda	–	–	60	60	60	51	47	47	47	48	47	48	51	51	56	*	*	*	*	*	*	*	*	*	*	*
17 Zimbabwe	–	–	–	55	49	45	44	42	36	36	32	32	27	43	54	60	*	*	*	*	*	*	*	*	*	*
18 Thailand	–	0.3	5.2	22	41	48	76	68	74	74	77	74	72	58	48	37	*	*	*	*	*	*	*	*	*	*
19 Mozambique	59	55	53	53	50	47	45	45	45	46	47	49	49	*	*	*	*	*	*	*	*	*	*	*	*	*
20 Myanmar	–	27	27	30	34	50	60	69	78	88	102	111	116	27	30	29	*	*	*	61	*	*	*	*	*	*
21 Cambodia	40	34	44	48	54	50	48	57	62	62	68	62	61	*	43	*	*	*	*	*	*	*	*	*	*	*
22 Afghanistan	–	–	4.2	12	11	18	29	39	37	45	52	63	64	–	–	*	*	*	*	*	*	*	*	*	*	*
High-burden countries	**8.4**	**14**	**17**	**20**	**23**	**26**	**31**	**35**	**43**	**53**	**60**	**64**	**65**	**31**	**36**	**37**	**38**	**39**	**39**	**41**	**42**	**47**	**56**	**61**	**64**	**65**
AFR	23	26	30	35	37	36	37	43	45	46	46	47	47	33	43	42	47	43	41	42	44	46	47	47	47	47
AMR	26	26	29	33	36	43	42	45	49	57	62	72	73	68	69	74	71	73	73	73	74	74	76	76	78	76
EMR	12	10	12	19	21	25	27	32	34	39	46	52	60	25	27	24	34	32	27	30	32	34	39	46	52	60
EUR	2.6	3.5	4.6	11	11	12	14	22	24	26	37	53	51	64	63	58	58	46	47	43	43	53	48	50	58	55
SEAR	1.4	4.0	5.5	8.0	14	18	26	33	44	55	62	67	69	28	29	29	30	37	38	42	45	50	57	62	67	69
WPR	15	28	31	33	31	37	38	39	50	65	77	77	77	36	44	48	43	44	43	43	43	52	67	78	78	78
Global	**11**	**16**	**18**	**22**	**25**	**28**	**32**	**37**	**44**	**52**	**58**	**62**	**63**	**35**	**40**	**40**	**41**	**42**	**42**	**43**	**45**	**49**	**56**	**60**	**63**	**64**

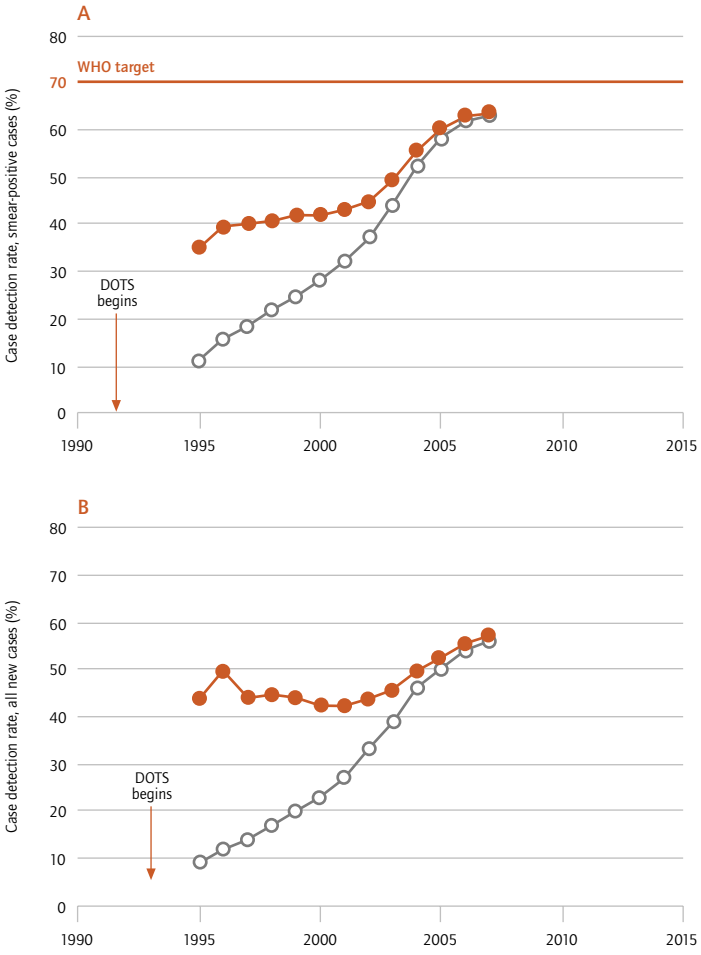
– Indicates not available.

[a] Estimates for all years are recalculated as new information becomes available and techniques are refined, so they may differ from those published previously.

* No additional data beyond DOTS report, either because country is 100% DOTS, or because no non-DOTS report was received.

FIGURE 1.19

Progress towards the 70% case detection target. (a) Open circles mark the number of new smear-positive cases notified under DOTS 1995–2007, expressed as a percentage of estimated new cases in each year. 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).



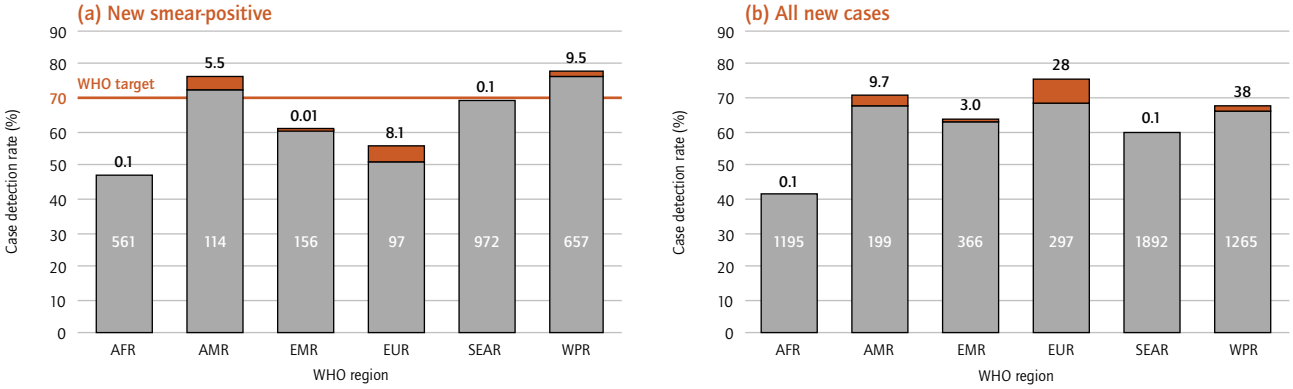
1.5.2 Case detection rate, DOTS programmes

In 2007, over 99% of all notified cases of smear-positive TB were from DOTS programmes and the case detection rate under DOTS was 63% (TABLE 1.6; FIGURE 1.19). This was a small improvement compared with 2006. National estimates of the case detection rate of new smear-positive cases suggest that 74 countries met the 70% target in 2007, down from 78 in 2006 (ANNEX 3). At regional level, the case detection rate was lowest in the African (47%) and European (51%) regions and highest in the Western Pacific Region (77%) (TABLE 1.6; FIGURE 1.20; FIGURE 1.21). The Western Pacific Region (since 2005) and the Region of the Americas (since 2006) are the only regions to have exceeded the 70% target, although the South-East Asia Region (at 69%) falls just short. The particularly low figure for case detection under DOTS in the European Region compared with the case detection rate (in DOTS and non-DOTS programmes) of all forms of TB of 75% (FIGURE 1.20) is explained by two factors: incomplete geographical coverage of DOTS and lack of emphasis on sputum smear microscopy.[1]

The implication that DOTS programmes in the African Region especially need to improve case detection comes with an important caveat. Efforts to assess improvements in case detection in this region have been hampered by the upward trend in incidence linked to the spread of HIV infection, such that it has been difficult to disentangle the effect of better programme performance and the HIV epidemic on increases in case notifications (see also SECTION 1.3 and BOX 1.2). More in-depth analyses of existing surveillance and programmatic data as well as data from forthcoming surveys of the prevalence of TB disease (TABLE 1.4) may indicate that case detection is higher than stated in this report.

FIGURE 1.20

Proportion of estimated cases notified under DOTS (grey portion of bars) and non-DOTS (red portion of the bar) in 2007 for (a) new smear-positive cases and (b) all new cases. The number of notified cases (in thousands) is shown in or above each portion or each bar.



[1] Countries in the European Region report substantial numbers of cases in whom disease is diagnosed by methods other than sputum smear microscopy. These cases are not necessarily smear-negative.

Although case detection of new smear-positive cases in DOTS programmes improved globally between 2006 and 2007, the increment between 2006 and 2007 (an extra 55 000 cases) was less than 1%, the smallest reported annual increase since 1995–1996 (TABLE 1.6; FIGURE 1.19; FIGURE 1.22). Most of the small increase in detected cases was attributable to India and Pakistan (in Pakistan this is linked to countrywide efforts to develop and scale up partnerships between the NTP and private providers, as described more fully in CHAPTER 2), and to a lesser extent Nigeria and South Africa (FIGURE 1.23). In the South-East Asia Region, the acceleration in case-finding after 2000 was attributable mostly to progress in Bangladesh, India, Indonesia and Myanmar. The Western Pacific Region is dominated by China, where case-finding expanded rapidly between 2002 and 2005; subsequently, little progress has been made (TABLE 1.6; ANNEX 1).

China and India accounted for an estimated 27% of all undetected new smear-positive cases in 2007. Nigeria accounted for 10% of undetected cases. These three countries are among eight HBCs that together accounted for 57% of all new smear-positive cases not detected by DOTS programmes in 2007 (FIGURE 1.24).

DOTS programmes detected 5.2 million new cases in 2007 (99% of all notifications) out of a total of 9.27 million estimated cases (TABLE 1.2; TABLE 1.5). This is equivalent to a case detection rate (all new cases) of 56% in 2007, a 2% increase from 54% in 2006.

1.6 Outcomes of treatment in DOTS programmes

1.6.1 New smear-positive cases

A total of 2.5 million new smear-positive cases were registered for treatment in DOTS programmes in 2006, approximately the same number that were notified that year (TABLE 1.7). The biggest discrepancies, where registered cases exceeded notifications, were in the Region of the Americas (Brazil) and in the Russian Federation and South Africa.

Globally, the rate of treatment success was 85% in 2006 (TABLE 1.7; TABLE 1.8). This means that 52% of the smear-positive cases estimated to have occurred in 2006 were treated successfully by DOTS programmes. Among all the patients treated under DOTS, 9.7% had no known outcome (defaulted, transferred, not evaluated). Treatment results for 13 consecutive cohorts (1994–2006) of new smear-positive patients show that the success rates have been 80% or higher in DOTS areas since 1998, even though the number of patients increased 10-fold from 240 000 in 1994 to 2.5 million in 2006 (TABLE 1.8).

The target for treatment success was reached at global level in 2006 because of the high treatment success rates reported from the South-East Asia and Western Pacific regions (87% and 92%, respectively; the latter figure is high enough to warrant further validation of the data). The DOTS treatment success rate reached or exceeded 85% in ten HBCs (TABLE 1.7), seven of which were in the South-East

FIGURE 1.21
Smear-positive case detection rate under DOTS, by WHO region, 1995–2007. Heavy line shows global DOTS case detection rate.

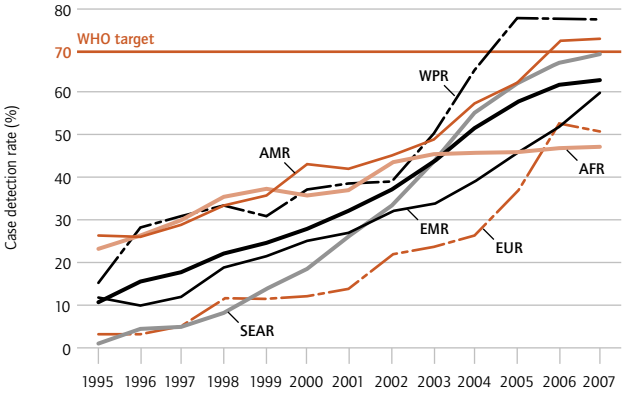
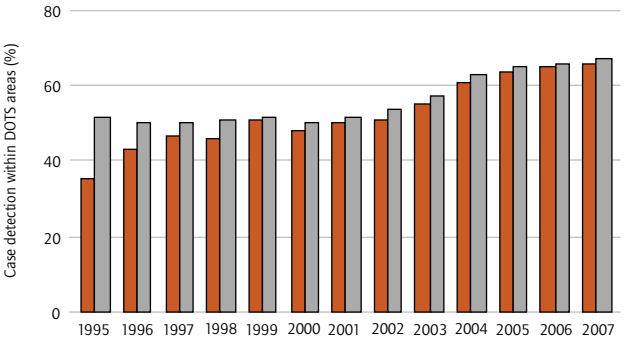


FIGURE 1.22
Smear-positive case detection rate within DOTS areas[a] for high-burden countries (red) and the world (grey), 1995–2007



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

FIGURE 1.23
Contributions to the global increase in the number of new smear-positive cases notified under DOTS made by high-burden countries, 2006–2007

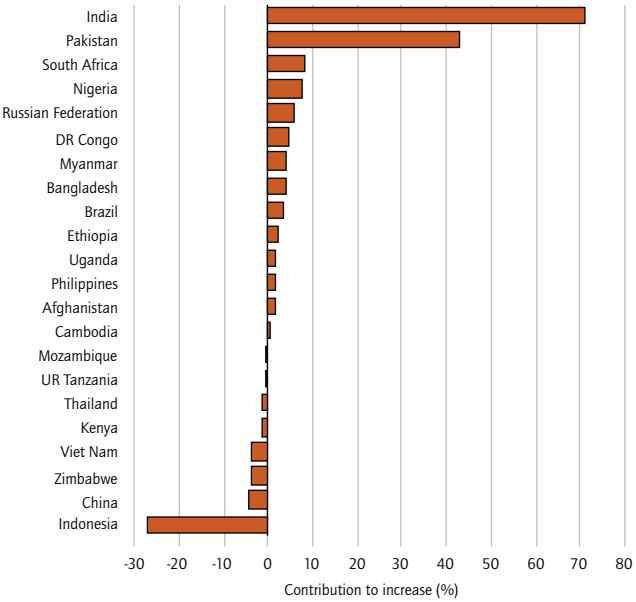


TABLE 1.7
Treatment outcomes for new smear-positive cases treated under DOTS, 2006 cohort

				TREATMENT OUTCOMES (%)[a]								
	NOTIFIED	REGISTERED[a]	REGST'D (%)	CURED	COMPLETED TREATMENT	DIED	FAILED	DEFAULTED	TRANS-FERRED	NOT EVAL'D	TREATMENT SUCCESS (%)	% EST[b] CASES SUCCESSFULLY TREATED UNDER DOTS
1 India	553 797	553 302	100	84	2.1	4.6	2.3	6.4	0.8	0.03	86†	55
2 China	468 291	470 436	100	92	1.7	1.5	0.8	0.6	2.9	0	94†	75
3 Indonesia	175 320	175 320	100	83	8.5	2.1	0.6	4.6	1.7	0	91†	67
4 Nigeria	39 903	39 903	100	65	11	5.8	1.9	10	2.2	3.6	76	16
5 South Africa	131 099	139 516	106	63	11	7.3	1.7	9.1	5.2	2.9	74	60
6 Bangladesh	101 967	101 761	100	91	0.8	3.2	0.5	2.0	1.5	0.6	92†	59
7 Ethiopia	36 674	36 674	100	69	15	4.8	0.5	4.5	5.1	1.0	84	23
8 Pakistan	65 253	65 589	101	75	13	2.8	0.6	6.2	2.4	0	88†	44
9 Philippines	85 740	85 797	100	80	7.9	2.3	1.0	3.9	2.4	2.0	88†	66
10 DR Congo	63 488	63 488	100	82	4.6	5.4	1.3	4.9	2.2	0	86†	51
11 Russian Federation	29 989	30 745	103	56	2.7	12	15	9.6	4.8	0	58	27
12 Viet Nam	56 437	56 470	100	90	2.3	2.6	1.0	1.6	2.1	0.7	92†	79
13 Kenya	39 154	39 154	100	73	12	4.5	0.3	7.3	2.7	0	85†	61
14 Brazil	32 463	34 818	107	33	39	4.2	0.1	8.3	3.3	12	72	50
15 UR Tanzania	24 724	24 724	100	80	4.5	7.9	0.2	3.2	4.0	0	85	42
16 Uganda	20 364	20 364	100	29	41	5.7	0.6	13	4.7	6.9	70	33
17 Zimbabwe	12 718	16 205	127	54	6.0	7.6	0.1	5.3	8.4	19	60	24
18 Thailand	29 081	28 856	99	71	6.3	8.2	1.8	5.8	2.9	4.0	77	57
19 Mozambique	18 275	18 275	100	82	1.1	10	0.9	4.5	1.9	0	83	40
20 Myanmar	40 241	40 350	100	77	7.3	5.5	3.2	5.0	1.9	0	84	94
21 Cambodia	19 294	19 349	100	90	3.1	3.0	0.3	1.6	1.6	0	93†	58
22 Afghanistan	12 468	12 468	100	80	4.9	2.1	1.1	2.1	5.6	4.6	84	53
High-burden countries	**2 056 740**	**2 073 564**	**101**	**81**	**5.6**	**3.9**	**1.5**	**4.6**	**2.4**	**0.9**	**87†**	**56**
AFR	555 361	562 884	101	65	10	6.2	1.2	7.7	4.1	5.3	75	36
AMR	114 680	116 925	102	55	20	4.4	0.9	6.3	3.2	10	75	55
EMR	131 820	132 001	100	75	11	2.8	1.0	6.1	2.7	1.2	86	45
EUR	100 102	94 266	94	61	9.3	8.4	8.9	7.2	3.2	2.3	70	35
SEAR	938 572	937 764	100	84	3.6	4.1	1.8	5.4	1.2	0.2	87†	59
WPR	662 273	663 261	100	89	3.1	2.1	0.9	1.4	2.8	1.1	92†	71
Global	**2 502 808**	**2 507 101**	**100**	**78**	**6.3**	**4.2**	**1.6**	**5.0**	**2.5**	**2.2**	**85**	**52**

† Treatment success ≥ 85% (treatment success for UR Tanzania 84.7%, global 84.5%).

[a] Cohort: cases diagnosed during 2006 and treated/followed-up through 2007. See TABLE A2.1 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.

[b] Est: estimated cases for 2006 (as opposed to notified or registered for treatment).

FIGURE 1.24
Smear-positive TB cases undetected by DOTS programmes in eight high-burden countries, 2007. Numbers indicate the percentage of all missed cases that were missed by each country.

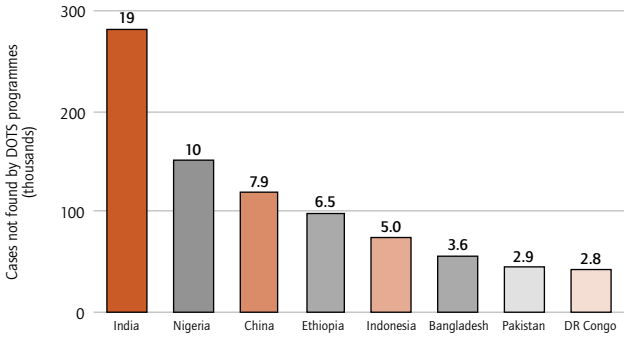


TABLE 1.8
Treatment success for new smear-positive cases treated under DOTS (%), 1994–2006 cohorts[a]

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1 India	83	79	79	82	84	82	84	85	87	86	86	86	86
2 China	94	96	96	96	97	96	95	96	93	94	94	94	94
3 Indonesia	94	91	81	54	58	50	87	86	86	87	90	91	91
4 Nigeria	65	49	32	73	73	75	79	79	79	78	73	75	76
5 South Africa	–	–	69	73	74	60	66	65	68	67	70	71	74
6 Bangladesh	73	71	72	78	80	81	83	84	84	85	90	91	92
7 Ethiopia	74	61	73	72	74	76	80	76	76	70	79	78	84
8 Pakistan	74	70	–	67	66	70	74	77	78	79	82	83	88
9 Philippines	80	–	82	83	84	87	88	88	88	88	87	89	88
10 DR Congo	71	80	48	64	70	69	78	77	78	83	85	85	86
11 Russian Federation	–	65	62	67	68	65	68	67	67	61	59	58	58
12 Viet Nam	91	91	90	85	93	92	92	93	92	92	93	92	92
13 Kenya	73	75	77	65	77	78	80	80	79	80	80	82	85
14 Brazil	–	–	–	–	91	89	73	67	75	83	81	77	72
15 UR Tanzania	80	73	76	77	76	78	78	81	80	81	81	82	85
16 Uganda	–	–	33	40	62	61	63	56	60	68	70	73	70
17 Zimbabwe	–	–	–	–	70	73	69	71	67	66	54	68	60
18 Thailand	–	–	78	62	68	77	69	75	74	73	74	75	77
19 Mozambique	67	39	54	67	–	71	75	78	78	76	77	79	83
20 Myanmar	–	66	79	82	82	81	82	81	81	81	84	84	84
21 Cambodia	84	91	94	91	95	93	91	92	92	93	91	93	93
22 Afghanistan	–	–	–	45	33	87	86	84	87	86	89	90	84
High-burden countries	**87**	**83**	**78**	**81**	**83**	**81**	**84**	**84**	**83**	**84**	**86**	**86**	**87**
AFR	59	62	57	63	70	69	72	71	73	73	74	76	75
AMR	76	78	83	82	81	83	81	82	83	83	82	78	75
EMR	82	87	86	79	77	83	83	83	84	83	83	83	86
EUR	68	69	72	72	76	77	77	75	76	75	74	71	70
SEAR	80	74	77	72	72	73	83	84	85	85	87	87	87
WPR	90	91	93	93	95	94	92	93	90	91	91	92	92
Global	**77**	**79**	**77**	**79**	**81**	**80**	**82**	**82**	**82**	**83**	**84**	**85**	**85**

– Indicates not available.
[a] See notes for TABLE 1.7.

Asia and Western Pacific regions, and in 59 countries (up from 57 the previous year) in total (ANNEX 3). Treatment success rates of 90% or more were reported in Bangladesh, Cambodia, China, Indonesia and Viet Nam.

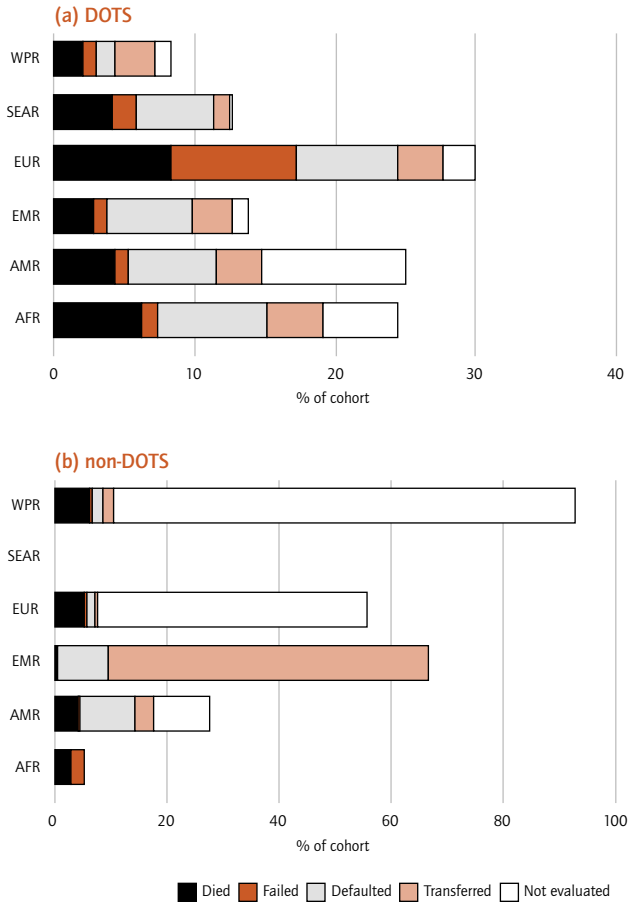
Treatment success rates in other regions in 2006 were 75% in the African Region, 86% in the Eastern Mediterranean Region (where the target was reached for the first time in 2006), 70% in the European Region (the lowest recorded since 1996) and 75% in the Region of the Americas (TABLE 1.7; TABLE 1.8). In the Region of the Americas, the treatment success rate has been worsening since 2002, related to the geographical expansion of DOTS to those parts of countries where health services are weaker. There was no evaluation of treatment outcome for 10% of patients in the region as a whole. Relatively low treatment success rates in the European Region are explained in large part by high rates of death and treatment failure in the Russian Federation, which are linked among other factors to drug resistance. Here, the treatment success rate was 58% in 2006, the lowest level since WHO began monitoring this indicator in 1995. Death and default rates remain high in the African Region, linked to high rates of HIV coinfection and weak health services: one or other of these indicators exceeded 10% in Mozambique, Nigeria and Uganda. However, Kenya achieved a treatment success rate of 85% in 2006 and the United Republic of Tanzania achieved a treatment success rate of 84.7%, indicating that it is possible to achieve the target of 85% in settings where a high proportion of patients are HIV-positive. Cure was not confirmed (by a final, negative sputum smear) for large numbers of patients in Brazil (39%), Ethiopia (15%), Nigeria (11%), Pakistan (13%), South Africa (11%) and Uganda (41%).

Variation in treatment outcomes among regions (TABLE 1.7; FIGURE 1.25) raises important questions about the quality of treatment, the quality of the data and how quickly these will improve in future.

1.6.2 Re-treatment cases

A total of 564 131 patients were re-treated in DOTS programmes in 2006 (TABLE 1.9), an increase from 531 228 patients in 2005. The re-treatment success rate in 2006 was 70%. As expected from the results of treating new patients, re-treatment success rates were lowest in the European

FIGURE 1.25
Outcomes for those patients not successfully treated in (a) DOTS and (b) non-DOTS areas, by WHO region, 2006 cohort



Region (42%) and highest in the Western Pacific Region (87%).

1.6.3 Comparison of treatment outcomes in HIV-positive and HIV-negative TB patients

Data on the outcomes of treatment for HIV-positive and HIV-negative TB patients were reported separately by between 31 and 55 countries, depending on the category of case (FIGURE 1.26; smear-negative and extrapulmonary cases are presented as one category, since separate analysis showed very similar treatment outcomes for these two types of case). These countries were mostly in the Region of the Americas and the European Region. There were few data for African countries (only for Ghana, Lesotho, Mauritania, Mauritius, Namibia and Zambia), even though Africa accounts for 79% of estimated HIV-positive cases. The data that were reported show lower treatment success rates among HIV-positive patients, due mainly to higher death rates and, to a lesser extent, higher default rates. A similar pattern existed for two regions that could be analysed separately (the Region of the Americas and the European Region; data not shown).

1.7 Progress towards reaching targets for case detection and treatment success

The global targets for both case detection (70%) and treatment success (85%) were achieved in 36 countries (up from 33 in 2005–2006) including four HBCs: China, Kenya, the Philippines and Viet Nam (FIGURE 1.27; FIGURE 1.28). Kenya is the first country in sub-Saharan Africa that is assessed to have achieved both targets, following new analysis of TB incidence and the case detection rate (BOX 1.2) and a treatment success rate that reached 85% for the first time in the 2006 cohort. Indonesia dropped out of the "target zone" (FIGURE 1.28) in 2007, possibly as a consequence of a temporary cessation of funding from a Global Fund grant delaying implementation of some programmatic activities.

The only region to have reached both targets is the Western Pacific Region, although the South-East Asia Region is very close. The Region of the Americas could achieve both targets if treatment outcomes could be improved by reducing the proportion of patients for whom treatment outcome is not evaluated. The African and European regions perform worst on both indicators.

Progress can also be directly compared with the expectations set out in the Global Plan (TABLE 1.10), which was designed to achieve the MDG, Stop TB Partnership and WHA targets set for 2015 (SECTION 1.1). The case detection rate for new smear-positive cases in DOTS programmes in 2007, at 63%, lags behind the milestone of 68% in the Global Plan. The detection of smear-negative and extrapulmonary cases also lags behind the Global Plan, and by a larger amount (51% estimated for 2007 compared with the Global Plan milestone of 69%). More positively, progress in the treatment success rate is ahead of the Global Plan, at 85% compared with 83%. In addition, the absolute number of smear-pos-

TABLE 1.9

Re-treatment outcomes for smear-positive cases treated under DOTS, 2006 cohort[a]

		TREATMENT OUTCOMES (%)							
	REGISTERED	CURED	COMPLETED TREATMENT	DIED	FAILED	DEFAULTED	TRANS-FERRED	NOT EVAL'D	TREATMENT SUCCESS (%)
1 India	259 130	45	26	7.1	4.2	15	1.7	0.02	72
2 China	78 146	85	4.7	2.3	2.2	1.2	5.1	0	89†
3 Indonesia	4 227	61	16	4.5	2.5	11	5.0	0	77
4 Nigeria	4 605	60	17	3.6	7.1	9.7	2.6	0	77
5 South Africa	43 225	56	10	5.1	9.0	12	3.5	3.5	67
6 Bangladesh	4 211	70	7.1	4.5	2.2	3.9	3.5	8.4	77
7 Ethiopia	2 846	54	16	8.0	2.1	4.3	4.9	11	69
8 Pakistan	5 566	59	18	4.2	3.1	11	4.2	0.2	77
9 Philippines	3 293	63	17	5.4	4.4	4.7	2.5	3.4	80
10 DR Congo	6 345	63	3.7	7.6	3.2	14	2.6	6.2	67
11 Russian Federation	17 109	33	4.7	14	26	14	7.7	0	38
12 Viet Nam	7 500	79	4.3	5.9	5.2	3.2	2.9	0.1	83
13 Kenya	3 945	71	7.8	7.1	0.9	8.3	4.7	0	79
14 Brazil	4 955	15	28	5.7	1.7	16	11	23	43
15 UR Tanzania	4 639	38	39	12	0.6	3.9	4.0	2.0	78
16 Uganda	1 357	33	43	8.4	1.0	10	4.3	0	76
17 Zimbabwe	929	54	3.0	17	0.5	6.7	6.6	12	57
18 Thailand	2 191	53	8.6	13	5.5	7.2	4.9	7.5	62
19 Mozambique	1 818	63	2.1	12	1.8	7.0	14	0	65
20 Myanmar	8 866	50	20	12	6.5	7.4	4.4	0	70
21 Cambodia	1 389	48	37	6.2	2.2	1.9	4.3	0	85†
22 Afghanistan	1 132	74	5	2.7	2.3	2.2	6.3	7.9	79
High-burden countries	**467 424**	**54**	**19**	**6.4**	**5.0**	**12**	**3.1**	**0.9**	**73**
AFR	98 957	49	17	6.9	5.4	11	4.5	6.3	66
AMR	12 282	37	18	6.1	2.7	14	5.9	16	55
EMR	14 039	58	18	4.0	3.3	11	4.7	1.6	76
EUR	51 866	34	7.4	14	19	12	5.4	7.7	42
SEAR	290 910	47	25	7.1	4.5	14	2.0	0.2	72
WPR	96 159	80	6.3	3.0	2.6	1.7	5.1	1.0	87†
Global	**564 213**	**52**	**18**	**6.9**	**5.6**	**11**	**3.4**	**2.5**	**70**

– Indicates not available.
† Treatment success ≥ 85%.
[a] See notes for TABLE 1.7.

FIGURE 1.26

Treatment outcomes for HIV-positive and HIV-negative TB patients, 2006 cohort. The numbers under the bars are the numbers of patients included in the cohort.

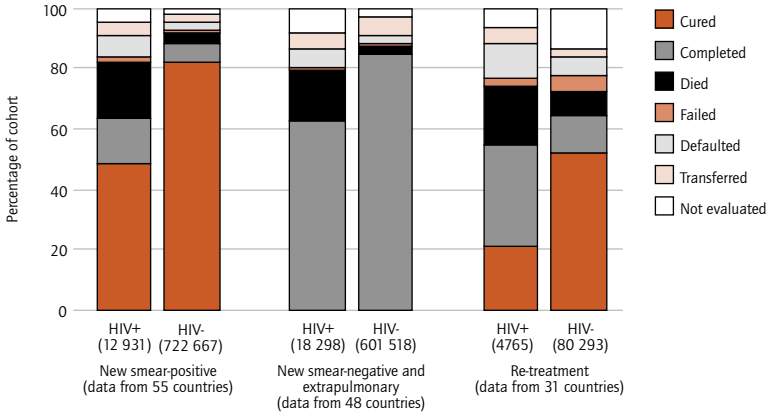


FIGURE 1.27

DOTS status in 2007, countries close to targets. 100 countries reported treatment success rates 70% or over and DOTS detection rates 50% or over. 36 countries (including 5 countries out of range of graph) have reached both targets; 2 in the African Region, 8 in the Region of the Americas, 6 in the Eastern Mediterranean Region, 6 in the European Region, 2 in the South-East Asia Region and 12 in the Western Pacific Region.

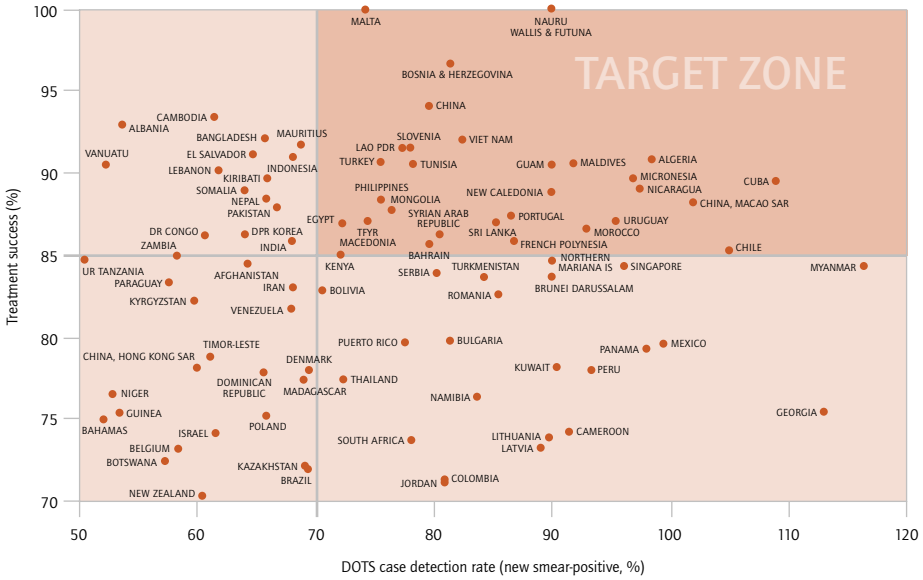
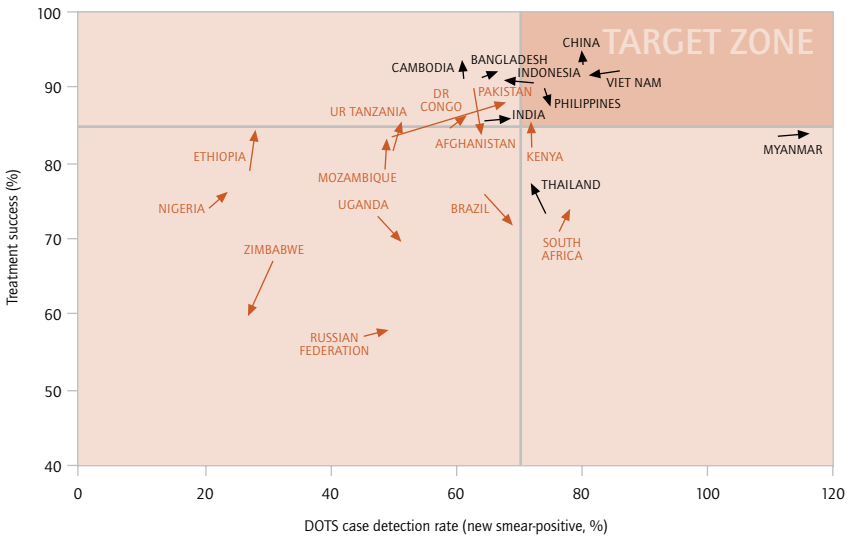


FIGURE 1.28

DOTS progress in high-burden countries, 2006–2007. Treatment success refers to cohorts of patients registered in 2005 or 2006, and evaluated, respectively, by the end of 2006 or 2007. 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, EMR and EUR are shown in red, those from SEAR and WPR are shown in black.



itive patients treated in DOTS programmes in 2007 (2.1 million) was higher than the number forecast in the Global Plan (1.8 million) because the estimated incidence of TB in 2007 was higher than anticipated by the Global Plan.

1.8 Summary

The latest estimates of the global burden of TB show that there were 9.27 million new cases of TB in 2007 (including 1.37 million cases among HIV-positive people), 1.32 million deaths from TB in HIV-negative people with an additional 0.46 million TB deaths in HIV-positive people, and 13.7 million prevalent cases (of which 687 000 were HIV-positive cases). There were 0.5 million cases of MDR-TB, of which 0.3 million were among people not previously treated for TB and 0.2 million were among previously treated TB cases. The estimates of cases and deaths in HIV-positive people in 2007 as well as in previous years are substantially higher than those published in previous years by WHO, and are based on new data that became available in 2008 and associated updates to analytical methods. The revised estimates suggest that TB cases and deaths from TB in HIV-positive people peaked in 2005, at 1.39 million and 0.48 million respectively. Collectively, these statistics show that TB remains a major global health problem.

The total number of global cases is still increasing in absolute terms as a result of population growth. Nonetheless, the number of incident cases per capita is falling globally, in five out of six WHO regions (the exception is Europe, where rates are approximately stable) and in seven out of nine epidemiological subregions (the exceptions are Eastern Europe and African countries with a low prevalence of HIV in the general population). If the global trend is confirmed by further monitoring, MDG Target 6.c will have been met by 2005 (following a peak in the incidence rate in 2004), well ahead of the target date of 2015. The more challenging targets of halving prevalence and death rates by 2015 compared with a baseline of 1990, set by the Stop TB Partnership, are unlikely to be achieved globally because of the

TABLE 1.10
DOTS expansion and enhancement in 2007: country reports compared with expectations given in the Global Plan

	COUNTRY REPORTS[a]	GLOBAL PLAN
	(MILLIONS OR PERCENTAGES)	
Number of new smear-positive cases notified under DOTS	2.5	2.2
Estimated number of new smear-positive cases	4.0	3.2
New smear-positive case detection rate under DOTS	63%	68%
Number of new smear-positive cases successfully treated under DOTS	2.1	1.8
Number of new smear-positive cases registered for treatment under DOTS	2.5	2.2
New smear-positive treatment success rate, 2006	85%	83%
Number of new smear-negative and extrapulmonary cases notified under DOTS	2.6	3.1
Estimated number of new smear-negative and extrapulmonary cases	5.1	4.5
New smear-negative and extra-pulmonary case detection rate under DOTS	51%	69%

[a] Includes only those countries in the Global Plan, i.e. countries in sub-regions Central Europe and Established Market Economies are excluded here.

enormous gap between rates in 2007 and the 2015 target in the African and European regions. However, three of six WHO regions are on track to meet both targets: these are the Eastern Mediterranean and South-East Asia regions, and the Region of the Americas. The Western Pacific Region is on track to achieve the prevalence target, but progress will have to accelerate from 2008 onwards, otherwise the mortality target may be narrowly missed. Implementation of recommendations for measuring progress towards the impact targets that have been made by the Global Task Force on TB Impact Measurement, including more in-depth analyses of the quality and coverage of existing surveillance data, surveys of the prevalence of TB disease in 21 global focus countries and strengthening of vital registration systems to improve the measurement of mortality, will considerably improve measurement of progress towards the impact targets as well as measurement of progress in TB control after 2015.

The WHA target of successfully treating 85% of new smear-positive patients was achieved at global level in 2006. It has also been achieved in three regions: in the Eastern Mediterranean Region (for the first time) and in the South-East Asia and Western Pacific regions, as well as in 59 countries (up from 57 the previous year). Treatment success rates remain well below the target in the other regions, especially the European Region.

With 5.2 million cases notified in DOTS programmes (99% of the total notified globally), of which 2.6 million (44%) were new smear-positive cases (also 99% of the total notified globally), the case detection rate for new smear-positive TB under DOTS was 63% in 2007, a very small increase from 62% in 2006. Much of the progress that did take place was in India and Pakistan, which in Pakistan was linked in particular to countrywide efforts to develop partnerships between the NTP and private providers. The percentage of estimated cases notified by DOTS and non-DOTS programmes combined was 64%. The slow rate of progress reinforces the observation in last year's report that progress in case detection has slowed since 2005 and that the WHA target of a case detection rate of at least 70%, originally set for 2000 and later reset to 2005, is still some way from being achieved. More positively, the Western Pacific Region and the Region of the Americas have achieved the target, as have 74 countries; at 69%, the South-East Asia Region is very close to doing so. The Western Pacific Region and 36 countries (up from 33 in 2006/7) appear to have achieved both the case detection and treatment success targets. Reaching the case detection target at global level requires greater efforts to detect and treat cases in all regions, using the range of interventions and approaches defined in the Stop TB Strategy that are discussed in the next chapter.

CHAPTER 2

Strategy

Two landmark documents in global TB control – the Stop TB Strategy[1] and the Global Plan to Stop TB[2] – were launched in 2006. The Stop TB Strategy, developed by WHO, sets out the interventions that need to be implemented to achieve the MDG, Stop TB Partnership and World Health Assembly targets discussed in CHAPTER 1. The Global Plan to Stop TB, developed by the Stop TB Partnership, sets out how, and at what scale, the strategy should be implemented over the decade 2006–2015 (see also CHAPTER 1). To monitor implementation of the strategy, WHO has asked countries to report on the implementation of TB control activities according to the strategy's major components and subcomponents (TABLE 2.1; TABLE 2.2) since 2007. In the 2008 round of data collection, countries were asked to report on activities implemented in 2007 and on activities planned for 2008 (see ANNEX 2 for further details about the data that were collected). In a few cases, projections for 2009 were also requested.

This chapter, structured in seven main sections, summarizes the major findings on global progress in implementing the Stop TB Strategy. Wherever possible, comparable data reported in previous years are also presented, to illustrate trends over time. The first section provides an overview of the completeness of reporting for each component of the Stop TB Strategy. The next six sections cover each of the six major components of the strategy in turn: pursue high-quality DOTS expansion and enhancement; address TB/HIV, MDR-TB, and the needs of poor and vulnerable populations; contribute to health system strengthening based on primary health care; engage all care providers; empower people with TB, and communities through partnership; and enable and promote research.[3] Further details about the implementation of all major components and subcomponents of the Stop TB Strategy are provided for each of the 22 HBCs in ANNEX 1.

TABLE 2.1
Components of the Stop TB Strategy

1. **Pursue high-quality DOTS expansion and enhancement**
   a. Secure political commitment, with adequate and sustained financing
   b. Ensure early case detection, and diagnosis through quality-assured bacteriology
   c. Provide standardized treatment with supervision, and patient support
   d. Ensure effective drug supply and management
   e. Monitor and evaluate performance and impact
2. **Address TB-HIV, MDR-TB, and the needs of poor and vulnerable populations**
   a. Scale up collaborative TB/HIV activities
   b. Scale up prevention and management of multidrug-resistant TB (MDR-TB)
   c. Address the needs of TB contacts, and of poor and vulnerable populations, including women, children, prisoners, refugees, migrants and ethnic minorities
3. **Contribute to health system strengthening based on primary health care**
   a. Help improve health policies, human resource development, financing, supplies, service delivery and information
   b. Strengthen infection control in health services, other congregate settings and households
   c. Upgrade laboratory networks, and implement the Practical Approach to Lung Health (PAL)
   d. Adapt successful approaches from other fields and sectors, and foster action on the social determinants of health
4. **Engage all care providers**
   a. Involve all public, voluntary, corporate and private providers through Public–Private Mix (PPM) approaches
   b. Promote use of the International Standards for TB Care (ISTC)
5. **Empower people with TB, and communities through partnership**
   a. Pursue advocacy, communication and social mobilization
   b. Foster community participation in TB care
   c. Promote use of the Patients' Charter for TB Care
6. **Enable and promote research**
   a. Conduct programme-based operational research, and introduce new tools into practice
   b. Advocate for and participate in research to develop new diagnostics, drugs and vaccines

TABLE 2.2
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 TABLE 2.7).

[1] *The Stop TB Strategy: building on and enhancing DOTS to meet the TB-related Millennium Development Goals*. Geneva, World Health Organization, 2006 (WHO/HTM/TB/2006.368).

[2] *The Global Plan to Stop TB, 2006–2015: actions for life towards a world free of tuberculosis*. Geneva, World Health Organization, 2006 (WHO/HTM/STB/2006.35).

[3] At the end of 2008, the wording used to describe the six components of the strategy was updated based on lessons learnt and feedback received. For the updated wording, see TABLE 2.1.

TABLE 2.3

Reporting on implementation of the Stop TB Strategy, 2007. Number of countries (out of 196 countries reporting) answering given percentage of questions on each sub-component of the strategy.

	COMPLETENESS OF REPORTING			
	<50%	50–75%	75–90%	>90%
1. DOTS expansion and enhancement				
Political commitment	4	15	0	177
Overview of services for diagnosis and treatment of TB	12	13	14	157
Laboratory diagnostic services	23	9	17	147
Drug management	14	16	166	0
Monitoring and evaluation, including impact measurement*	0	0	36	160
2. TB/HIV, MDR-TB and other challenges				
Collaborative TB/HIV activities				
Mechanisms for collaboration and policy development	17	6	17	156
HIV-testing for TB patients, provision of CPT and ART	55	33	14	92
Intensified TB case-finding and IPT for HIV-positive people	89	12	12	83
Treatment outcomes of HIV-positive TB patients	0	0	133	63
Management of MDR-TB				
Policy and stage of implementation	11	11	21	153
Diagnosis and treatment of MDR-TB	24	15	22	135
Treatment outcomes of MDR-TB patients	138	54	0	4
High-risk groups and special situations	21	15	19	141
3. Health system strengthening				
Health system stengthening and integration of TB control within primary health care	24	0	2	170
Practical Approach to Lung Health (PAL)	35	15	24	122
Human resource development	16	28	13	139
4. Engaging all care providers				
Public–Private and Public–Public Mix approaches (PPM)	77	118	0	1
International Standards for Tuberculosis Care	29	1	24	142
5. Empowering people with TB, and communities				
Advocacy, communication and social mobilization (ACSM)	16	3	24	153
Community participation in TB control	32	4	5	155
Patients' Charter for Tuberculosis Care	33	14	0	149
6. Enabling and promoting research				
Operational research	30	38	5	123
Research to develop new diagnostics, drugs and vaccines	28	4	6	158

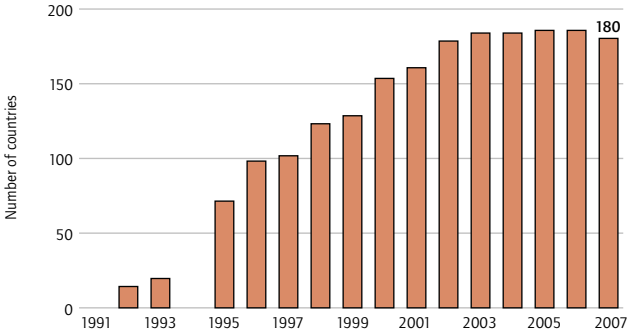
* include data on case notifications by type and age/sex and treatment outcomes.

2.1 Data reported to WHO in 2008

The data that were reported to WHO in 2008 are summarized in TABLE 2.3.[1] A total of 196 (out of 212) countries and territories (hereafter "countries") reported data; these countries collectively account for 99.6% of the world's estimated TB cases. Among countries which reported, at least 75% of the requested data were provided by 70–80% of countries for most sections of the data collection form. The topics for which reporting of data was much less complete were collaborative TB/HIV activities, treatment outcomes for patients with multidrug-resistant TB (MDR-TB), and public–public and public–private mix (PPM). For HBCs specifically, a similar pattern existed (data not shown).

FIGURE 2.1

Number of countries and territories implementing DOTS (out of a total of 212), 1991–2007



2.2 DOTS expansion and enhancement

2.2.1 DOTS coverage and numbers of patients treated

The total number of countries implementing DOTS increased steadily from 1995 to 2003, and has since remained stable at around 180 countries (FIGURE 2.1). All 22 HBCs have had DOTS programmes since 2000. DOTS coverage within

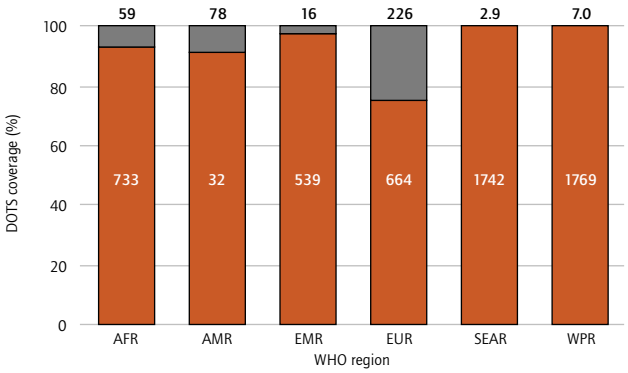
[1] The wording used in TABLE 2.3 is the wording used on the 2008 data collection form, which was distributed before the update to the wording of the Stop TB Strategy presented in TABLE 2.1.

TABLE 2.4
Progress in DOTS implementation, 1995–2007

	PERCENT OF POPULATION COVERED BY DOTS												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
1 India	1.5	2.0	2.3	9.0	14	30	45	52	67	84	91	100	100
2 China	49	60	64	64	64	68	68	78	91	96	100	100	100
3 Indonesia	6.0	14	28	80	90	98	98	98	98	98	98	98	100
4 Nigeria	47	30	40	45	45	47	55	55	60	65	65	75	91
5 South Africa	–	0	13	22	66	77	77	98	100	93	94	100	100
6 Bangladesh	41	65	80	90	90	92	95	95	99	99	99	100	100
7 Ethiopia	39	39	48	64	63	85	70	95	95	70	90	100	95
8 Pakistan	2.0	8.0	–	8.0	8.0	9.0	24	44	66	79	100	100	99
9 Philippines	4.3	2.0	15	17	43	90	95	98	100	100	100	100	100
10 DR Congo	47	51	60	60	62	70	70	70	75	75	100	100	100
11 Russian Federation	–	2.3	2.3	5.0	5.0	12	16	25	25	45	83	84	100
12 Viet Nam	50	95	93	96	99	100	100	100	100	100	100	100	100
13 Kenya	15	100	100	100	100	100	100	100	100	100	100	100	100
14 Brazil	–	0	0	3.0	7.0	7.0	32	25	34	52	68	86	75
15 UR Tanzania	98	100	100	100	100	100	100	100	100	100	100	100	100
16 Uganda	–	0	100	100	100	100	100	100	100	100	100	100	100
17 Zimbabwe	–	0	0	100	12	100	100	100	100	100	100	100	100
18 Thailand	–	1.1	4.0	32	59	70	82	100	100	100	100	100	100
19 Mozambique	97	100	84	95	–	100	100	100	100	100	100	100	100
20 Myanmar	–	59	60	60	64	77	84	88	95	95	95	95	95
21 Cambodia	60	80	88	100	100	99	100	100	100	100	100	100	100
22 Afghanistan	–	–	12	11	14	15	12	38	53	68	81	97	97
High-burden countries	**24**	**32**	**36**	**43**	**45**	**55**	**61**	**68**	**79**	**87**	**94**	**98**	**98**
AFR	43	46	56	61	56	71	70	81	85	83	88	92	93
AMR	12	48	50	55	65	68	73	73	78	83	88	93	91
EMR	16	12	18	33	51	65	71	77	87	90	97	98	97
EUR	5.4	8.2	17	22	23	26	31	39	41	46	59	67	75
SEAR	6.7	12	16	29	36	49	60	66	77	89	93	100	100
WPR	43	55	57	58	57	67	68	77	90	94	98	100	100
Global	**22**	**32**	**37**	**43**	**47**	**57**	**62**	**69**	**77**	**83**	**89**	**93**	**94**

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

FIGURE 2.2
DOTS coverage by WHO region, 2007. The red portion of each bar shows DOTS coverage as a percent of the population. The numbers in each bar show the population (in millions) within (red portion) or outside (grey portion) DOTS areas.



countries has also increased since 1995 (TABLE 2.4). By the end of 2007, 94% of the world's population lived in countries that had adopted DOTS, and population coverage was reported to exceed 90% in all regions except Europe (FIGURE 2.2). However, 100% DOTS coverage does not mean that all providers in a country are implementing the DOTS strategy (see also SECTION 2.5).

As reported in greater detail in CHAPTER 1, 5.5 million new and relapse cases of TB were notified by DOTS programmes in 2007, of which 2.6 million (47%) were new sputum smear-positive cases. These numbers represented 98.5% and 99.1% of total TB case notifications (that is, notifications from DOTS and non-DOTS programmes combined), respectively. The percentage of all estimated new cases of smear-positive TB detected by DOTS programmes – the case detection rate – was 63% globally in 2007; the case detection rate for all cases was 56%. A cumulative total of 37.3 million new and relapse cases have been treated in DOTS programmes in the 13 years from 1995 (when reliable records began) to 2007. Globally, the treatment success rate was 85% in the 2006 cohort. The Western Pacific Region has

achieved both global targets related to DOTS implementation (a case detection rate of 70% and a treatment success rate of 85%), and the South-East Asia Region and the Region of the Americas are close to doing so. The other three regions (African, European and Eastern Mediterranean regions) are much further from achieving these targets. This short summary of the data that are presented in much greater detail in CHAPTER 1 provides a context for the information provided in the rest of this chapter.

2.2.2 Political commitment

Scaling up implementation of all components of the Stop TB Strategy while maintaining strong basic DOTS services requires sustained political commitment. Indicators of political commitment include the existence of a national strategic plan for TB control and the percentage of total funding required for TB control that is funded from domestic sources.

A total of 155 countries (84% of those reporting), including all HBCs, had a national strategic plan for TB control, including all countries in the African, Eastern Mediterranean and South East Asia regions that reported data. Domestic funding between 2002 and 2009 has increased in absolute terms in almost all of the HBCs; examples of countries with particularly large increases are Brazil, China, Indonesia, Mozambique, Nigeria and the Russian Federation. However, as a percentage of total funding for TB control, domestic funding has been relatively stable or has fallen in all of the 20 HBCs for which an assessment can be made (there are insufficient data for South Africa and Thailand). Additional information about national plans and financial indicators in HBCs are included in ANNEX 1. Further details about financing for TB control in all countries are provided in CHAPTER 3 and ANNEX 3.

2.2.3 Early case detection through quality-assured bacteriology

Sputum smear microscopy is the primary tool for diagnosis of TB in most countries. Among reporting countries, 83% (136/164) used sputum smear microscopy for all individuals with suspected pulmonary TB in all diagnostic sites in 2007.

TABLE 2.5
Stock-outs of laboratory reagents and of first-line anti-TB drugs, 2007

	LABORATORY REAGENTS AND SUPPLIES		FIRST-LINE ANTI-TB DRUGS	
	CENTRAL	PERIPHERAL	CENTRAL	PERIPHERAL
1 India	N	Some units	N	N
2 China	N	N	N	Some units
3 Indonesia	Not applicable	Some units	N	N
4 Nigeria	N	N	Y	Some units
5 South Africa	N	N	Y	N
6 Bangladesh	–	–	N	N
7 Ethiopia	N	Some units	Y	Some units
8 Pakistan	N	Some units	N	N
9 Philippines	N	N	Y	Some units
10 DR Congo	N	N	Y	Some units
11 Russian Federation	N	N	–	–
12 Viet Nam	Y	–	Y	Y
13 Kenya	N	N	N	N
14 Brazil	N	N	N	N
15 UR Tanzania	N	N	N	N
16 Uganda	N	Some units	Y	Some units
17 Zimbabwe	Y	Some units	Y	Some units
18 Thailand	N	N	N	N
19 Mozambique	Y	Some units	N	Some units
20 Myanmar	N	N	N	N
21 Cambodia	N	N	N	N
22 Afghanistan	N	N	Y	N
High-burden countries[a]	**3/21**	**7/22**	**9/20**	**9/22**
AFR (46)[b]	10/37	16/36	13/36	15/36
AMR (44)	6/38	6/39	3/34	5/36
EMR (22)	2/22	3/22	3/22	2/22
EUR (53)	4/41	10/40	3/41	6/40
SEAR (11)	0/10	3/11	0/10	0/11
WPR (36)	5/32	5/32	10/31	7/31
Global (212)	**27/180**	**43/180**	**32/174**	**35/176**

– Indicates information not provided.

[a] In the lower part of the table the numerator of each fraction is the number of countries reporting stock-outs; the denominator is the number of countries providing information.

[b] The number of countries in each region is shown in parentheses.

TABLE 2.6
Coverage of laboratory services, high-burden countries, 2007

			ACCESS TO DIAGNOSTIC SERVICES						LABORATORIES INCLUDED IN EXTERNAL QUALITY ASSURANCE (EQA) FOR SPUTUM SMEAR MICROSCOPY	
			SPUTUM SMEAR		CULTURE		DST			
	POPULATION THOUSANDS	NATIONAL REFERENCE LABORATORY (NRL)[a]	NUMBER OF LABS	PER 100 000 POP	NUMBER OF LABS	PER 5 MILLION POP[b]	NUMBER OF LABS	PER 10 MILLION POP[b]	NUMBER	%
1 *India*	1 169 016	Y	12 184	1.0	*11*	*0.05*	*11*	*0.1*	11 386	93
2 *China*	1 328 630	Y	3 294	0.2	*327*	*1.2*	*187*	*1.4*	3 294	100
3 *Indonesia*	231 627	N	4 855	2.1	*41*	*0.9*	*11*	*0.5*	4 855	100
4 *Nigeria*	148 093	Y	794	0.5	*2*	*0.1*	*1*	*0.1*	347	44
5 South Africa	48 577	Y	249	0.5	15	1.5	10	2.1	241	97
6 *Bangladesh*	158 665	Y	753	0.5	*4*	*0.1*	*2*	*0.1*	753	100
7 Ethiopia	83 099	Y	833	1.0	1	0.1	1	0.1	–	–
8 *Pakistan*	163 902	N	1 131	0.7	*3*	*0.1*	*1*	*0.1*	360	32
9 *Philippines*	87 960	Y	2 374	2.7	*3*	*0.2*	*3*	*0.3*	2 374	100
10 DR Congo	62 636	Y	1 205	1.9	1	0.1	1	0.2	1 023	85
11 *Russian Federation*	142 499	Y	4 048	2.8	*965*	*34*	*280*	*20*	–	–
12 Viet Nam	87 375	Y	737	0.8	17	1.0	2	0.2	–	–
13 Kenya	37 538	Y	930	2.5	5	0.7	1	0.3	37	4.0
14 *Brazil*	191 791	Y	4 044	2.1	*193*	*5.0*	*38*	*2.0*	1 819	45
15 UR Tanzania	40 454	Y	717	1.8	3	0.4	1	0.2	–	–
16 Uganda	30 884	Y	716	2.3	3	0.5	2	0.6	716	100
17 Zimbabwe	13 349	Y	180	1.3	1	0.4	1	0.7	0	0
18 Thailand	63 884	Y	1 023	1.6	65	5.1	14	2.2	1 023	100
19 Mozambique	21 397	Y	252	1.2	1	0.2	1	0.5	252	100
20 Myanmar	48 798	Y	324	0.7	2	0.2	1	0.2	54	17
21 Cambodia	14 444	Y	201	1.4	3	1.0	1	0.7	186	93
22 Afghanistan	27 145	Y	500	1.8	1	0.2	–	–	360	72
High-burden countries (22)	**4 201 761**	**20**	**41 344**	**1.0**	**1 667**	**2.0**	**570**	**1.4**	**29 080**	**70**
AFR	765 283	34	8 547	1.1	110	0.7	45	0.6	4 466	52
AMR	599 140	29	13 874	2.3	1 487	12	111	1.9	9 040	65
EMR	555 064	18	4 094	0.7	162	1.5	36	0.6	2 158	53
EUR	611 415	43	6 744	1.1	2 216	18	762	12	284	4.2
SEAR	1 745 394	10	20 090	1.2	129	0.4	43	0.2	18 372	91
WPR	1 621 633	27	7 341	0.5	459	1.4	224	1.4	6 262	85
Global	**5 897 929**	**161**	**60 690**	**1.0**	**4 563**	**3.9**	**1 221**	**2.1**	**40 582**	**67**

– Indicates information not provided; labs, laboratories; pop, population.

[a] In the lower part of the table the number of countries answering "yes" to this question is shown.

[b] 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 (*country name and numbers shown in italics*), one laboratory for culture and DST in each major administrative area (e.g. province) may be sufficient. See also note in country profiles (ANNEX 1).

This included 17 of the 22 HBCs. In Mozambique, South Africa and Zimbabwe, only some patients were screened by microscopy; no data were reported by Viet Nam. Laboratory supplies for microscopy were also generally reported to be adequate. Among all countries, 15% (27/180) reported stock-outs at the central level and 24% (43/180) reported stock-outs at the peripheral level (TABLE 2.5). Three HBCs (Mozambique, Viet Nam and Zimbabwe) reported stock-outs at the central level (Bangladesh did not provide any data). Seven HBCs reported stock-outs at the peripheral level in some units, while Bangladesh and Viet Nam did not report data (TABLE 2.5).

The average number of microscopy laboratories exceeds the target of at least 1 per 100 000 population in four regions (TABLE 2.6). The average number in the Western Pacific Region is 0.5 per 100 000 population, reflecting a comparatively low number of laboratories relative to population size in the largest country in the region (China). Besides China, other HBCs with a relatively low number of microscopy laboratories per 100 000 population include Bangladesh, Myanmar, Nigeria and Pakistan. External quality assurance (EQA) was conducted for a high proportion of laboratories in the South-East Asia and Western Pacific regions (91% and 85% respectively), with much lower figures in other regions. Among the HBCs, coverage of EQA was reported as 100% in seven countries: Bangladesh, China, Indonesia, the Philippines, Uganda, Mozambique and Thailand.

Laboratories with the capacity to provide culture and DST services are essential for diagnosis of drug-resistant TB; culture services are also important for diagnosis of smear-negative TB, especially in settings where the prevalence of

HIV is high. However, capacity to perform culture and DST was seriously limited in most HBCs in 2007 (TABLE 2.6). Only seven HBCs (Brazil, Cambodia, China, the Russian Federation, South Africa, Thailand and Viet Nam) had at least one culture laboratory per 5 million population (the currently recommended level); for more than half of the HBCs, the figure was below 0.5. The Russian Federation is exceptional, with 34 culture laboratories per 5 million population. Four regions have more than one culture laboratory per 5 million population, but the distribution of laboratories among countries in these regions is uneven. A similar pattern exists for DST. Only five HBCs reported having at least 1 laboratory with DST capacity per 10 million population (the currently recommended level): Brazil, China, the Russian Federation (20 per 10 million population), South Africa and Thailand. Among the remaining HBCs, most had less than 1 laboratory with DST capacity per 20 million population.

While 94% of all countries that reported data (161/171) indicated that a national reference laboratory (NRL) was available (TABLE 2.6), the functionality and/or performance of these laboratories is mostly unknown. Two HBCs (Indonesia and Pakistan) indicated that no NRL was available, although all had plans to establish one within the next 1–2 years.

Most laboratories with capacity to test for drug susceptibility, including many NRLs, are able only to provide DST of first-line drugs. The emergence of extensively drug-resistant TB (XDR-TB) in an increasing number of countries globally highlights the importance of access to DST of second-line drugs. These services were available to 63 of 142 reporting countries (44%) in 2007, either within or outside the country; however, their quality is unclear, and only nine HBCs had access to second-line DST. In Africa, very few countries apart from South Africa have any capacity (or access to capacity) to diagnose MDR-TB and XDR-TB.

In response to the need to increase the availability of quality-assured culture and DST services including second-line DST, the supranational reference laboratory network (SRLN) is being expanded. Currently, there are 26 SRLs: two in the African Region, five in the Region of the Americas, 11 in the European Region, one in the Eastern Mediterranean Region, two in the South-East Asian Region and five in the Western Pacific Region (FIGURE 2.3). All regions have plans to expand these networks, and in some regions a formalized evaluation and accreditation process is being developed.

Notwithstanding the expansion of the SRLN, the general shortage of laboratory capacity to provide culture and DST based on conventional technologies demonstrates the need for rapid introduction of new diagnostic tools. In order to facilitate the development of policy to guide the implementation of new diagnostic tools, WHO has established a structured process for evaluating and translating research findings into policy and practice (the latest WHO policy on TB diagnosis is summarized in BOX 2.1).[1] Such policy guidance needs

[1] Moving research findings into new WHO policies. Geneva, World Health Organization, 2008 (available at http://www.who.int/tb/dots/laboratory/policy/en/index4.html; accessed January 2009).

BOX 2.1

Recent WHO policy changes in diagnosis of TB

1. WHO policy on smear microscopy and case detection

With the prerequisite of a functional external microscopy quality assurance (EQA) system, with blinded rechecking, the new definition of a smear-positive TB case is "a patient with one or more initial sputum smear examinations positive for acid fast bacilli (AFB)". Further information including evidence for this policy can be found at: http://www.who.int/tb/dots/laboratory/policy/en/index1.html

2. WHO policy on the use of liquid medium for culture and drug susceptibility testing (DST) in middle-income and low-income countries

WHO recommends the use of commercial liquid systems (the standard of care for TB diagnosis and patient management in developed countries) for culture and DST in middle-income and low-income countries, within the context of national laboratory strengthening plans and using a phased approach to implementation at the country level. Further information including prerequisites for the phased introduction of this technology can be found at: http://www.who.int/tb/dots/laboratory/policy/en/index3.html

3. WHO policy on the use of molecular line probe assays

WHO recommends the use of molecular line probe assays for the rapid detection of MDR-TB cases, within the context of national laboratory strengthening plans and using a phased approach to implementation at the country level. Further information including prerequisites for the phased introduction of this technology can be found at: http://www.who.int/tb/publications/2008/who_htm_tb_2008_392.pdf

4. WHO policy recommendations on DST of second-line anti-TB drugs

An Expert Group convened by WHO in 2007 reviewed current evidence and re-confirmed that the laboratory diagnosis of MDR-TB and XDR-TB under good laboratory practice is reliable and reproducible. In addition, this consultative process culminated in an interim policy guidance document summarizing available evidence on the second-line DST methods, and providing recommendations for which drugs to test as well as the critical concentrations. The document also provides programmatic advice on designing diagnostic algorithms, required laboratory capacity and safety requirements. The Expert Group also developed a detailed outline for the update of the 2001 technical guidelines for DST of second-line drugs, incorporating the newer technologies. A writing committee was established with the aim of releasing the updated guidelines by the middle of 2009. *Policy guidance on drug-susceptibility testing (DST) of second-line antituberculosis drugs* can be found at: http://www.who.int/tb/publications/2008/who_htm_tb_2008_392.pdf

FIGURE 2.3
Tuberculosis supranational reference laboratory network, 2007

BOX 2.2

The Global Laboratory Initiative (GLI)

The GLI is part of the Stop TB Partnership, with a secretariat housed in WHO. Its major objectives include providing global standards for laboratory services, promoting quality assurance and adequate laboratory biosafety, accelerating human resource development for laboratory activities, and facilitating partnerships that will enable the establishment or expansion of laboratory services capable of absorbing new technologies. A current example is a GLI project that aims to accelerate access to new diagnostic tools for MDR-TB that have recently been endorsed by WHO. The project is being implemented in 16 of the high MDR-TB burden countries (for definition of these countries see TABLE 2.10), in close collaboration with the Foundation for Innovative New Diagnostics and the Global Drug Facility, with funding from UNITAID.

to be followed by implementation (a process referred to as "retooling"; see also SECTION 2.7).[1] Most regions have introduced one or more new tools (for example, liquid culture and DST, endorsed by WHO in 2007; and molecular line probe assays, endorsed by WHO in 2008). Ongoing monitoring will be used to assess the uptake of these tools and their impact on diagnosis and treatment outcomes.

In most resource-constrained countries, uptake of new tools requires considerable strengthening of laboratory infrastructure, deployment of additional human resources and funding for the purchase of new technologies. To help to address these challenges, the Global Laboratory Initiative (GLI) was established in 2007 (BOX 2.2).

2.2.4 Standardized treatment with supervision, and patient support

In 2007, all of the 146 countries reporting data, including all HBCs, provided treatment with standardized short-course chemotherapy (SCC). There were 105 countries using the six-month Category I regimen and 23 countries using an eight-month regimen that does not include rifampicin in the continuation phase of treatment. The remaining 18 countries did not specify the regimen that was being used. Of the HBCs, four use an eight-month regimen (Ethiopia, Nigeria, Pakistan and Uganda), of which two (Pakistan and Nigeria) plan to switch to the six-month regimen in 2009. Of the 35

[1] *Moving research findings into new WHO policies.* Geneva, World Health Organization, 2008 (available at http://www.who.int/tb/dots/laboratory/policy/en/index4.html; accessed January 2009).

countries that reported using regimens based on intermittent treatment, 18 use thrice-weekly treatment in the continuation phase only, five use a thrice-weekly regimen throughout treatment and five use a twice-weekly regimen in the continuation phase; seven countries did not state what kind of intermittent regimen was used. Fixed-dose combinations (FDCs) of two, three or four drugs were being used by 75 countries during the two-month intensive phase of treatment, while 61 countries were using two-drug FDCs in the continuation phase of treatment. Among 167 reporting countries, 79 (including 13 HBCs) purchased paediatric formulations of anti-TB drugs.

Health-care workers are the main providers of directly observed therapy (DOT) during the initial phase of treatment in 86% (150/174) of reporting countries, with a community or family member being the main provider in the remaining countries. In 63% (109/173) of reporting countries, health-care workers are also the main providers of DOT in the continuation phase of treatment. Among HBCs, DOT was provided in some units and/or for some patients only in Thailand, for some patients in all units in Myanmar, and for some units only in Uganda and Zimbabwe.

In almost all reporting countries (90%, 166/180), including all HBCs, anti-TB drugs are provided free of charge to all patients being treated with the Category I regimen under DOTS. Patient support to encourage adherence to treatment was reported mainly by countries in the European Region; examples included incentives and enablers such as food parcels and tickets for public transport, and provision of psychological counselling.

2.2.5 Drug supply and management system

Most countries (82%, 142/174) reported an uninterrupted supply of first-line TB drugs at the central level; the figure was similar (80%, 141/176) for the peripheral level (TABLE 2.5). Stock-outs at both central and peripheral levels were most frequent in the African Region, and included stock-outs at the peripheral level in six of the region's nine HBCs. Notably, no stock-outs were reported by countries in the South-East Asia Region.

The continuing occurrence of stock-outs demonstrates the need for better planning of procurement, monitoring of drug supplies and distribution capacity. More timely ordering of drugs by principal recipients of Global Fund grants and closer coordination between principal recipients and NTPs would also help in some countries.

Fewer countries reported data about the availability of second-line anti-TB drugs. Shortages at the central level occurred in 15% of reporting countries (25/168); the figure at peripheral level was slightly lower (11%, 18/162). Shortages occurred mostly in the Region of the Americas (seven countries), the African Region (five countries) and the European Region (seven countries). Among HBCs, only the Democratic Republic of the Congo reported shortages of second-line drugs.

At the global level, the Stop TB Partnership's Global Drug Facility (GDF) and Green Light Committee (GLC) are contributing to strengthened drug supply and drug management systems.[1] By the end of 2008, the GDF had provided first-line anti-TB drugs to 89 countries and the GLC has approved the use of second-line drugs in 134 projects in 60 countries (see also SECTION 2.3.2). Funding from UNITAID is also allowing the development of stockpiles of anti-TB drugs and the establishment of a strategic revolving fund to provide lines of credit for the purchase of second-line drugs. Grants from UNITAID have already supported the supply of quality-assured paediatric formulations to more than 50 countries. Additional first-line anti-TB drugs were prequalified by WHO in 2008, and more dossiers for prequalification were submitted for second-line drugs and paediatric formulations of first-line drugs. Besides supplying drugs, the GDF has also given priority to building capacity in drug procurement and management, for example through country missions and workshops. With the expansion of the TB Technical Assistance Mechanism known as TBTEAM (BOX 2.3), it is anticipated that technical assistance for drug management as well as many other components of TB control will be increased.

BOX 2.3

Providing technical assistance for TB control: the role of TBTEAM

The TB Technical Assistance Mechanism, known as TBTEAM, was established by the Stop TB Partnership in 2007. TBTEAM is designed to facilitate access to high-quality, well-coordinated technical assistance, which is widely recognized as being needed to fully implement the Stop TB Strategy and the Global Plan. TBTEAM has developed a roster of experts, tools for tracking missions and training opportunities around the world, as well as a directory of technical partners. Requests for technical assistance can be sent to the TBTEAM secretariat based in WHO headquarters, either directly or via channels such as WHO country offices and TBTEAM focal points at regional and country levels.

By the end of 2008, 839 missions and events had been recorded in the TBTEAM database, and 60 of the 81 requests for technical assistance had been responded to successfully. TBTEAM has also provided financial support for 140 country missions.

A recent external assessment of TBTEAM acknowledged the service provided by TBTEAM to countries in need of technical assistance as well as its efforts to provide funding for such assistance. This assessment has also provided guidance related to the future direction of TBTEAM, including how to best engage all partners. A plan to implement the recommendations of the external assessment is being developed following broad agreement with these recommendations during a meeting of TBTEAM partners in October 2008.

Further details about TBTEAM are available at: http://www.stoptb.org/wg/tbteam

2.2.6 Monitoring and evaluation

Routine monitoring of TB control is crucial to understand trends in the TB epidemic and progress in TB control. Col-

[1] Information about the work of the GDF, the GLC and UNITAID was provided by their secretariats rather than through the annual data collection form.

TABLE 2.7
TB data management and recording and reporting systems, 2007

	DATA FOR INDIVIDUAL TB PATIENTS ACCESSIBLE AT NTP CENTRAL OFFICE	TB DATA STORED IN A RELATIONAL DATABASE MANAGEMENT SYSTEM[a]		TB DATA FROM ALL THE BASIC MANAGEMENT UNITS RECEIVED BY CENTRAL NTP OFFICE		NTP PRODUCES ANNUAL REPORT
		STAND-ALONE	WEB-BASED	CASE-FINDING, 2007	TREATMENT OUTCOMES, 2006	
1 India	N	N	N	Y	Y	Y
2 China	Y	–	Y	Y	Y	Y
3 Indonesia	N	N	N	N	N	Y
4 Nigeria	N	N	N	Y	Y	Y
5 South Africa	N	–	Y	Y	Y	N
6 Bangladesh	N	Y	–	Y	Y	Y
7 Ethiopia	N	N	N	–	–	Y
8 Pakistan	N	–	Y	–	–	Y
9 Philippines	N	N	N	–	–	Y
10 DR Congo	N	N	N	Y	Y	N
11 Russian Federation	Y	Y	–	Y	N	Y
12 Viet Nam	–	–	–	–	–	–
13 Kenya	N	N	N	Y	Y	Y
14 Brazil	Y	–	Y	Y	Y	N
15 UR Tanzania	Y	Y	–	Y	Y	Y
16 Uganda	N	N	N	N	N	Y
17 Zimbabwe	N	N	N	N	N	Y
18 Thailand	N	N	N	N	N	Y
19 Mozambique	N	N	N	Y	Y	Y
20 Myanmar	N	Y	–	N	N	Y
21 Cambodia	Y	–	–	Y	Y	Y
22 Afghanistan	N	Y	–	Y	Y	Y
High-burden countries[b]	**5/21**	**5/21**	**4/21**	**13/19**	**12/19**	**18/21**
AFR (46)c	9/37	10/37	2/37	22/35	22/33	29/37
AMR (44)	23/38	7/38	4/38	20/31	20/30	24/38
EMR (22)	13/22	10/22	4/22	17/22	16/22	18/22
EUR (53)	40/43	19/42	8/42	29/35	27/35	27/41
SEAR (11)	2/11	4/11	0/11	7/11	7/11	9/11
WPR (36)	28/33	12/31	5/31	21/28	21/28	20/31
Global (212)	**115/184**	**62/181**	**23/181**	**116/162**	**113/159**	**127/180**

– Indicates information not provided or not applicable.

[a] A relational database management system (RDBMS) is an application or system that allows users to store and easily access a large amount of data. It is usually accessible to several people at the same time and allows users to enter/upload and edit/update the data. It also allows users to produce standard and/or customized analyses and reports.

[b] In the lower part of the table the numerator of each fraction is the number of countries providing an affirmative answer (i.e. yes); the denominator is the number of countries providing information.

[c] The number of countries in each region is shown in parentheses.

lection of data on key indicators allows documentation of achievements, identification of challenges, better estimation of the epidemiological burden of TB and informed planning. Monitoring is most informative when there are clear targets or benchmarks of good performance for the indicators on which data are collected, when data management practices ensure that data are complete, accurate and reported on time, when data are analysed using appropriate methods and when data are used to inform the design and implementation of interventions to control TB.

In 2007, 63% (115/184) of NTPs had access to data for individual patients (as opposed to aggregated data for cohorts of patients) at the central office (TABLE 2.7). This included five HBCs (Brazil, Cambodia, China, the Russian Federation and the United Republic of Tanzania), and a particularly high proportion of countries in the European and Western Pacific regions (93% and 85% of reporting countries, respectively). In the remaining countries, data at the central office were received from lower administrative levels in an aggregated format. Among these countries, around 20% could not confirm whether or not data about case notifications and treatment outcomes had been reported by all management units (for example, all districts). About 30% of the remaining countries with aggregated data reported that some data were missing. This highlights the need for greater efforts to ensure complete reporting of data, and for better monitoring of the completeness of reporting at the central level (see also SECTION 1.3 in CHAPTER 1).

Many countries produce an annual report, including 71% of the 180 reporting countries and almost all countries in the Eastern Mediterranean and South-East Asia regions (TABLE 2.7).

The optimum system for managing data is a relational database management system (RDBMS). This allows a large amount of data to be entered or uploaded, validated, stored, edited and updated, with access by multiple users. It also allows the production of standard and customized analyses and reports. To date, however, the use of such systems is relatively limited. Less than 50% of countries have an RDBMS, with around one quarter of these being web-based systems (including four HBCs – Brazil, China, Pakistan and South Africa). Some of these systems were customized for a particular country.[1] Other countries use spreadsheet-based systems (e.g. Excel) to hold and analyse their data. Management and analysis of data is much more difficult as well as time-consuming in such systems, and as a result data can be lost or errors introduced.

More countries need to introduce an RDBMS to improve data quality and to facilitate management, analysis, presentation and use of data. Existing options include OpenMRS (Open Medical Records System), DHIS (District Health Information System) or ENRS (Electronic National Record System), which are all open-access and generic software.[2] While generic, these systems can be adapted to the needs of particular countries and are supported by a global community of developers and implementers. A recent example of the successful introduction of an open-source RDBMS is provided in BOX 2.4.

Besides routine recording and reporting of data, evaluation of trends in incidence, prevalence and mortality (impact measurement) requires in-depth analysis of surveillance data (case notifications and mortality data from vital registration systems) and programmatic data, combined with periodic surveys of the prevalence of TB disease in some countries. The latest WHO estimates of trends in incidence, prevalence and mortality, recent recommendations about how impact measurement should be done and the latest data on progress at country level are provided in CHAPTER 1.

BOX 2.4

Introducing District Health Information Software (DHIS) in Myanmar

DHIS is a flexible, open-source (free-of-charge) software that was developed in 1994 to facilitate collection, transmission, storage, analysis, presentation and use of the health information systems programme (HISP; www.hisp.org). It was piloted in several countries in Africa and Asia including Ethiopia, India, Malawi, Mozambique, Nigeria, Myanmar, South Africa, the United Republic of Tanzania and Viet Nam. Given the dynamic nature of data management, the software is designed to be flexible and can be adapted to changing needs at local and national levels.

The NTP in Myanmar had long recognized the value of an electronic recording and reporting system, but it had proved difficult to identify a suitable solution. In 2007, following discussions between the NTP and WHO staff, it was agreed to explore the option of DHIS. With the assistance of consultants who are part of a network of developers, DHIS was customized for use in Myanmar, and staff at central and state or divisional levels were trained. The system was then tested for six months, during which programming bugs were identified and removed.

In early 2008, 32 staff from the central unit of the NTP, all state or divisional TB officers and all statistical clerks were trained. The 14 (out of 17) states and divisions that implement NTP services were equipped with a computer. The DHIS was installed in June and July 2008, with on-the-job training provided by staff from WHO. The system was tested in the last six months of 2008 by all the states and divisions, and remaining programming bugs were resolved by consultants. Further supervisory visits and refresher training courses are planned for 2009. DHIS has already reduced the workload associated with data management and analysis.

The experience of Myanmar shows that when there is strong commitment from the NTP, sufficient funding, external expertise and appropriate training, the DHIS can be successfully adapted and implemented to manage TB data in a high-burden country. The flexibility of the software allows for rapid and low-cost customization (instead of development from scratch). The DHIS could be relevant in many other countries.

2.3 Address TB/HIV, MDR-TB, and the needs of poor and vulnerable populations

2.3.1 Collaborative TB/HIV activities

Globally, the latest data suggests that there were 1.4 million new HIV-positive TB cases in 2007 (out of a total of 9.3 million incident cases of TB). This estimate is much higher than figures previously published by WHO in this series of annual reports. In this context, it is important to highlight that the estimated total number of incident TB cases (HIV-positive and HIV-negative combined) has changed only slightly. The reason for the much higher estimated number of *HIV-positive* TB cases is that the *proportion* of incident cases of TB who are estimated to be infected with HIV has been revised upwards, based on much more extensive data about HIV prevalence in TB patients. These data became available mostly in 2008 following the rapid expansion of routine HIV testing since 2005–2006, notably in African countries (as documented below). Further details about these new estimates, and the methods used to produce them, are provided in CHAPTER 1 and ANNEX 2 respectively. The African Region accounts for 79% of estimated HIV-positive TB cases; most of the remaining cases are in the South-East Asia Region (TABLE 2.8).

Collaborative TB/HIV activities are essential to ensure that HIV-positive TB patients are identified and treated appropriately, and to prevent TB in HIV-positive people.[3] These activities include establishing mechanisms for collaboration between TB and HIV programmes (coordinating bodies, joint TB/HIV planning, monitoring and evaluation, HIV surveillance); infection control in health-care and congregate settings; HIV testing of TB patients and, for those TB patients infected with HIV, co-trimoxazole preventive therapy (CPT)

[1] http://www.who.int/tb/err/catalogue
[2] See: http://openmrs.org, DHIS (www.hisp.org) or ENRS (www.emro.who.int/stb/enrs.htm).
[3] *Interim policy on collaborative TB/HIV activities*. Geneva, World Health Organization, 2004 (WHO/HTM/TB/2004.330; WHO/HTM/HIV/2004.1).

TABLE 2.8
HIV testing and treatment in TB patients, by WHO region, 2007

	NUMBER OF TB PATIENTS WITH KNOWN HIV STATUS (THOUSANDS)	% OF NOTIFIED TB PATIENTS TESTED FOR HIV	% OF TESTED TB PATIENTS HIV-POSITIVE	% OF ESTIMATED HIV-POSITIVE TB CASES[a] IDENTIFIED BY TESTING	% OF IDENTIFIED HIV-POSITIVE TB PATIENTS STARTED ON CPT	% OF IDENTIFIED HIV-POSITIVE TB PATIENTS STARTED ON ART	REGIONAL DISTRIBUTION OF ESTIMATED HIV-POSITIVE TB CASES
AFR	492	37	51	23	66	33	79
AMR	114	49	13	44	36	77	2.4
EMR	4.2	1.1	12	2.3	35	65	1.5
EUR	169	35	2.5	16	52	16	3.1
SEAR	122	5.5	15	12	37	17	11
WPR	95	6.6	7.0	13	45	28	3.7
Global	**996**	**16**	**30**	**22**	**63**	**34**	**100**

[a] Includes estimated HIV-positive TB cases in countries which did not provide information on testing.

FIGURE 2.4
Mechanisms for collaboration and national policies for collaborative TB/HIV activities, 63 priority countries, 2006–2007. Numbers under bars show the percentage of total estimated HIV-positive TB cases accounted for by reporting countries.

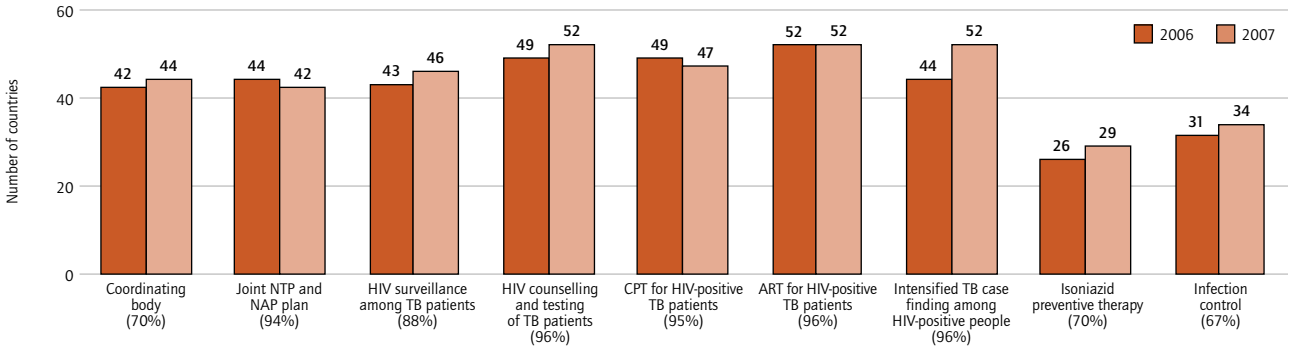
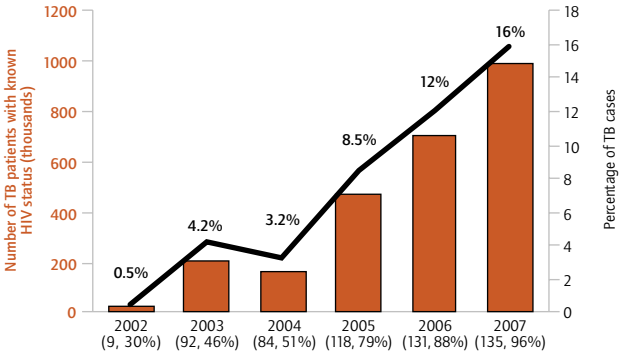


FIGURE 2.5
HIV testing for TB patients, all countries, 2002–2007. Number (bars) and percentage (line) of notified new and re-treatment TB cases for which the HIV status of the patient was recorded in the TB register. The numbers under each bar show the number of countries reporting data, followed by the percentage of total estimated HIV-positive TB cases accounted for by reporting countries.



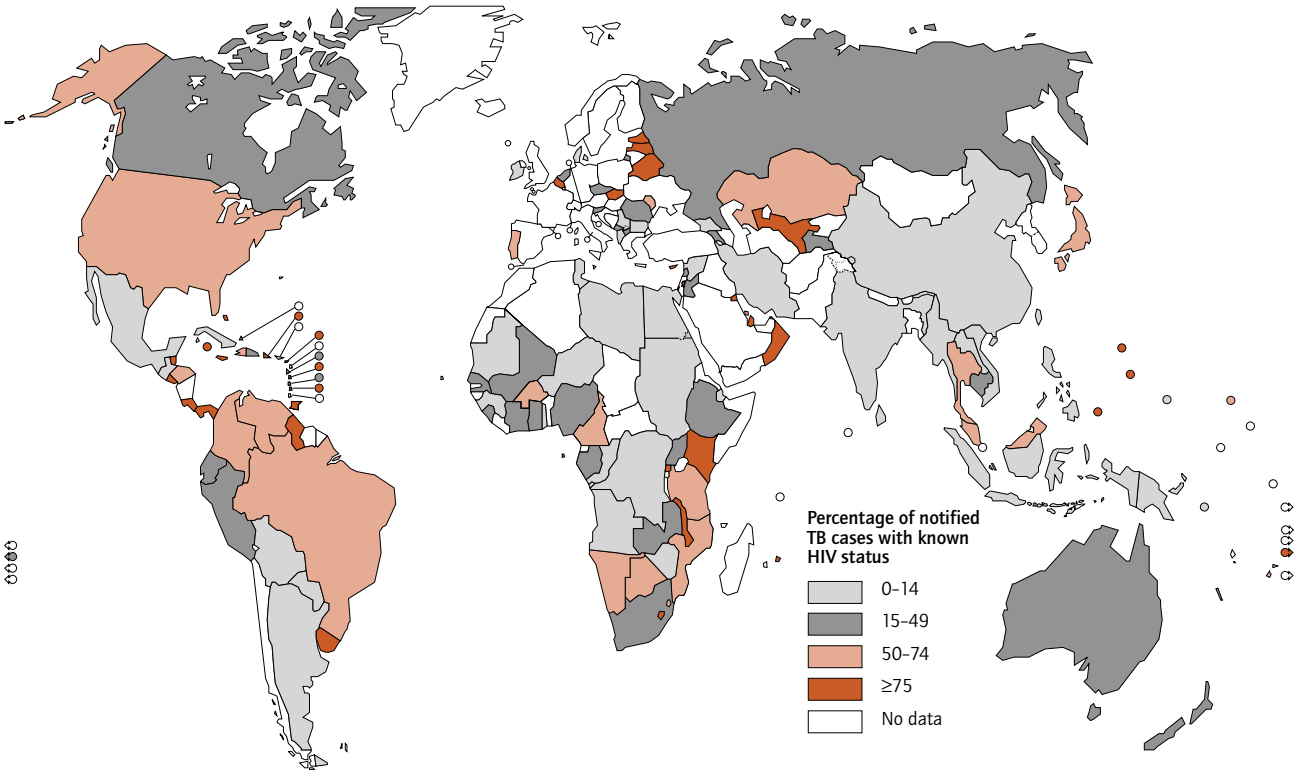
and antiretroviral therapy (ART); and intensified TB case-finding among people living with HIV followed by isoniazid preventive therapy (IPT) for those without active TB.

Mechanisms for collaboration and policy development

Among 63 countries that have been identified as priorities for the implementation of collaborative TB/HIV interventions at global level[1] and which collectively account for 97% of estimated HIV-positive cases worldwide, approximately two-thirds had established coordinating bodies, developed a joint TB/HIV plan and were undertaking HIV surveillance by 2007 (FIGURE 2.4). Around 50 of these 63 countries had policies for HIV counselling and testing among TB patients, as well as for the provision of CPT and ART to those coinfected with HIV. A relatively high number of countries (n=52) also had policies for intensified case-finding among HIV-positive people. In contrast, a smaller number of countries had policies related to IPT (29 countries) and infection control (34 countries). While there was variation in the extent to which mechanisms for collaboration or policies were in place in 2007, there was generally an improvement compared with 2006 (the exceptions were joint TB/HIV planning and provision of CPT). When all countries that reported data are con-

[1] Refers to 41 countries that were identified as priorities at global level in 2002 and that account for 97% of estimated HIV-positive TB cases globally, plus 22 additional countries that UNAIDS has defined as having a generalized HIV epidemic. See ANNEX 2 for a list of the 63 countries.

FIGURE 2.6
HIV testing for TB patients, 2007



sidered, the number of countries with policies is much higher, but the fraction of the global number of HIV-positive TB cases covered is almost the same (data not shown).

HIV testing of TB patients

The provision of HIV testing for TB patients is a critical entry point to interventions for both treatment and prevention. There was a substantial increase in the number of TB patients with known HIV status between 2002 and 2007, from 21 806 patients across nine countries in 2002 (less than 1% of notified TB cases) to 1.0 million patients across 135 countries in 2007 – equivalent to 16% of notified TB cases (FIGURE 2.5). In the African Region, the HIV status of 491 755 TB patients was known in 2007; this represented 37% of all notified cases, up from 22% in 2006 (TABLE 2.8). These aggregated figures conceal considerable variation in testing rates among countries (FIGURE 2.6). Among countries with a high prevalence of HIV among TB patients, Kenya, Malawi, Lesotho, Rwanda and Swaziland stand out as having the highest testing rates in 2007. Globally, there were 65 countries (14 in the African Region) where the HIV status of more than 50% of notified TB cases was known; these countries include 23 of the 63 countries that have been defined as high TB/HIV burden countries, and collectively account for 23% of the estimated total number of HIV-positive TB cases.[1] This progress in knowledge of HIV status of TB patients is impressive, although the high variability in current testing rates also shows that there is much further scope for improvement.

This increase in numbers of TB patients with known HIV status may be explained in part by the increase in the number of countries reporting data and the share of the global number of HIV-positive TB cases accounted for by reporting countries (see numbers and percentages below the bars of FIGURE 2.5). Clearer evidence that the provision of HIV testing has increased since 2004 is presented in FIGURE 2.7. This shows the number of TB patients with known HIV status in 60 countries that reported data for all four years 2004–2007. The number of TB patients with known HIV status in 11 African countries representing 48% of estimated HIV-positive TB cases globally (and 61% of cases in the African Region, data not shown) increased almost seven times in four years, while the percentage of all notified cases with known status increased from 7.6% to 48%. Outside the African Region, the number of patients with known HIV status also increased, but by a much smaller amount in absolute terms.

Across all reporting countries (n=119), a total of 296 995 HIV-positive TB patients were identified. These detected patients represent 22% of the estimated number of incident HIV-positive TB cases in 2007, although there was considerable variation among regions (TABLE 2.8).

[1] The total of 65 countries is higher than the total of 49 countries for which direct measurements of HIV prevalence in TB patients were used to estimate the global total of HIV-positive TB cases. For the additional 15 countries (which are mostly islands with small populations), estimates of HIV in the general population are not available and these countries are not included in global estimates of HIV-positive cases.

FIGURE 2.7

HIV testing in the 60 countries that reported data for each year 2004–2007. The number above each bar shows the percentage of notified TB cases that were tested for HIV.

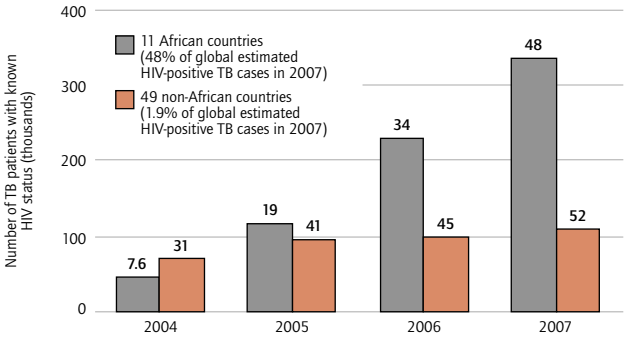


FIGURE 2.8

Co-trimoxazole preventive therapy for HIV-positive TB patients, 2002–2007. The numbers under each bar show the number of countries reporting data, followed by the percentage of total estimated HIV-positive TB cases accounted for by reporting countries.

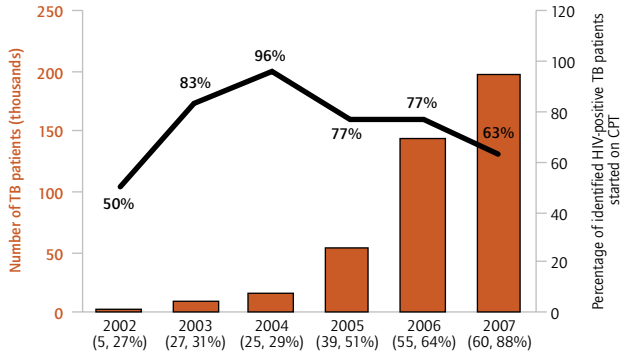
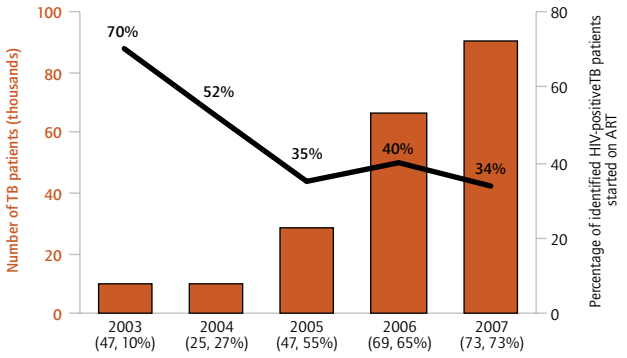


FIGURE 2.9

Antiretroviral therapy for HIV-positive TB patients, 2003–2007. The numbers under each bar show the number of countries reporting data, followed by the percentage of total estimated HIV-positive TB cases accounted for by reporting countries.



Provision of CPT and ART to HIV-positive TB patients

A major reason for promoting HIV testing in TB patients is to facilitate provision of CPT and ART to HIV-positive patients. The number of HIV-positive TB patients treated with CPT has steadily increased in absolute terms, reaching almost 200 000 in 2007. However, this has been accompanied by a fall in the percentage of TB patients in whom HIV is diagnosed who are treated with CPT, to 63% in 2007 (FIGURE 2.8). A similar pattern exists for ART. The total number of HIV-positive patients enrolled on ART has grown steadily, reaching around 90 000 patients in 2007, but the proportion of diagnosed HIV-positive patients started on treatment fell to 34%. In the African Region specifically, the proportion of patients in whom HIV infection was diagnosed and who were started on CPT reached 66% in 2007; the figure for ART was 33% (TABLE 2.8).

These figures for CPT and ART show that the provision of treatment interventions is not keeping pace with the increase in HIV testing. For ART, a possible explanation is the disparity between the number of health facilities offering TB treatment as well as HIV testing and counselling, and the number of facilities where ART is provided (BOX 2.5).

Intensified TB case-finding and provision of IPT among HIV-positive people

Screening for TB among HIV-positive people attending HIV care services was provided to 0.6 million people in 2007, up from 0.2 million in 2005 (FIGURE 2.10). This is a small fraction (2.2%) of the 33 million people estimated to be living with HIV. Of those in HIV care, almost 0.2 million were found to have TB, equivalent to 14% of the estimated 1.4 million incident HIV-positive TB cases globally. This high proportion suggests that if screening for TB increased beyond its currently low levels, TB case-finding would improve.

Provision of IPT continues to be extremely limited (FIGURE 2.10). Globally, less than 30 000 people were reported to have been started on IPT in 2007 – equivalent to just 0.1% of the 33 million people estimated to be infected with HIV. The low number of people being treated with IPT is inconsistent with the policies that have been established. While 100 countries reported the existence of an IPT policy, only 29 reported any provision of IPT in 2007 (although this was an increase from 26 countries in 2006).

Progress against Global Plan targets

The Global Plan details the progress required to implement collaborative TB/HIV activities for each year 2006–2015 within the framework of the goal of universal access to ART by 2010. The milestones or targets included for each year in the Global Plan provide a benchmark against which progress in practice can be assessed. A comparison of Global Plan expectations with implementation reported by countries in 2007 is shown in TABLE 2.9, for all regions combined and for the African Region. Among the 171 countries considered in the Global Plan, the absolute number of patients tested for HIV reached about half of the target in the Global Plan

BOX 2.5

Providing antiretroviral therapy (ART) to HIV-positive TB patients: access barriers limit progress

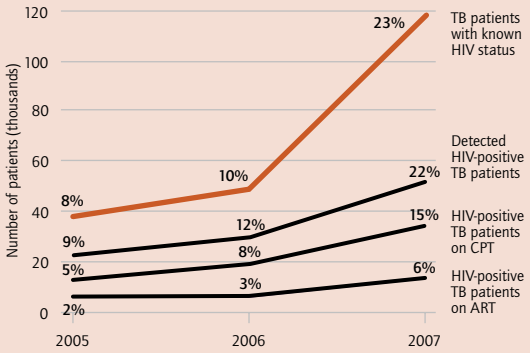
Data from eight countries (that account for 18% of the estimated global burden of HIV-positive TB cases) show that TB patients have poorer access to ART than to HIV testing. This may be a limiting factor in scaling up the provision of ART to HIV-positive TB patients and may result in unnecessary deaths.

The percentage of estimated HIV-positive TB cases identified by the NTPs of these eight countries increased substantially during 2005–2007, from 9% to 22%. This matched an increase in the proportion of notified TB cases with known HIV status, which rose from 8% to 23% (FIGURE). However, the number of patients placed on ART did not increase at the same pace. Compared with 2005, an additional 30 392 HIV-positive TB cases were identified in 2007 in the eight countries providing data, but only an additional 8261 patients were started on ART. This meant that an increasing number of diagnosed HIV-positive TB patients were not receiving ART.

In 2007, there was at least one HIV testing facility for every two health-care facilities where anti-TB treatment was available (TABLE). However, each ART facility was shared by five TB treatment facilities. HIV treatment services need to be decentralized and combined with TB services to improve access to ART for HIV-positive TB patients.

The provision of CPT is better. The proportion of diagnosed HIV-positive TB patients receiving CPT increased from 58% in 2005 to 65% in 2007, and CPT was provided to 15% of all estimated HIV-positive TB patients. Although data on the number of facilities providing CPT are not available, it is likely that CPT is more often available at TB clinics than ART.

HIV testing for TB patients, and provision of ART and CPT to HIV-positive TB patients, 8 countries,[a] 2005–2007. The numbers beside each point on the red line show the percentage of notified TB cases with known HIV status. The numbers on the other three lines show the percentage of total estimated HIV-positive TB cases accounted for by the patients detected and treated.



[a] Data shown are for the following 8 countries, which provided complete data for the years 2005–2007: Burkina Faso, DR Congo, Ethiopia, Malawi, Myanmar, Rwanda, Uganda and UR Tanzania.

Provision of TB treatment, HIV testing and counselling, and ART, 8 countries,[a] 2007

	NUMBER OF FACILITIES PROVIDING TB TREATMENT	NUMBER OF FACILITIES PROVIDING HIV TESTING AND COUNSELLING[b]	NUMBER OF FACILITIES PROVIDING ART[b]
Burkina Faso	462	454	76
DR Congo	1 205	286	209
Ethiopia	833	1 005	272
Malawi	551	504	163
Myanmar	324	291	32
Rwanda	450	312	165
Uganda	1 261	554	286
UR Tanzania	2 500	1 035	204
Total	**7 586**	**4 441**	**1 407**

[a] For comparison, this table shows the 8 countries included in the figure.

[b] Source: *Towards universal access: scaling up priority HIV/AIDS interventions in the health sector. Progress report 2008*. Geneva, World Health Organization, 2008.

FIGURE 2.10

Intensified TB case-finding and IPT provision among HIV-positive people, 2007. Numbers above bars show the proportion of estimated HIV-positive people screened for TB (graph a) and the proportion of HIV-positive people without TB started on IPT (graph b). Numbers under bars show the number of countries reporting data followed by the percentage of total estimated HIV-positive people (graph a) and HIV-positive people without active TB (graph b) accounted for by reporting countries.

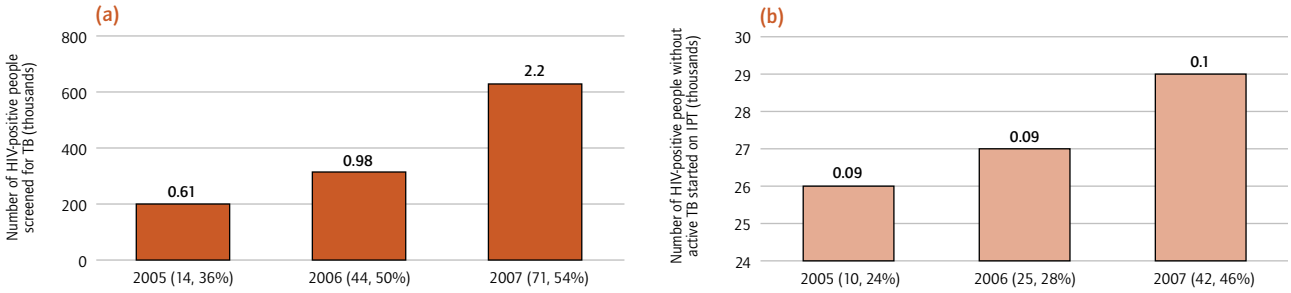
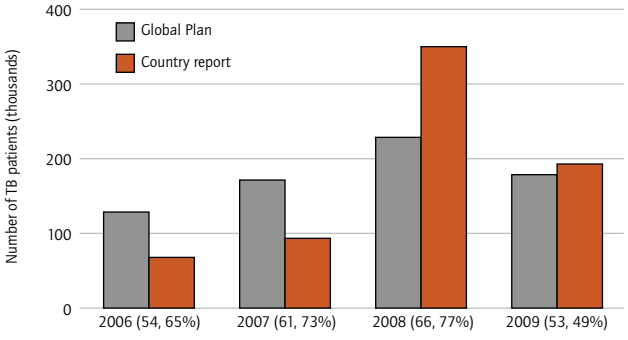


TABLE 2.9
Collaborative TB/HIV activities, 2007: country reports compared with expectations given in the Global Plan

	GLOBAL		AFRICA	
	COUNTRY REPORTS AND LATEST ESTIMATES[a]	GLOBAL PLAN	COUNTRY REPORTS AND LATEST ESTIMATES	GLOBAL PLAN
	(MILLIONS OR PERCENTAGES)		(MILLIONS OR PERCENTAGES)	
HIV-testing for TB patients, provision of CPT and ART				
Number of TB patients tested for HIV	0.9[b]	2.0	0.5[b]	0.9
Total number of notified TB cases including new, re-treatment and other cases	3.7[c]	3.5	1.3[c]	1.6
Proportion of all notified TB cases that were tested for HIV	27%[c,d]	56%	39%[c,d]	58%
Number of diagnosed HIV-positive TB cases enrolled on CPT	0.2	0.6	0.2	0.5
Number of diagnosed HIV-positive TB cases	0.3	1.1	0.3	0.9
Proportion of all HIV-positive TB cases enrolled on CPT	72%[e]	53%	76%[e]	56%
Number of diagnosed HIV-positive TB cases enrolled on ART	0.1	0.3	0.1	0.3
Number of diagnosed HIV-positive TB cases eligible for ART	0.3	0.5	0.3	0.4
Proportion of all HIV-positive TB cases enrolled on ART	34%[f]	53%	33%[f]	58%
Intensified TB case-finding and IPT for people with HIV				
Number of HIV-positive people attending HIV services screened for TB	0.6	14	0.3	13
Number of HIV-positive people attending HIV services	3.5	19	2.7	17
Proportion of HIV-positive people attending HIV services screened for TB	27%[g]	72%	21%[g]	76%
Number of eligible HIV-positive people offered IPT	0.03[h]	1.5	0.02[h]	1.4
Estimated number of HIV-positive people eligible for IPT	26	31	20	27
Proportion of estimated number of HIV-positive people eligible for IPT who received IPT	0.2%[i]	4.8%	0.1%[i]	5.0%

[a] Includes only those countries in the Global Plan, i.e. countries in sub-regions Central Europe and Established Market Economies are excluded here. Includes patients reported from DOTS and non-DOTS areas.
[b] Maximum number included for each country is the number of notified cases multiplied by the population coverage of collaborative TB/HIV activities anticipated by the Global Plan.
[c] Numbers of notified TB cases are weighted according to the population coverage of collaborative TB/HIV activities anticipated by the Global Plan.
[d] Only the 116 countries (33 in Africa) that provided both numerator and denominator are included in this percentage.
[e] Only the 58 countries (27 in Africa) that provided both numerator and denominator are included in this percentage.
[f] Only the 66 countries (22 in Africa) that provided both numerator and denominator are included in this percentage.
[g] Only the 62 countries (11 in Africa) that provided both numerator and denominator are included in this percentage.
[h] 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.
[i] Only the 32 countries (8 in Africa) that provided the numerator are included in the denominator of this percentage.

FIGURE 2.11
Antiretroviral therapy for HIV-positive TB patients: country reports compared with the Global Plan, 2006–2009. Data from country reports are notified cases (2006–2007) and projections (2008–2009). The numbers under each bar represent the number of countries reporting data, followed by the percentage of total estimated HIV-positive TB cases accounted for by reporting countries.



in 2007, and provision of CPT and of ART both reached about one-third of the Global Plan targets. In terms of the percentage of TB cases found to be HIV-positive and who were enrolled on CPT, the comparison is much more favourable: for the world as a whole, 72% of TB cases in whom HIV infection was diagnosed were started on CPT in 2007 based on country reports, compared with the target of 53% for 2007 in the Global Plan. For ART, the figures were 34% and 53%, respectively. Findings were similar for the African Region specifically. The differences between the absolute numbers of people receiving CPT and ART in the Global Plan and country reports are mostly attributable to the shortfall in HIV testing. For patients to be treated with either CPT or ART, they must first be tested for and diagnosed with HIV. Among those found to be HIV-positive, lack of access to ART at local health facilities may also be a factor in the low uptake of ART (BOX 2.5).

For ART specifically among TB/HIV interventions, countries were requested to provide projections of the number of HIV-positive patients who would be started on ART in 2008 and 2009, as well as figures for the actual provision of ART in 2007. These data are compared with the Global Plan targets

TABLE 2.10
Number of MDR-TB cases estimated, notified and expected to be treated, 27 high MDR-TB burden countries and WHO regions

	ESTIMATED CASES, 2007			NOTIFIED		EXPECTED NUMBER OF MDR-TB CASES TO BE TREATED	
	% OF ALL TB CASES WITH MDR-TB	NUMBER OF MDR-TB CASES	NUMBER OF SS+ MDR-TB CASES	NUMBER OF MDR-TB CASES, 2007	% OF ESTIMATED SS+ MDR-TB CASES NOTIFIED, 2007	2008	2009
1 India	5.4	130 526	99 639	146	0.1	450	900
2 China	7.5	112 348	76 154	79	0.1	388	–
3 Russian Federation	21	42 969	31 397	5 297	17	4 221	9 897
4 South Africa	2.8	15 914	10 708	7 350	69	5 252	–
5 Bangladesh	4.0	14 506	7 694	–	–	150	–
6 Pakistan	4.3	13 218	7 939	–	–	250	250
7 Indonesia	2.3	12 209	6 427	–	–	100	250
8 Philippines	4.6	12 125	6 451	568	8.8	620	1 000
9 Nigeria	2.4	11 700	6 934	45	0.6	500	–
10 Kazakhstan	32	11 102	9 540	5568	58	1 562	4 266
11 Ukraine	19	9 835	5 568	–	–	–	–
12 Uzbekistan	24	9 450	6 936	484	7.0	334	720
13 DR Congo	2.8	7 336	4 137	82	2.0	523	756
14 Viet Nam	4.0	6 468	4 199	–	–	100	–
15 Ethiopia	1.9	5 979	3 086	145	4.7	45	200
16 Tajikistan	23	4 688	3 286	–	–	–	–
17 Myanmar	4.7	4 181	2 331	600	26	125	150
18 Azerbaijan	36	3 916	3 109	196	6.3	20	–
19 Republic of Moldova	29	2 231	1 656	896	54	466	490
20 Kyrgyzstan	17	1 290	813	322	40	–	–
21 Belarus	16	1 101	758	870	115	–	–
22 Georgia	13	728	590	269	46	280	540
23 Armenia	17	486	373	125	33	–	–
24 Lithuania	17	464	339	314	93	–	–
25 Bulgaria	12	371	217	82	38	50	50
26 Latvia	14	202	129	98	76	120	120
27 Estonia	20	123	85	80	94	120	100
High MDR-TB burden countries	**5.7**	**435 470**	**300 496**	**23 616**	**7.9**	**15 676**	**19 689**
AFR	2.4	75 657	45 029	8 841	20	9 337	4 070
AMR	3.2	10 214	7 261	2 522	35	3 670	4 046
EMR	3.8	23 049	14 120	487	3.4	966	707
EUR	17	92 554	67 440	16 062	24	8 414	17 457
SEAR	4.8	173 660	124 826	918	0.7	1 496	1 724
WPR	6.3	135 411	89 926	948	1.1	1 572	1 573
Global	**4.9**	**510 545**	**348 602**	**29 778**	**8.5**	**25 455**	**29 577**

– Indicates information not provided.

for ART in FIGURE 2.11. Among reporting countries, anticipated progress is encouraging, with projected numbers close to or above the Global Plan targets (note that the lower projection of patients to be treated in absolute terms in 2009 compared with 2008 is due to fewer countries reporting data for 2009).

Intensified case-finding and provision of IPT is far from Global Plan targets (TABLE 2.9). The target for 2007 was to screen 14 million HIV-positive people for TB; the actual figure reported was 0.6 million.

Overall, implementation of TB/HIV interventions falls short of the Global Plan targets, although data from individual countries show that these targets are achievable.

2.3.2 Diagnosis and treatment of MDR-TB

The most recent estimates suggest that, globally, there were 510 545 cases of MDR-TB in 2007. This estimate is based on data from drug resistance surveys or routine surveillance (DRS)[1] for 113 (new cases) and 102 (re-treatment cases) countries,[2] and statistical modelling for other countries (see ANNEX 2). Cases of MDR-TB are very unevenly distributed, with 27 countries (of which 15 are in Eastern Europe) accounting for 85% of all cases (TABLE 2.10). These 27 countries

[1] *WHO/IUATLD Global Project on Anti-tuberculosis Drug Resistance Surveillance*. Geneva, World Health Organization, 2008 (WHO/HTM/TB/2008.394).

[2] Full details are provided in The WHO/IUATLD Global Project on Anti-tuberculosis Drug Resistance Surveillance. *Anti-tuberculosis drug resistance in the world. Fourth global report*. Geneva, World Health Organization, 2008 (WHO/HTM/TB/2008.394).

FIGURE 2.12
Countries that had reported at least one case of XDR-TB by the end of 2008

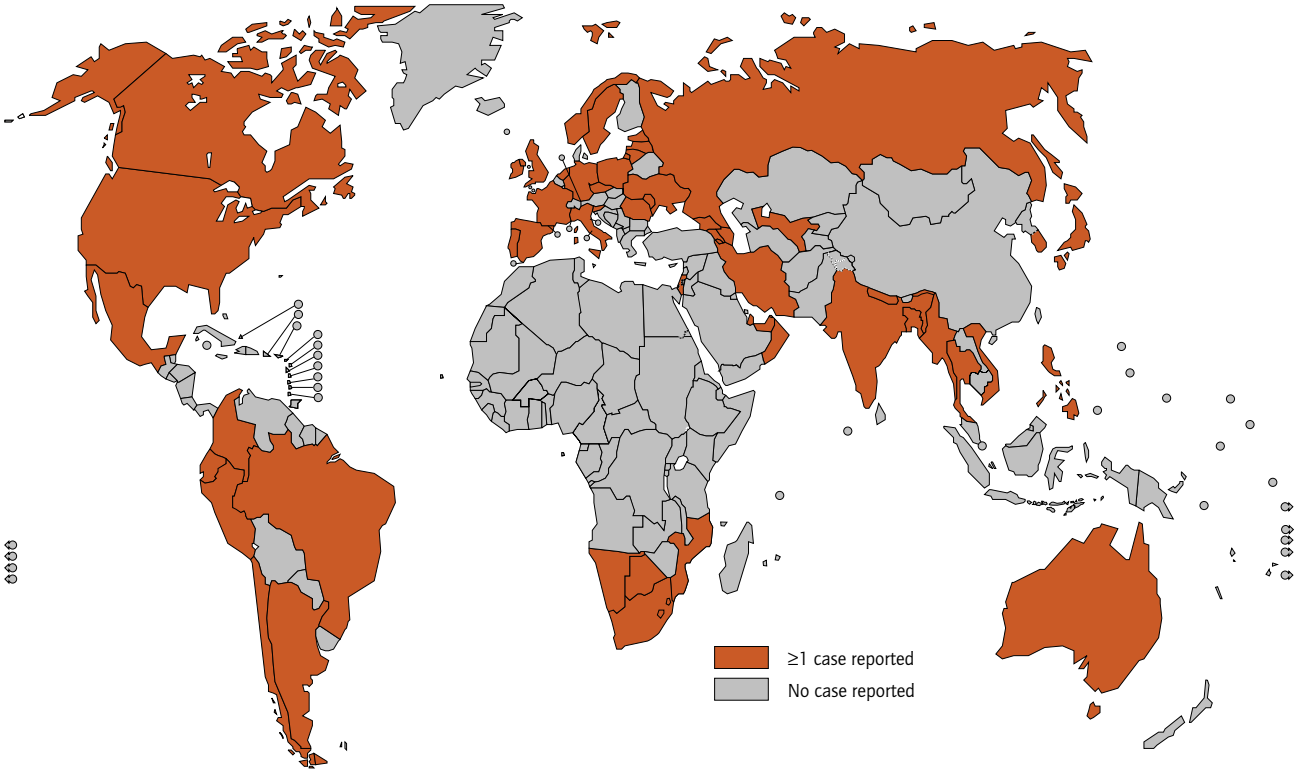
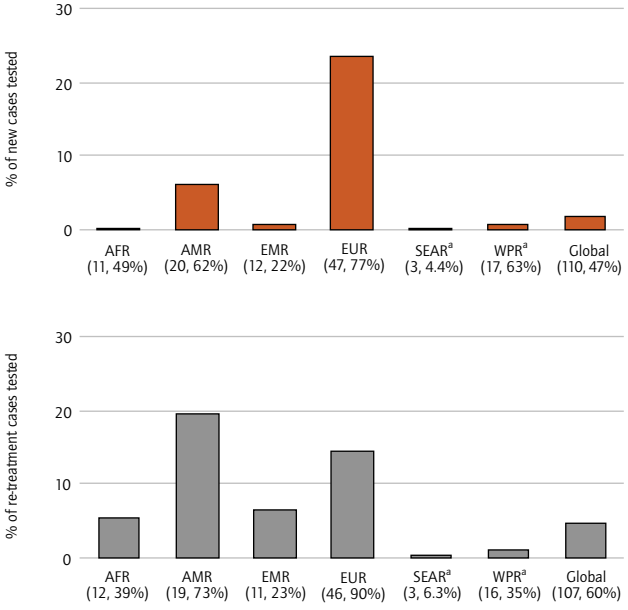


FIGURE 2.13
Diagnostic DST for new and re-treatment cases, by WHO region, 2007. The numbers under each bar show the number of countries reporting data, followed by the percentage of total estimated cases of MDR-TB accounted for by reporting countries.



[a] Data from India and China excluded as fewer than <0.1% of notified cases were tested.

have been identified as priorities for improved diagnosis and management of MDR-TB at the global level. By the end of 2008, 55 countries and territories had reported at least one case of XDR-TB (FIGURE 2.12), including five that reported cases for the first time in 2007 (Colombia, Oman, Qatar, the United Arab Emirates and Uzbekistan).

Diagnosis and notification

Diagnosis of MDR-TB requires DST services to be available and used (see also SECTION 2.2.3 above on Early case detection through quality-assured bacteriology). In 2007, 220 467 tests for drug susceptibility were reported by 122 countries, with 46% of these tests conducted in the European Region and 34% in the African Region (mostly for re-treatment cases in South Africa). Countries reporting DST data accounted for only 47% of the estimated total number of new cases of MDR-TB, and for 60% of the estimated total number of previously treated cases of MDR-TB (FIGURE 2.13). The proportion of new cases for whom DST was undertaken worldwide was 2%, although testing was much more common in the European Region (22% of new cases, with 45/53 countries reporting) (FIGURE 2.13). The proportion of re-treatment cases for whom DST was undertaken was higher (4.7% across all regions).

Among TB cases tested for drug susceptibility in 2007, 29 778 cases of MDR-TB were diagnosed and notified (TABLE 2.10; FIGURE 2.14); 54% of these cases were in Europe (TABLE 2.10). Although there is evidence that notifications are increasing (FIGURE 2.14), the number of MDR-TB cases

notified in 2007 represented only 6% of the 0.5 million cases estimated to exist worldwide (and 9% of estimated cases of smear-positive MDR-TB). This average conceals higher figures for several high MDR-TB burden countries: the number of notified cases was above 70% of the estimated number of cases in Belarus, Estonia, Kazakhstan and Lithuania and above one-third of estimated cases in Georgia, Latvia, the Republic of Moldova and South Africa. Globally, a small increase in provision of treatment for MDR-TB is anticipated between 2008 and 2009 (TABLE 2.10; FIGURE 2.14), including in India and the Russian Federation.

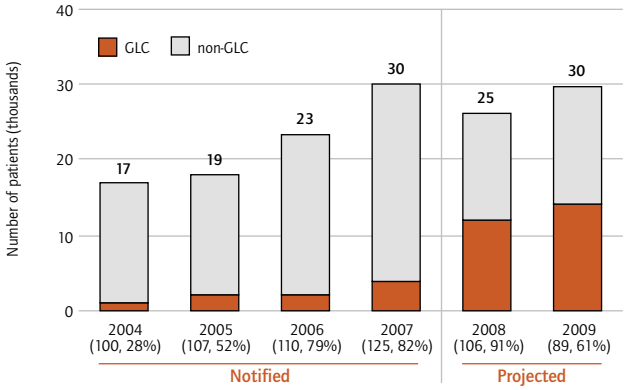
To date, most notifications have been from programmes and projects that were not affiliated to the Green Light Committee, or GLC (FIGURE 2.14). The GLC was established in 2000,[1] with the purpose of enhancing access to quality-assured second-line drugs at competitive prices and ensuring that treatment was provided according to WHO guidelines.[2] In 2007, the 3 681 patients who were treated in GLC-approved projects represented 0.7% of estimated MDR-TB cases. Current data indicate that this will increase to 14 136 patients in 2009 (FIGURE 2.14), or about 3% of estimated cases and 4% of estimated smear-positive cases of MDR-TB. Outside GLC-approved projects, it is not known how many notified cases are enrolled on treatment, and of these how many received treatment that is in line with WHO guidelines.

Scaling-up diagnosis and treatment

In recognition of the comparatively small share of the global burden of MDR-TB that is diagnosed and appropriately treated, the GLC has intensified its efforts to enable rapid expansion of MDR-TB diagnosis and treatment according to the latest WHO recommendations.[3] This includes building partnerships with major funding agencies (such as the Global Fund and UNITAID) and recent initiatives (such as the Global Laboratory Initiative and TBTEAM), and introducing mechanisms designed to speed up the review of applications. The result of these efforts was evident in 2008, when the annual number of reviewed applications was the highest to date. Among 43 applications that were reviewed, 39 projects were approved, including projects in 7 countries that had not previously benefited from GLC support (Belarus, Bulgaria, Cameroon, Ethiopia, Mozambique, the Republic of Serbia and the United Republic of Tanzania). These 39 projects will treat a cumulative total of about 20 000 MDR-TB patients during their lifetime, three times more than the total number of patients to be treated by projects approved in 2007. By the end of 2008, a total of 134 projects in 60 countries covering a cumulative total of approximately 50 000 patients had been approved by the GLC. Most of these countries were in the European Region (15 countries) and the Region of the Americas (14 countries), followed by the African Region (12 countries), the Western Pacific Region (7 countries), the Eastern Mediterranean Region (6 countries) and the South-East Asia Region (6 countries).[4] The number of patients enrolled for treatment in GLC projects is expected to increase more than three-fold in 2008 compared with 2007; GLC-approved

FIGURE 2.14

Notified cases of MDR-TB (2004–2007) and projected numbers of patients to be enrolled on treatment (2008–2009). The numbers under each bar show the number of countries reporting data, followed by the percentage of total estimated cases of MDR-TB accounted for by reporting countries.



treatments would then represent a larger share of the global number of MDR-TB patients on treatment (FIGURE 2.14).

An overview of the latest status of progress in introducing and scaling-up treatment of patients with MDR-TB, as reported by countries, is shown in TABLE 2.11. The most advanced of the 27 high MDR-TB burden countries appear to be Estonia, Georgia, Latvia, Kazakhstan and the Republic of Moldova, with all of the assessed components of MDR-TB management in place. The experience of Estonia and Latvia in managing MDR-TB within their NTPs is summarized in BOX 2.6. Among the remaining 27 high MDR-TB burden countries, all except South Africa have submitted an application to the GLC; national guidelines have been developed for the management of drug-resistant TB in 17 countries; and 20 countries have reported that they are scaling up activities. In Nigeria, Pakistan and Tajikistan, progress is limited to an application to the GLC or approval of a GLC project.

Treatment outcomes

Given that it takes 18–24 months to treat MDR-TB, in 2008 the WHO TB data collection form requested treatment outcome data for patients treated in 2004 and interim outcomes for patients started on treatment in 2005 and 2006. Annual MDR-TB cohorts were reported by 40, 53 and 65 countries for 2004, 2005 and 2006 respectively. As expected, in several countries with larger cohorts (such as the Democratic Republic of the Congo, Morocco and the Philippines), the proportion of cases started on treatment in 2006 who had not yet completed treatment was much higher than the proportion reported for patients who were started on treatment in 2004.

[1] http://www.who.int/tb/challenges/mdr/greenlightcommittee/en/

[2] *Guidelines for the programmatic management of drug-resistant tuberculosis*. Emergency update. Geneva, World Health Organization, 2008 (WHO/HTM/TB/2008.402).

[3] Data related to GLC operations were provided by the GLC secretariat, with the exception of projections for MDR-TB patients expected to be treated in 2008–2009, which were reported by countries via the annual WHO data collection form.

[4] Green Light Committee. *Annual Report 2007*. Geneva, Switzerland, 2008 (WHO/HTM/TB/2008.409).

TABLE 2.11
Management of drug-resistant TB, high MDR-TB burden countries and WHO regions, 2007

	DRUG RESISTANCE SURVEILLANCE CONDUCTED	APPLIED TO GLC	GLC-APPROVED PROJECTS PILOTED	NATIONAL GUIDELINES	TRAINING MATERIAL	TRAINING CONDUCTED	SCALING UP INITIATED	FULLY INTEGRATED INTO ACTIVITIES OF NTP	MDR-TB DATA REPORTED
1 India	Y	Y	Y	Y	Y	Y	Y	N	Y
2 China	Y	Y	Y	Y	Y	Y	Y	N	Y
3 Russian Federation	Y	Y	Y	N	Y	Y	Y	Y	Y
4 South Africa	Y	N	N	Y	Y	Y	Y	Y	Y
5 Bangladesh	N	Y	Y	Y	Y	Y	N	N	N
6 Pakistan	N	Y	Y	N	N	N	N	N	N
7 Indonesia	Y	Y	Y	Y	Y	N	Y	N	N
8 Philippines	Y	Y	Y	Y	Y	Y	Y	N	Y
9 Nigeria	N	Y	N	–	N	N	N	N	Y
10 Kazakhstan	Y	Y	Y	Y	Y	Y	Y	Y	Y
11 Ukraine	Y	Y	Y	N	–	–	Y	Y	N
12 Uzbekistan	Y	Y	Y	Y	Y	Y	Y	N	Y
13 DR Congo	Y	Y	Y	Y	Y	Y	Y	N	Y
14 Viet Nam	Y	Y	Y	–	–	–	–	–	N
15 Ethiopia	Y	Y	Y	Y	N	N	N	N	Y
16 Tajikistan	–	Y	N	N	N	N	N	N	N
17 Myanmar	Y	Y	Y	Y	Y	N	N	N	Y
18 Azerbaijan	Y	Y	Y	–	N	Y	Y	N	Y
19 Republic of Moldova	Y	Y	Y	Y	Y	Y	Y	Y	Y
20 Kyrgyzstan	N	Y	Y	N	Y	Y	Y	N	Y
21 Belarus	N	Y	Y	Y	Y	Y	Y	N	Y
22 Georgia	Y	Y	Y	Y	Y	Y	Y	Y	Y
23 Armenia	Y	Y	Y	N	N	Y	Y	N	Y
24 Lithuania	Y	Y	Y	Y	Y	Y	Y	N	Y
25 Bulgaria	N	Y	Y	N	N	N	Y	N	Y
26 Latvia	Y	Y	Y	Y	Y	Y	Y	Y	Y
27 Estonia	Y	Y	Y	Y	Y	Y	Y	Y	Y
High MDR-TB burden countries[a]	**20**	**26**	**24**	**17**	**18**	**18**	**20**	**8**	**21**
AFR (46)[b]	22	18	7	24	12	17	10	12	23
AMR (44)	21	14	14	25	20	23	17	13	25
EMR (22)	8	7	6	13	9	8	8	6	14
EUR (53)	33	17	13	24	20	21	28	22	45
SEAR (11)	6	8	6	9	7	5	7	3	5
WPR (36)	19	8	7	11	6	10	8	6	13
Global (212)	**109**	**72**	**53**	**106**	**74**	**84**	**78**	**62**	**125**

– Indicates information not provided.
[a] The lower part of table shows the number of countries answering "yes" to each question.
[b] The number of countries in each region is shown in parentheses.

The size of most country cohorts in 2004 was too small to allow any useful analysis (there were fewer than 40 cases in 26 countries, of which 13 had cohorts of fewer than 10 patients). The nine countries with cohorts of around 100 or more patients are shown in FIGURE 2.15. The highest treatment success rates have been achieved in the Philippines (73%) and Latvia (71%), both of which have GLC-approved projects, followed by the USA (61%). Treatment success rates ranged from 53% to 58% in Brazil and the Democratic Republic of the Congo, as well as in GLC projects in Peru and the Russian Federation. Outcomes were especially poor in two countries without GLC projects: Romania (38%, with a large proportion of patients dying or failing treatment) and Morocco (25%, with over half the cohort lost to follow up). To improve our understanding of treatment outcomes

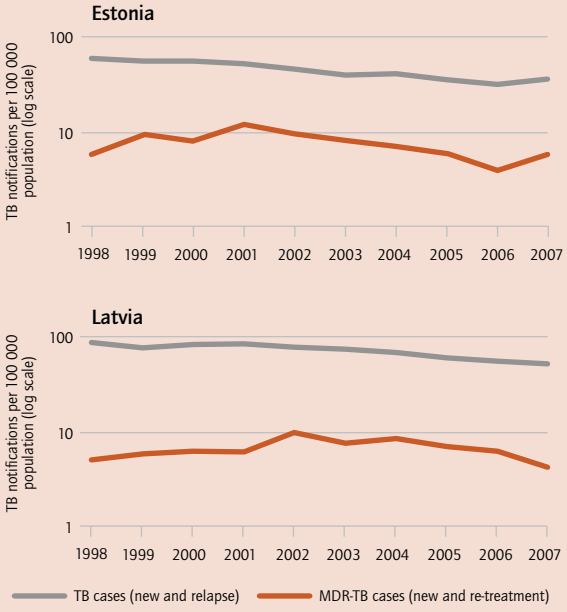
BOX 2.6

Controlling multidrug-resistant tuberculosis (MDR-TB) in Estonia and Latvia

A decade ago, Estonia and Latvia were considered to be the MDR-TB hotspots of the world, with the highest prevalence of MDR-TB among TB cases ever reported (23% and 13% in 1999, respectively). DOTS was initiated countrywide in Latvia in 1995 and in Estonia in 2000, in advance of other countries of the former Soviet Union. By 2006, the treatment success rate for new smear-positive cases was 68% in Estonia and 73% in Latvia. DOTS-Plus pilot programmes for the treatment of MDR-TB were launched in 1999 in Latvia and 2002 in Estonia, and were rapidly expanded to achieve nationwide coverage. These MDR-TB treatment programmes included provision of quality-assured drug susceptibility testing to all TB patients and use of molecular diagnostic tools for the rapid screening of MDR-TB. Infection control measures were implemented in in-patient and out-patient settings, including major renovation and upgrading of existing hospital wards. Outpatient treatment with patient support such as food packages and transport vouchers was made available during the continuation phase of treatment.

Despite struggling with social issues among TB patients, such as alcohol misuse and drug dependency as well as homelessness and increasing rates of coinfection with HIV, both countries have made significant progress in bringing TB and MDR-TB under control. Treatment success rates for the latest MDR-TB cohorts with complete data were 71% in Latvia (2005 cohort) and 54% in Estonia (2005). Between 2002 and 2007, the total number of MDR-TB cases per 100 000 population/year that were detected decreased by an average of 6% per year in Estonia and 14% in Latvia. Latvia opened the first WHO collaborating centre for MDR-TB management training. The example of these two countries as well as the collaborating centre provide important models for MDR-TB management elsewhere.

Notification rates of TB and MDR-TB, Estonia and Latvia, 1998–2007

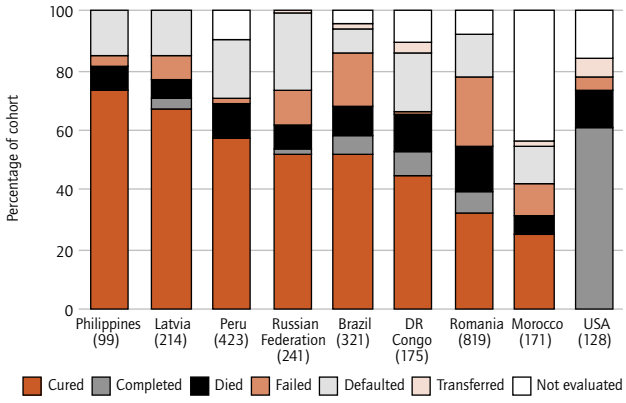


for patients with MDR-TB, more data from more countries, including data from GLC-approved projects and treatment provided outside the framework of the GLC, are needed.

Progress against Global Plan targets

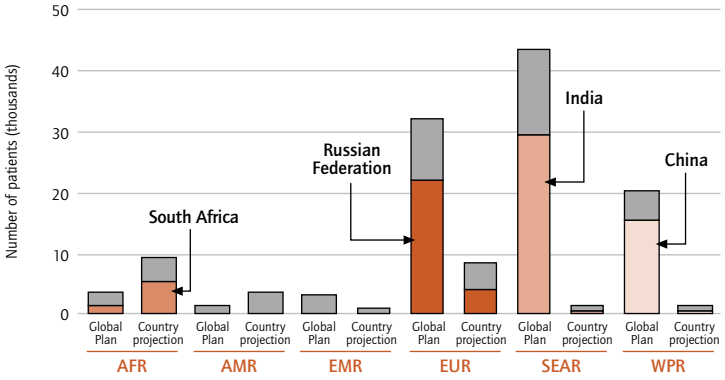
As with collaborative TB/HIV activities, the Global Plan sets out the progress required in provision of treatment for MDR-TB cases for each year 2006–2015. During 2007, the targets for the number of patients to be diagnosed and treated for MDR-TB were reviewed and revised to make the targets for 2010 comparable to the goal of universal access to ART by 2010.[1] The principal 2010 targets for MDR-TB are: (i) to offer diagnostic DST to all previously treated and chronic TB cases as well as to 90% of new TB cases with a high risk of having MDR-TB (for example, contacts of MDR-TB cases and those for whom treatment is failing after three months); and (ii) to enrol all those in whom MDR-TB is diagnosed in GLC-approved or equivalent treatment programmes. Despite the progress that has been made in some countries documented above, the number of MDR-TB patients notified in 2007 and country projections of the number of MDR-TB patients to be enrolled on treatment in 2008 and 2009 fall far behind the expectations of the Global Plan (TABLE 2.10; FIGURE 2.14; FIGURE 2.16). In 2008, the Global Plan recommended that

FIGURE 2.15
MDR-TB treatment outcomes in nine countries, 2004 cohort.
The number of patients in the cohort is shown under each bar. Countries ranked by cure rate.



[1] *The Global MDR-TB and XDR-TB response plan 2007–2008*. Geneva, World Health Organization, 2007 (WHO/HTM/STB/2007.387).

FIGURE 2.16
Country projections of MDR/XDR-TB patients to be enrolled on treatment in 2008 compared with the Global Plan



around 100 000 MDR-TB patients (including 10000 patients with XDR-TB) should be enrolled on treatment, which is more than three times higher than notifications (for 2007) or country projections (for 2008 and 2009).

Differences between Global Plan expectations for 2008 and country projections vary by region, as shown in FIGURE 2.16. In particular, targets set in the Global Plan are far above country projections in the three regions with the highest number of MDR-TB cases: the European Region, the South-East Asia Region (principally India) and the Western Pacific Region (where most cases are in China). In the African Region and the Region of the Americas, projections of the number of patients treated for MDR-TB treatment are ahead of Global Plan targets.

The relatively small numbers of MDR-TB cases diagnosed and treated to date, the modest projections of the patients to be treated in the near future and the fact that only 25% of countries have reported XDR-TB all demonstrate how much work remains to be done to improve the availability and provision of diagnosis and treatment for MDR-TB and XDR-TB. A ministerial meeting on MDR-TB and XDR-TB to be held in Beijing in April 2009, with representation from all 27 high MDR-TB burden countries, will provide a foundation for global efforts to accelerate provision of diagnosis and treatment for MDR-TB from 2009 onwards.

2.3.3 Poor and vulnerable populations

Although routine investigation of close contacts of TB patients is known to help early case detection, TB contact investigation is not yet a routine activity of TB control programmes in most countries. A total of 82 countries reported that TB contact investigation activities were implemented; among these, 63 reported that a total of 1.4 million contacts had been screened, of whom 3.8% (53 981) had active TB. The remaining 19 countries reported either on the number of contacts screened or the number of TB cases diagnosed among contacts, but not both.

Among the 176 countries and territories addressing TB in high-risk groups, 57 (32%) including seven HBCs were providing TB care to refugees and displaced people in 2007. Adaptation of TB control services to meet the needs of migrant workers and cross-border populations was reported by 47 (27%) and 35 (20.0%) countries, respectively (including seven HBCs). About one fifth of countries stated that special attention was given to providing TB care among the homeless, slum dwellers, minorities, drug dependent individuals and people living with diabetes.

Routine screening for TB among immigrants is undertaken in 36 countries (20%), including two HBCs. In 154 countries (88%) including 20 HBCs, no differentiation is made between the provision of TB care for immigrants and non-immigrants. However, in other settings, immigrants with TB have either to pay for their TB treatment (four countries) or be repatriated (12 countries). The repatriation may be immediately on diagnosis of TB (two countries) or after the initial phase of treatment (10 countries).

Despite complex emergency situations, TB care continues to be provided in Afghanistan, Iraq, Somalia and Sudan, thanks to close collaboration and coordination among various partners. TB services that were temporarily disrupted in areas heavily affected by the typhoon Nargis in Myanmar were restored swiftly, under the leadership of the NTP.

2.4 Contribute to health system strengthening based on primary health care

Achieving all the health-related MDGs requires strengthening of health systems. In the past 2–3 years, greater emphasis has been placed on such strengthening at national and international levels. A prominent example is the International Health Partnership (IHP+)[1] established in September 2007, which aims to accelerate the scale-up of health services to achieve the health-related MDG and universal access targets via the development and implementation of "country compacts". These country compacts commit development partners to predictable funding for national plans that are both results-oriented and address health system constraints. By the end of 2008, 10 countries had been fully inaugurated as IHP+ countries: Burundi, Cambodia, Ethiopia, Kenya, Madagascar, Mali, Mozambique, Nepal, Nigeria and Zambia.[2] A second example is the renewed commitment of WHO as well as its Member States and partners to primary health care (PHC) in 2008, 30 years on from the original launch of PHC as a means to achieve the goal of "health-for-all".

There are various ways to monitor how NTPs and their partners are contributing to health system strengthening. This section discusses the topics on which data were available from the 2008 data collection form.

2.4.1 Integration in primary health care

Diagnosis and treatment of TB are integrated fully into PHC services in almost all countries. Twenty HBCs (and 83% of

[1] The "+" in the title recognizes that there are number of other partnerships addressing system strengthening elements.
[2] http://www.internationalhealthpartnership.net

all countries) reported that TB control services were delivered through PHC facilities. Similarly, laboratory services for diagnosis of TB are usually integrated into general laboratory services: 86% of laboratories performing sputum smear microscopy in HBCs (80% across all countries) are general laboratories. Procurement, distribution and stock management of anti-TB drugs are undertaken together with other essential drugs management in 10 HBCs and in 64% (110/173) of all reporting countries.

2.4.2 Alignment with broader planning and financing frameworks

A high proportion of HBCs reported alignment of NTP plans and budgets with broader planning and financing frameworks (FIGURE 2.17). Contributing to health-system strengthening is an explicit component of the national strategic plan for TB control in 19 HBCs. However, there appears to be more scope for NTPs to involve the full range of stakeholders in planning and strategy development (FIGURE 2.18).

2.4.3 Human resource development

A comprehensive strategic plan for human resource development (HRD) should ensure both financing and guidance for an adequate, competent and performing workforce for TB control, integrated within overall health workforce plans and strategies. Plans should be based on a recent needs assessment and include: (i) a clear vision and goal, and associated objectives and strategies; (ii) definition of training and staffing needs for all components of the Stop TB Strategy; (iii) up-to-date job descriptions; (iv) provision for updating of the TB training curricula of various health cadres where appropriate; (v) ongoing training for existing staff at all levels of the health system; and (vi) systematic supervision and monitoring of recruitment and training needs.

A total of 94 countries including 14 HBCs have conducted a recent needs assessment, and 90 countries including 14 HBCs have a comprehensive plan for HRD for TB control (TABLE 2.12). Six countries that reported having a plan had not conducted any needs assessment. Among the HRD plans that do exist, most could be strengthened. For example, only seven HBCs have considered training and staffing needs for all the major components of the Stop TB Strategy.

Job descriptions of staff involved in the implementation of the Stop TB strategy were up-to-date in 120 countries, including 19 HBCs. Among the 22 HBCs, 18 had a designated person for HRD at the central level of the NTP. However, a full-time member of staff was available in only six countries: Afghanistan, Nigeria, Pakistan, the Russian Federation, South Africa and the United Republic of Tanzania.

Information regarding staff positions, vacancies and the training status of staff is essential for HRD, but routine monitoring of staff availability, turnover and training appears weak across HBCs. Only 9 HBCs provided at least some information about the availability of staff trained in TB control at health care facilities. In all but two countries, the information was incomplete or contradictory.

FIGURE 2.17
Alignment of NTP plans and budgets with other planning frameworks and initiatives, high-burden countries, 2007

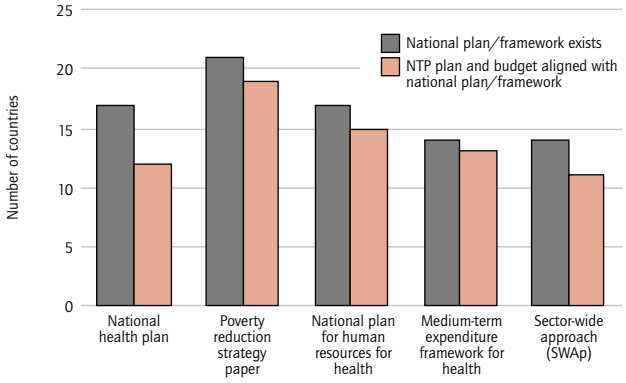
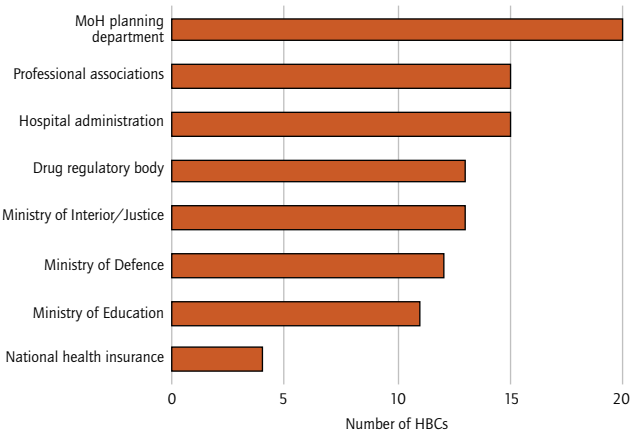


FIGURE 2.18
Involvement of different stakeholders in the development of national TB control strategies and plans



Training related to TB control is included in the basic curriculum of doctors, nurses and laboratory technicians in 141, 133 and 135 countries, respectively (including 18, 16 and 18 HBCs). Nonetheless, monitoring missions to HBCs have shown that the work on updating basic curricula is often not formalized.

Compared with data reported in 2007, data reported in 2008 suggest only modest improvements in HRD. Reporting weaknesses including inconclusive, contradictory and incomplete data. The main conclusion based on these data remains the same as last year: major strengthening of HRD for TB control is urgently needed in many countries in all regions, especially in HBCs.

2.4.4 Infection control

Infection control is a combination of measures aimed at minimizing the risk of TB transmission through early identification of individuals with suspected and known TB, and proper management of these people. Infection control for TB includes organizational, administrative, environmental and personal protective controls, each of which needs to be implemented using a patient-centred approach that minimizes the risk of stigma for TB patients and TB suspects. The importance of

TABLE 2.12
Human resource development (HRD) for TB control, 2007

			HRD PLAN INCLUDES TRAINING NEEDS IN					HRD PLAN INCLUDES STAFFING NEEDS IN					
	HRD NEEDS ASSESS-MENT	COMPRE-HENSIVE STRATEGIC HRD PLAN	DOTS	MANAGE-MENT OF MDR-TB	COLLABO-RATIVE TB/HIV ACTIVITIES	PUBLIC–PUBLIC MIX APPROACHES (PPM)	ACSM	DOTS	MANAGE-MENT OF MDR-TB	COLLABO-RATIVE TB/HIV ACTIVITIES	PUBLIC–PUBLIC MIX APPROACHES (PPM)	ACSM	JOB DESCRIPTIONS UP TO DATE
1 India	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	All
2 China	Y	N	–	–	–	–	–	–	–	–	–	–	None
3 Indonesia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	–
4 Nigeria	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	All
5 South Africa	Y	N	–	–	–	–	–	–	–	–	–	–	All
6 Bangladesh	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	All
7 Ethiopia	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	–
8 Pakistan	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Some
9 Philippines	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	–
10 DR Congo	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	–
11 Russian Federation	N	N	–	–	–	–	–	–	–	–	–	–	None
12 Viet Nam	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	–
13 Kenya	Y	N	–	–	–	–	–	–	–	–	–	–	All
14 Brazil	N	Y	Y	Y	Y	N	Y	Y	Y	Y	N	N	–
15 UR Tanzania	N	Y	–	–	–	–	–	–	–	–	–	–	–
16 Uganda	N	N	–	–	–	–	–	–	–	–	–	–	All
17 Zimbabwe	Y	N	–	–	–	–	–	–	–	–	–	–	All
18 Thailand	Y	Y	Y	–	Y	–	–	Y	–	Y	–	–	–
19 Mozambique	Y	N	–	–	–	–	–	–	–	–	–	–	All
20 Myanmar	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	All
21 Cambodia	Y	N	–	–	–	–	–	–	–	–	–	–	–
22 Afghanistan	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	–
High-burden countries[a]	**14**	**14**	**13**	**11**	**13**	**11**	**12**	**11**	**9**	**10**	**8**	**8**	**19**
AFR (46)[b]	17	18	17	17	16	15	17	16	15	12	12	12	24
AMR (44)	19	18	19	19	19	17	18	16	15	16	15	16	21
EMR (22)	16	18	19	15	14	16	18	19	15	14	16	17	16
EUR (53)	16	13	14	15	14	10	15	13	13	13	9	12	24
SEAR (11)	8	10	10	9	10	7	8	9	8	9	7	7	10
WPR (36)	18	13	13	13	13	10	12	10	10	9	6	8	25
Global (212)	**94**	**90**	**92**	**88**	**86**	**75**	**88**	**83**	**76**	**73**	**65**	**72**	**120**

– Indicates not applicable (no plan, or activity not implemented).

[a] Lower part of table shows the number of countries with affirmative answer (for last column, the number of countries where all or almost all job descriptions were up to date).

[b] The number of countries in each region is shown in parentheses.

implementing these measures has been highlighted by the transmission of MDR/XDR-TB in settings where HIV care is provided. Updated WHO policy guidance on controlling TB infection in health-care and congregate settings as well as within households is now available.

Measures to control infection need to be implemented throughout the health system. While some measures are TB-specific, others are relevant to all infectious diseases. Infection control also requires a multi-disciplinary team (comprising, for example, health staff as well as building surveyors and architects), and interventions to improve TB control can improve collaboration across these disciplines.

Data reported in 2008 suggest that infection control is at an early stage of development in most countries and that better indicators are needed to monitor implementation. No country provided data about actual implementation of interventions, although 75% (131/175) of countries had a policy on TB infection control in hospitals in 2007. The number of countries that reported the existence of a policy on TB infection control in clinics, prisons and military barracks was 114, 94 and 69 respectively.

2.4.5 Practical Approach to Lung Health

The Practical Approach to Lung Health (PAL) is a patient-centred approach to improving the quality of diagnosis and treatment for common respiratory illnesses in primary health-care facilities. It is designed to ensure a consistent approach to diagnosis and treatment at different levels of the health-care system, efficient use of resources (for example, by ensuring that care is provided at the most appropriate level of the health system and that drugs are used rationally), and coordination among TB control services and other health-care services. Implementation requires adaptation of guidelines according to existing national health policies and available

resources. At the end of 2008, 70 countries including nine HBCs had a plan to initiate PAL. Nine countries were piloting PAL and 11 were in the process of expanding it beyond pilot sites (including one HBC, South Africa). National guidelines for PAL were available or in preparation in 21 countries. PAL implementation is totally or partially funded by the Global Fund in 19 countries, including three HBCs.

2.5 Engage all care providers

2.5.1 Public–private mix approaches

Besides the network of health facilities directly within the jurisdiction of the NTP, diagnosis and treatment of TB are provided by a wide array of public, voluntary, corporate and private providers in many countries. Partnerships with these providers are essential to ensure delivery of TB services that are in line with international standards and to achieve global targets (notably the target for case detection). The Stop TB Strategy envisages that NTPs will engage all relevant care providers for TB care and control through PPM approaches.

In 2008, all countries were asked to provide information about the number of different types of providers[1] that had been engaged formally in TB control and the number of new TB cases referred and treated by major categories of public and private providers involved in PPM initiatives. Unfortunately, while most countries have begun implementing PPM-related activities, data were usually too incomplete to make an accurate assessment of the contribution of PPM to case detection and treatment. This suggests that very few countries are using the revised recording and reporting forms recommended by WHO, which are designed to allow disaggregated analysis of referrals and treatment by category of provider (at a minimum on an annual basis from selected facilities). By 2007, only nine HBCs had started systematically to record the source of referral of patients and where they were receiving treatment, and a smaller number were extracting data from these records in a systematic way. The best example of a country that was able to report data was the Philippines, where PPM initiatives that have been implemented in 40% of the country account for 9% of national notifications (ANNEX 1). It is also evident that PPM initiatives are capable of making a major contribution to notifications in Pakistan (BOX 2.7), although here results are from a special study rather than routinely reported data.

In the absence of precise data, countries were also asked to assess the contribution of different providers to referral and treatment by stating whether all, some or no providers in a given category were contributing to diagnosis and treatment. Almost half of the HBCs have managed to involve all health institutions belonging to the public sector health-care network, such as public hospitals, medical college hospitals, army health facilities and prison health facilities. Facilities

[1] Private providers were categorized as private hospitals, private practitioners, NGO/mission clinics and hospitals, corporate (business) health services and private medical college hospitals. Public providers were categorized as general public hospitals, public medical college hospitals, health/social insurance services, prison/detention centres and military facilities.

BOX 2.7

Forging public–private partnerships (PPP) for TB care and control in Pakistan

Pakistan's large and diverse private health sector (both profit and not-for-profit) is extensively used by TB patients. In recent years, successive NTP managers have given high priority to developing viable partnerships with health-care providers in this sector by using a systematic approach that is consistent with the steps recommended in WHO guidelines.[1] Introducing PPM began with a situational analysis that was used to design a range of PPM models suitable for the following types of provider: NGO clinics with and without laboratories; individual general practitioners; general practitioners who are grouped in clusters or linked to NGOs involved in social franchising; private clinics and hospitals; and informal providers (including both those who practise conventional medicine and those who do not). Developing national operational guidelines as a foundation for countrywide implementation was followed by establishing and funding staff positions specifically for PPM at national, provincial and district levels. The government also made a strong financial commitment, with 39% of the domestic funding available for TB control allocated to PPM in the 2005–2010 development plan.

The operational guidelines provide practical advice on several key topics, including the role of agreements with decision makers at district level; creation and maintenance of PPP coordination committees at provincial and district levels (with similar functions to those of the national steering committee); identification and selection of private partners; the value of a memorandum of understanding and how to develop one; training and certification of providers; monitoring and supervision; recording and reporting; and how to ensure that the general public is properly informed.

Many partners are now contributing to TB control via PPP schemes, and evidence of their contribution to case detection is emerging. A WHO-assisted mission conducted in 2008 found that in 2007, PPM initiatives accounted for almost 20% of total notifications (39 635) and just over 20% of notifications of new smear-positive cases (20 129). The table below presents data from three provinces that together had 90% of all registered TB patients in 2007. In the three provinces combined, 51% of all cases detected by non-NTP providers were new sputum smear positive cases while among those detected in the public sector, 36% were new sputum smear-positive cases.

PROVINCE OR CITY	NUMBER OF TB CASES NOTIFIED IN 2007			NUMBER OF NEW SMEAR-POSITIVE TB CASES NOTIFIED IN 2007		
	TOTAL	PPP	% OF NOTIFICATIONS FROM PPP	TOTAL	PPP	% OF NOTICATIONS FROM PPP
North West Frontier	30 699	5 485	18%	11 886	1 961	16%
Sindh (excluding Karachi City)	30 798	1 943	6%	14 718	147	1%
Karachi City	14 887	7 531	51%	6 882	3 625	53%
Punjab	131 742	24 676	19%	47 926	14 396	30%

[1] *Engaging all care providers in TB control. Guidance on implementing public-private mix approaches*. Geneva, World Health Organization, 2006 (WHO/HTM/TB/2006.360).

operated by health insurance agencies were fully engaged with NTP in about one third of the HBCs. Most HBCs have also started to involve at least some private practitioners, private hospitals and NGO health facilities in referral to the NTP, diagnosis according to programme guidelines and/or treatment with anti-TB drugs supplied by the NTP. More countries reported that all of these providers were engaged in national TB control in 2008 compared with 2007.

Several HBCs including Bangladesh, China, India, Indonesia, Kenya, the United Republic of Tanzania, Pakistan and the Philippines have used context-specific, innovative and NTP-led approaches to engage diverse care providers in TB control.

2.5.2 International Standards for Tuberculosis Care

Launched on World TB Day in 2006, the International Standards for Tuberculosis Care[1] provide an excellent basis for standardizing management practices across providers of TB care and are also an effective tool for advocating scale up of PPM implementation. A suggested initial step towards their application is to have the standards endorsed by relevant associations of health professionals. This step has been carried out by at least one professional association in about a quarter of reporting countries including 13 HBCs. One third of all reporting countries were using the standards to promote the engagement of non-NTP care providers. A higher proportion of reporting countries (about 50%, including 14 HBCs) have incorporated the standards into the curricula of medical schools; about 40% of countries (including 13 HBCs) have integrated them into NTP training material.

2.6 Empower people with TB, and communities through partnership

2.6.1 Advocacy, communication and social mobilization

An ACSM strategy involves three distinct sets of activities: advocacy aimed at influencing leaders or decision-makers, communication channelled to individuals and small groups, and social mobilization to empower and secure support for efforts in TB control from civil society and the community as a whole.

All HBCs report implementing ACSM activities that target the general public, TB suspects and patients, health-care providers and policy-makers. However, it is unclear from country reports whether the ACSM activities are a part of a strategic ACSM plan that supports the goals of the NTP; it is also unclear whether the impact of ACSM activities is being evaluated.

Strategic planning of ACSM should begin with a survey of knowledge, attitudes and practices to identify the challenges to be addressed and the audiences to which ACSM activities need to be targeted. It also allows programmes to establish baseline indicators so that progress can be monitored and impact evaluated. It is encouraging that 16 HBCs have conducted or have plans to conduct such a survey (see ANNEX 1).

Only seven HBCs reported involving patient-centred organizations or networks in advocacy activities and/or DOTS implementation. Forging partnerships with other organizations and networks that have expertise in the area of ACSM is an important strategy that can help to address the generally limited capacity of NTPs in this technical area.

2.6.2 Community participation in TB care

Community and patient empowerment are central to a human rights approach to care of TB patients and prevention of the disease. In addition, country experience shows that activities that foster community and patient empowerment can have a positive impact on case detection and treatment outcomes. Unfortunately, the available data do not shed much light on the activities that are being implemented at local level, although some descriptions are provided in ANNEX 1. Eight HBCs reported on the number of basic management units in the country that involved community members as treatment supporters, and only two HBCs reported data about the number of patients who were referred by general members of the community for TB screening or who were cared for in the community during treatment. The scarcity of information on the scope and nature of community involvement within countries indicates the need for greater emphasis and related guidance on this important aspect of TB care and control.

2.6.3 Patients' Charter for Tuberculosis Care

Launched alongside the International Standards for Tuberculosis Care, the Patients' Charter for Tuberculosis Care[2] outlines the rights and responsibilities of TB patients. An essential first step for many countries is translation of the charter into local languages. Many countries are also likely to require some guidance on the most effective way to use the charter; to date, information about its actual use is limited (see also ANNEX 1).

2.7 Enable and promote research

To help pilot, evaluate and scale up the various components and sub-components of the Stop TB Strategy, an increasing number of countries appear to be recognizing the importance of programme-based operational research. A total of 89 countries including 20 HBCs reported that research activities related to TB control were implemented in 2007, up from 49 countries in 2006. Among these countries, almost 400 research projects were reported. Four HBCs (Bangladesh, China, India and the Russian Federation) as well as Mexico listed more than 20 research topics that were being addressed. These topics were related to the basic elements of DOTS components (49 countries), collaborative TB/HIV activities (39 countries), MDR-TB and XDR-TB (39 countries), PAL (10 countries), and social mobilization and community

[1] *International standards for tuberculosis care: diagnosis, treatment, public health*. The Hague, Tuberculosis Coalition for Technical Assistance, 2006.

[2] *The Patients' charter for tuberculosis care: patients' rights and responsibilities*. World Care Council, 2006.

involvement (22 countries). Research on tobacco and diabetes as risk factors for TB, retooling (the introduction of new technologies) and evaluation or feasibility studies related to new technologies was also reported. Fifteen countries implemented surveys of anti-TB drug resistance in 2007. A literature search showed that papers related to TB were published from all but one HBC.

Information from the Stop TB Partnership's three working groups on the development of new tools for TB control also shows that over 100 sites are involved in clinical trials to develop new diagnostics, drugs and vaccines. Most of these sites are in countries where TB is endemic. Eleven countries have provided reports about their experience with the development and introduction of new diagnostics. With several potential new tools moving from the stage of discovery to clinical trials, increasing participation of countries in the evaluation of these tools is required.

2.8 Summary

Progress in implementing the Stop TB Strategy varies across components and among countries. The first component and foundation of the strategy – DOTS – is the most widely implemented. It is also the component for which progress is closest to matching the expectations contained in the Global Plan: the global case detection rate was 63% in 2007 and the treatment success rate 85% in 2006. Nonetheless, urgent improvements in the provision of services for laboratory culture and DST are needed in many countries, and there are countries that continue to report stock-outs of first-line drugs.

Besides DOTS implementation, diagnosis and treatment of MDR-TB and collaborative TB/HIV activities (both under component 2) are the other major parts of the Stop TB Strategy for which implementation can best be quantified. There is clear evidence of progress in implementing interventions such as HIV testing of TB patients and provision of CPT and ART to HIV-positive TB patients, particularly in the African Region. In 2007, 37% of TB patients in the African Region knew their HIV status, 0.2 million HIV-positive TB patients were enrolled on CPT and 0.1 million HIV-positive TB patients were started on ART; in each case, figures were higher than those reported in previous years. Nonetheless, the numbers of HIV-positive TB patients accessing services for provision of CPT and ART remain small compared with the estimated 1.4 million HIV-positive TB cases. Collaborative TB/HIV activities need to be scaled up to ensure that many more people know their HIV status and many more HIV-positive people, with and without TB, have access to appropriate treatment and care.

Progress in diagnosing MDR-TB and treating patients with the disease is mostly confined to the European Region and South Africa. Globally, just under 30 000 cases of MDR-TB were notified to WHO in 2007, or 8.5% of the estimated global total of smear-positive cases of MDR-TB. Of these notified cases, 3681 were started on treatment in projects or programmes affiliated to the GLC (and are thus known to be providing treatment according to international guidelines), which represents only 1% of the smear-positive cases of MDR-TB estimated to exist globally. Although the number of patients started on treatment is expected to increase to around 14 000 in 2009, this still represents only 4% of the smear-positive cases of MDR-TB estimated to exist globally. To meet the targets set in the Global Plan, diagnosis and treatment need to be rapidly expanded, especially in China, India and the Russian Federation.

The extent to which components 3–6 of the Stop TB Strategy are being implemented is less well understood, because to date progress is more difficult to quantify. The integration of diagnosis and treatment of TB into primary health care in almost all countries as well as reported alignment with broader health sector planning frameworks and expansion of PAL (all part of component 3) are encouraging. However, considerable work on HRD and infection control is needed in many countries in all regions. PPM and the ISTC (component 4) are being introduced and expanded in an increasing number of countries, and examples from specific countries such as Pakistan and the Philippines demonstrate the potential of PPM to contribute to increased case detection. In order to better understand the relative contribution of different providers to the detection, referral and treatment of cases requires much greater use of routine recording and reporting forms that allow disaggregated analysis for different categories of provider. ACSM (component 5) is still a new area for many countries. Much more guidance and technical support are necessary to ensure that interventions are appropriately designed and evaluated. Finally, while operational research and the introduction of new tools (both part of component 6) are occurring, the information available for this report was comparatively limited.

This chapter concludes that there is a need in most countries for major scaling up of the interventions and approaches included in the Stop TB Strategy. For this to be feasible, increased funding is required. Financing is the topic of the next chapter.

CHAPTER 3

Financing

Implementing the Stop TB Strategy at the scale required to achieve the 2015 targets for global TB control (see also CHAPTER 1 and CHAPTER 2) requires accurate budgeting of the financial resources required, mobilization of the necessary funding and spending of available funds such that TB control outcomes are improved. Analysis of budgets and funding for TB control was introduced into the annual WHO report on global TB control in 2002, and expenditures have been reported on since 2004.

This chapter provides WHO's latest analysis of financing of TB control. As with the previous two chapters, emphasis is placed on 22 high-burden countries (HBCs), but analyses for all countries reporting financial data are also included. The chapter is structured in eight major sections. The first section summarizes the data that were reported to WHO in 2008. The next six sections present the budgets of national TB control programmes (NTPs) from 2002 to 2009 and the sources of funding and funding gaps for these budgets; the total costs of TB control (including the cost of resources that are used within the general health system as well as the costs included in NTP budgets), also for 2002–2009; comparisons of funding requirements reported by countries with estimated funding requirements that were contained in the Global Plan to Stop TB, for the period 2006–2009; per patient costs and budgets in 2009; a comparison of expenditures with available funding and with changes in the number of cases that have been detected and treated; and the contribution of the Global Fund to financing for TB control. The eighth section discusses why funding gaps persist and the possible consequences of the global financial crisis for TB control.

Further details are also provided in ANNEX 1 and ANNEX 3.

3.1 Data reported to WHO in 2008

WHO received financial data from 158 out of 212 (75%) countries and territories in 2008, similar to the number that reported data in 2007.[1] Complete budget data for 2009 were provided by 102 countries (FIGURE 3.1), 98 countries provided complete budget data for 2008 and 92 countries provided complete expenditure data for 2007. Overall, countries reporting financial data accounted for 98% of the global burden of TB. The countries that provided financial reports accounted for 97% or more of the regional burden of TB in five WHO regions, with a lower figure of 83% for the European Region. This is the most complete reporting of financial data to WHO since financial monitoring began in 2002.

Complete budget data for 2009 were reported by all HBCs except South Africa (FIGURE 3.1). Of particular note is Thailand, which provided complete budget data for the first time in five years following a comprehensive planning and budgeting effort that was facilitated by use of the WHO planning and budgeting tool (BOX 3.1).[2] Expenditure data for 2007 were reported by all HBCs except South Africa and Uganda (data not shown).

Considerable clarification and verification of financial data by WHO are still required, but the quality of the data when first submitted continues to improve. In 2008, this was notable for the African Region, the Region of the Americas and the South-East Asia Region. Improvements were probably facilitated by related work on planning and budgeting undertaken with 35 African countries in 2007 and with nine countries from the South-East Asia Region in 2008, as well as close collaboration with countries in the Region of the Americas during regional meetings.

3.2 NTP budgets, available funding and funding gaps

3.2.1 High-burden countries

NTP budgets in the 22 HBCs amount to US$ 2.5 billion in 2009, almost three times their level in 2002 (TABLE 3.1; FIGURE 3.2; FIGURE 3.3). The Russian Federation has the highest budget (US$ 1.2 billion), followed by South Africa (US$ 352 million), China (US$ 225 million), India (US$ 100 million) and Brazil (US$ 64 million). These five countries account for 80% of the NTP budgets reported for 2009 by the 22 HBCs. The eight HBCs in the African Region (excluding South Africa) had a combined budget of US$ 225 million in 2009, only 10% of the total for all 22 HBCs.

Much of the increase in NTP budgets since 2007 is explained by an increase in the budget for MDR-TB (FIGURE 3.2), almost all of which (US$ 372 million, or 88% of a total of US$ 422 million) is accounted for by the Russian Federation and South Africa (ANNEX 1). Nonetheless, NTP budgets increased in most HBCs between 2007 and 2009, and NTP budgets have increased substantially in all HBCs except Viet Nam since 2002 (FIGURE 3.4; ANNEX 1).

In 2002–2006, activities to support the DOTS component of the Stop TB Strategy accounted for the largest proportion of NTP budgets (FIGURE 3.2). However, budgets for collaborative TB/HIV activities, ACSM, PPM and MDR-TB are much more in evidence in 2009 compared with previous years (FIGURE 3.2; FIGURE 3.5). This suggests that many HBCs are

[1] *Global tuberculosis control: surveillance, planning and financing. WHO report 2008*. Geneva, World Health Organization, 2008 (WHO/HTM/TB/2008.393).

[2] See http://www.who.int/tb/dots/planning_budgeting_tool/en/index.html

FIGURE 3.1
Reporting of financial data, NTP budgets for 2009

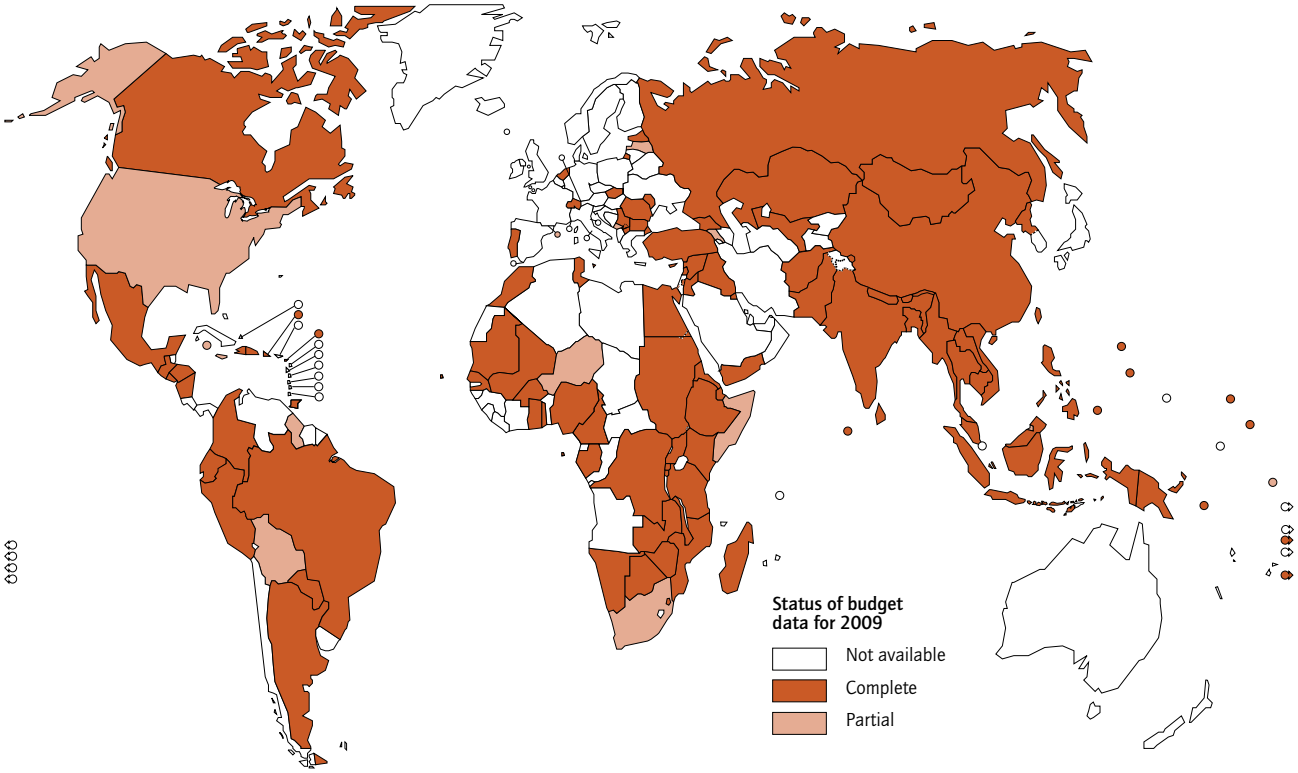


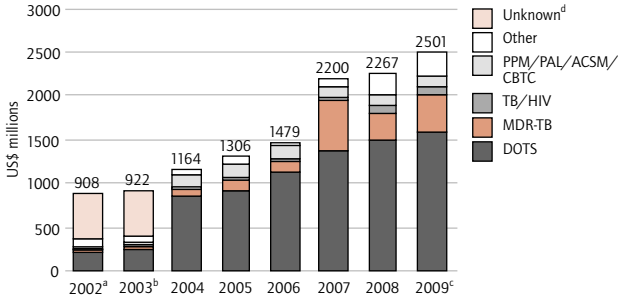
TABLE 3.1
NTP budgets, available funding, cost of utilization of general health-care services and total TB control costs (US$ millions), high-burden countries, 2009

		AVAILABLE FUNDING						
	NTP BUDGET	GOVERNMENT (EXCLUDING LOANS)	LOANS	GRANTS (EXCLUDING GLOBAL FUND)	GLOBAL FUND	FUNDING GAP	COST OF UTILIZATION OF GENERAL HEALTH-CARE SERVICES	TOTAL TB CONTROL COSTS[a]
1 India	100	9.2	37	9.8	14	30	38	138
2 China	225	163	11	0.7	41	9.8	0	225
3 Indonesia	80	34	0	13	17	16	4.8	85
4 Nigeria	44	7.3	0	4.4	13	19	11	55
5 South Africa	352	–	–	–	–	–	251	603
6 Bangladesh	15	4.9	1.1	0	9.2	0.1	5.8	21
7 Ethiopia	26	1.1	0	1.0	6.2	18	8.5	35
8 Pakistan	54	10	0	12	6.4	25	3.8	58
9 Philippines	23	7.9	0	0	10	4.4	11	34
10 DR Congo	53	1.6	0	3.3	11	37	12	66
11 Russian Federation	1 249	1 014	0	1.4	6.9	226	24	1 273
12 Viet Nam	13	5.3	0	4.3	3.9	0	13	27
13 Kenya	37	6.6	1.0	12	2.5	15	5.1	42
14 Brazil	64	50	0.6	1.5	0	11	28	92
15 UR Tanzania	25	7.1	0	4.7	5.4	7.4	4.2	29
16 Uganda	17	1.3	0	0.1	4.8	11	1.2	18
17 Zimbabwe	17	0.6	0	4.1	3.4	9.4	4.1	22
18 Thailand	50	46	0	0	0.8	3.2	1.0	51
19 Mozambique	25	6.4	0	7.9	4.4	6.0	5.9	31
20 Myanmar	11	1.2	0	5.3	0	4.3	1.9	13
21 Cambodia	11	1.1	0	1.3	4.6	3.7	2.5	13
22 Afghanistan	10	0.2	0	5.4	4.1	0.3	1.2	11
High-burden countries	**2 501**	**1 379**	**50**	**93**	**169**	**457**	**438**	**2 939**

– Indicates not available.

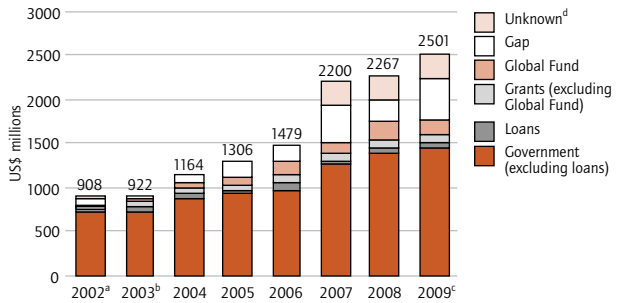
[a] Calculated as NTP budget plus the cost of utilization of general health-care services.

FIGURE 3.2
NTP budgets by line item, high-burden countries, 2002–2009



[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).
[c] Estimates assume budget 2009 equal to budget 2008 for South Africa.
[d] "Unknown" applies to Afghanistan 2002–2004, Russian Federation 2002–2003 and Mozambique 2002–2003. In these years, a breakdown by line item was not available.

FIGURE 3.3
NTP budgets by source of funding, high-burden countries, 2002–2009



[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).
[c] Estimates assume budget 2009 equal to budget 2008 for South Africa.
[d] "Unknown" applies to Afghanistan 2004, DR Congo 2002, Nigeria 2002, South Africa 2007–2009 and UR Tanzania 2007. In these years, a breakdown by funding source was not available or only partially available.

expanding the range of interventions to control TB, in line with the Stop TB Strategy.

The large budget increases described above have been accompanied by big improvements in available funding (FIGURE 3.3; FIGURE 3.4). Funding for NTP budgets in the 22 HBCs reached US$ 1.8 billion in 2009, up from US$ 0.8 billion in 2002. Governments of HBCs have provided most of the available funding since 2002; this funding amounts to US$ 1.4 billion in 2009 (57% of the total budget, and 85% of the available funding) (TABLE 3.1).[1] Financing from the Global Fund has become more important since 2004, reaching US$ 169 million (7% of the total budget and 10% of the available funding) in 2009. The Global Fund accounts for 65% of total grant funding for HBCs in 2009. Grants provided to HBCs from sources other than the Global Fund have not changed much since 2002, and in 2009 account for 4% of the total budget (and 5% of available funding).

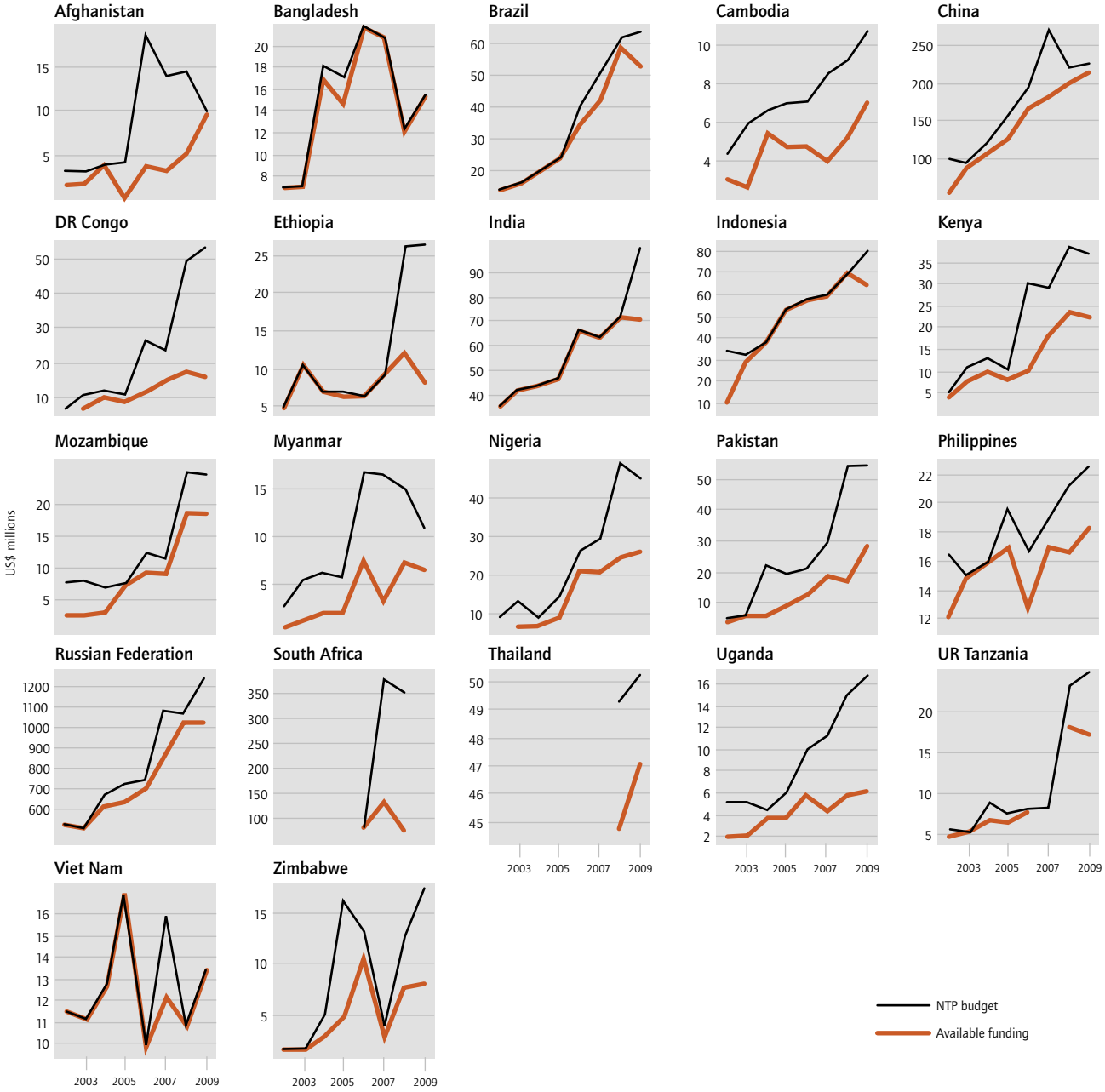
Despite these increases in funding, funding gaps that total US$ 457 million (18% of the total budget) have been reported for 2009; this could be as high as US$ 0.7 billion if the funding gap in South Africa could be accurately quantified (TABLE 3.1).[2] All HBCs except Viet Nam reported funding gaps in 2009. In India, Indonesia and Pakistan, these gaps may be reduced or closed by funding from grants from the Global Fund approved in round 8 or via the so-called "rolling continuation channel" of funding (ANNEX 1).

Most of the additional domestic funding since 2002 (government funding including loans) has come from three countries only: Brazil, China and the Russian Federation (an extra US$ 717 million in 2009 compared with 2002). These three countries plus Thailand will fund 77% or more of their NTP budgets from domestic sources in 2009 (TABLE 3.1). In other HBCs, increases in funding have come mainly from the Global Fund. In 2009, grants from the Global Fund will finance around one-third or more of the NTP budget in seven countries: Bangladesh, the Philippines, Cambodia, Afghanistan, Nigeria, Uganda and Viet Nam (in that order). In addition, grants from sources besides the Global Fund will finance one third or more of the NTP budget in Afghanistan, Mozambique, Myanmar, Kenya and Viet Nam (TABLE 3.1).

In absolute terms, the largest funding gaps are those reported by the Russian Federation, the Democratic Republic of the Congo, India, Pakistan, Nigeria and Ethiopia (in that order), which together account for 78% of reported funding gaps. The Russian Federation alone accounts for 50% of the total funding gaps reported by HBCs. Proportionally, the largest gaps are (in order) in the Democratic Republic of the Congo, Ethiopia, Uganda, Zimbabwe, Pakistan, Nigeria, Kenya, Myanmar and Cambodia; funding gaps in these countries represent more than one-third of the required budget (TABLE 3.1). Only three HBCs reported no funding gap

[1] Figures would probably be higher if complete information on funding from provincial governments in South Africa were available.
[2] The 11% of NTP budgets for which funding is unknown, which is accounted for by South Africa, is likely to be a mixture of funding from provincial governments and a funding gap (ANNEX 1).

FIGURE 3.4
NTP budgets and available funding, high-burden countries, 2002–2009



or a negligible funding gap: Afghanistan, Bangladesh and Viet Nam.

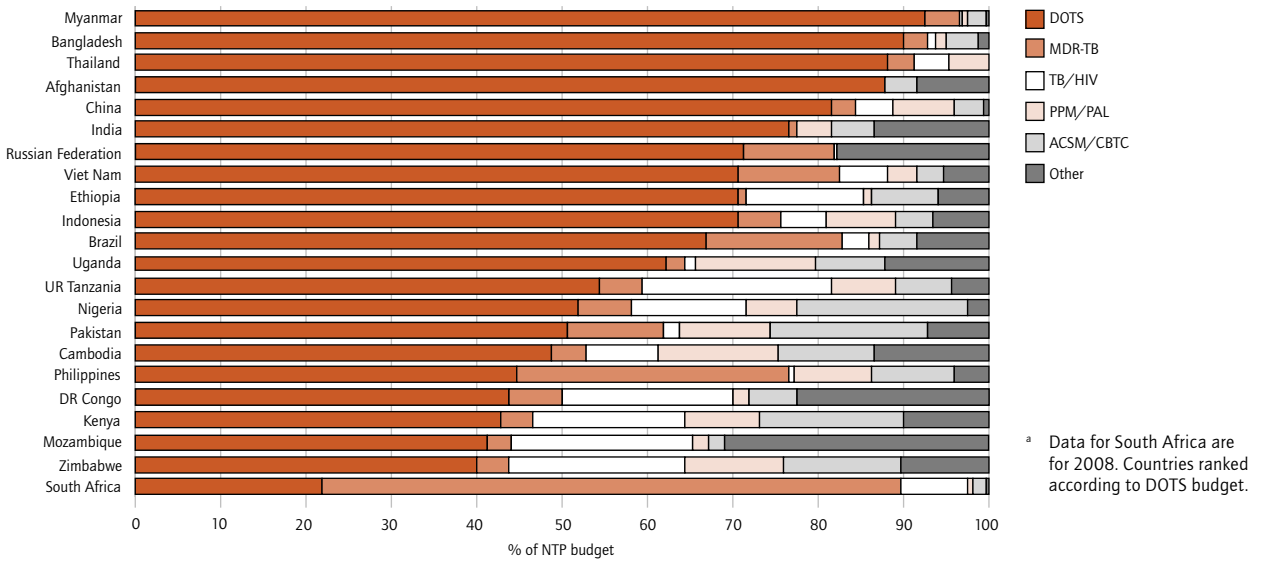
3.2.2 All countries

WHO began collecting financial data from all countries (in addition to the 22 HBCs) in 2003 and reported these data for the first time in 2004. Total NTP budgets in 2009, by WHO region and source of funding, are shown for the 103 countries for which data are available (22 HBCs and 81 other countries) in FIGURE 3.6.[1] Globally, these countries account for 93% of incident TB cases; at regional level, they account for almost all TB cases in the African, Eastern Mediterranean, South-East Asia and Western Pacific regions (89–99.6%, depending on the region), for 85% of the regional total in the Region of the Americas (up from 74% in 2008), and for 66% of the regional total in the European Region. NTP budgets amount to US$ 3.6 billion in 2009, up from US$ 2.6 billion in 2008 (for countries with 91% of global cases) and US$ 1.6 billion in 2007 (also for countries that accounted for 91% of TB cases globally). The funding gaps reported by these 103 countries total US$ 0.9 billion, of which US$ 0.5 billion is in the European Region. This is somewhat surprising given the relative wealth of the European Region. Overall, the reported funding gap is more than double the US$ 385 million reported for 2008.

Budgetary funding gaps as a proportion of the total bud-

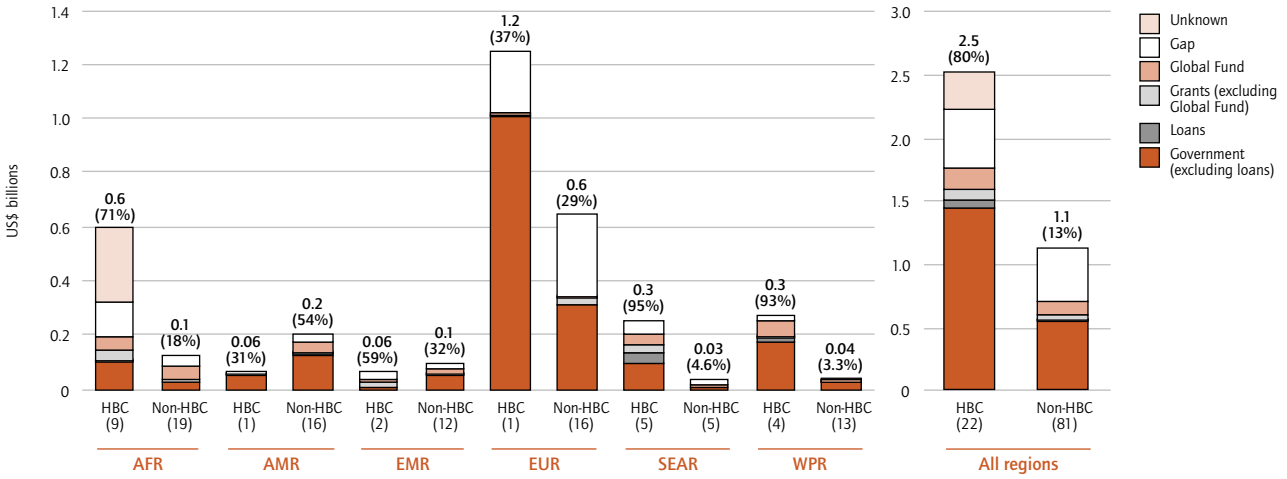
[1] The total of 103 countries is one more than the total of 102 countries mentioned in section 3.1, since South Africa is included in FIGURE 3.6 with the assumption that the budget for 2009 would be the same as the budget reported for 2008.

FIGURE 3.5
NTP budgets by line item, high-burden countries,[a] 2009



[a] Data for South Africa are for 2008. Countries ranked according to DOTS budget.

FIGURE 3.6
Regional distribution of NTP budgets by source of funding, 22 high-burden countries and 81 non high-burden countries, 2009.
Numbers in parentheses above bars show the percentage of all estimated incident cases of TB in the region that are accounted for by the countries included in the bar. Numbers in parentheses on the x-axis show the number of countries contributing to each bar.



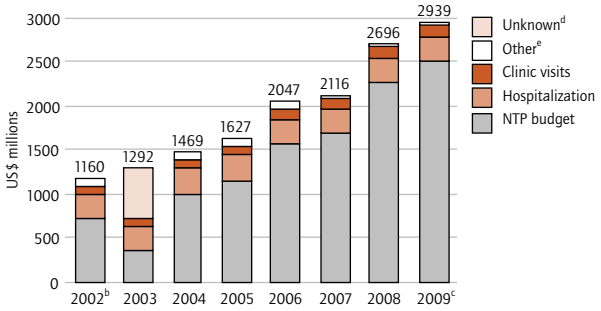
get were higher for non high-burden countries compared with HBCs in the African, European and South-East Asia regions. Funding gaps as a proportion of the total budget were similar for Brazil and non-HBCs in the Region of the Americas. Funding gaps were lower for non high-burden countries relative to HBCs in the Eastern Mediterranean and Western Pacific regions. Overall, NTP budgets per incident TB case were higher for HBCs compared with non-HBCs in the African Region and the European Region, and much lower for HBCs compared with non-HBCs in the Region of the Americas and the Eastern Mediterranean, South-East Asia and Western Pacific regions.

3.3 Total costs of TB control

3.3.1 High-burden countries

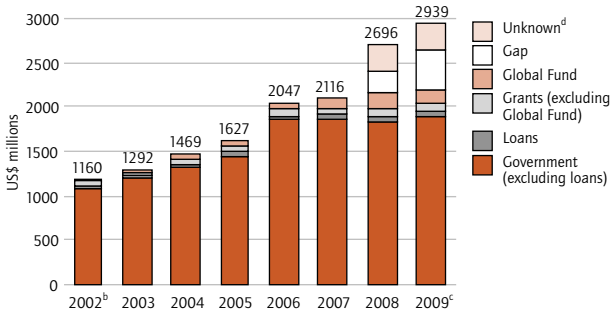
NTP budgets include only part of the resources needed to control TB. Specifically, they do not include the costs associated with using general health-service staff resources and infrastructure for TB control, both of which are used when TB patients are hospitalized or visit outpatient facilities during treatment. For the 22 HBCs combined, the total cost of TB control will reach almost US$ 2.9 billion in 2009 if funding gaps can be closed, almost three times higher than the US$ 1.2 billion actual expenditures estimated for 2002 (FIGURES 3.7–3.10; TABLE 3.1). The total of US$ 2.9 billion is mostly for DOTS (US$ 2 billion, or 69%). The other major components are MDR-TB (US$ 0.4 billion, or 14%; 88% of this total is accounted for by the Russian Federation and South Africa), TB/HIV (US$ 90 million, or 3%) and ACSM

FIGURE 3.7
Total TB control costs by line item, high-burden countries,[a] 2002–2009



[a] Total TB control costs for 2002–2007 are based on expenditure data, whereas those for 2008–2009 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 2009 equal to costs 2008 for South Africa.
[d] "Unknown" applies to Russian Federation 2003.
[e] "Other" includes costs for fluorography in the Russian Federation that are not reflected in NTP budget or NTP expenditure data.

FIGURE 3.8
Total TB control costs by source of funding, high-burden countries,[a] 2002–2009



[a] Total TB control costs for 2002–2007 are based on expenditure data, whereas those for 2008–2009 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 2009 equal to costs 2008 for South Africa.
[d] "Unknown" applies to South Africa 2008–2009.

(US$ 70 million, or 2%). The remaining 12% includes PPM, surveys of the prevalence of TB disease, community TB care and a variety of miscellaneous activities.

Total costs have increased year-on-year since 2002 across all HBCs, a pattern that is repeated in most individual countries (FIGURE 3.9). Exceptions are Bangladesh and Viet Nam; however, the apparently low expenditures in these countries in 2007 probably reflect only partial reporting of expenditures. The steady climb in the total resources available for TB control in Brazil, China and India since 2002 is impressive. Increases in projected costs during 2002–2009 arise because of the large increases in NTP budgets (described above) and, to a much lesser extent, because of the higher costs of clinic visits and hospitalization that are associated with treating more patients (FIGURE 3.7).

As in previous years, the Russian Federation and South Africa rank first and second in terms of total costs. Together, they account for US$ 1.9 billion (64%) of the total of US$ 2.9 billion (FIGURE 3.10; TABLE 3.1). China (US$ 225 million), India (US$ 138 million), Brazil (US$ 92 million) and Indonesia (US$ 85 million) rank third to sixth. These six countries account for 82% of the total cost of TB control in the 22 HBCs in 2009. In South Africa, there are two major reasons for the high cost of TB control estimated for 2009. One is the large costs associated with maintaining around 8000 TB beds in district hospitals and specialized TB hospitals at a unit price per bed-day of around US$ 100 and US$ 40, respectively. The second is a large budget for the diagnosis and treatment of MDR-TB (ANNEX 2; SECTION 3.2). The largest components of the budget for MDR-TB are for renovating and constructing infrastructure in line with a national policy of hospitalizing all patients with MDR-TB for at least six months; improving infection control in MDR-TB and XDR-TB units as well as in general district hospitals; and providing second-line anti-TB drugs for the enrolment of around 5000 patients on treatment. High costs in the Russian Federation in 2009 are associated with continued staffing and maintenance of an extensive network of TB hospitals and sanatoria; a large budget for second-line anti-TB drugs to treat MDR-TB patients (US$ 133 million, with an estimated total of about 4000 cases to be enrolled on treatment in 2009); and continued use of fluorography for mass population screening.

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 (ANNEX 2). This assumption, together with the implicit assumption that health systems have sufficient capacity to support the treatment of a growing numbers of patients in 2009,[1] means that the resources available for TB control are estimated to have increased from US$ 1.2 billion in 2002 to US$ 2.2 billion in 2009 (FIGURE 3.8). For all HBCs, the estimated gap between the funding already available and the total cost of TB control is between US$ 0.5 and US$ 0.7 billion in 2009.[2]

Of the US$ 2.2 billion available in the 22 HBCs in 2009, 88% is from HBC governments, 8% (US$169 million) is from the Global Fund and 4% (US$ 94 million) is from grants from sources other than the Global Fund. The distribution of funding sources is different when the Russian Federation and South Africa are excluded: the government contribution to available funding drops to 70%, the Global Fund contribution increases to 19%, and grants from sources besides the Global Fund account for 11%.

As in previous years, there is considerable variation in the distribution of funding sources among countries (FIGURE 3.11; TABLE 3.1). For example, Afghanistan is highly dependent on grant financing and four other countries (Ban-

[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.
[2] The range reflects uncertainty about the level of funding from provincial governments in South Africa.

FIGURE 3.9
Total TB control costs, high-burden countries, 2002–2009

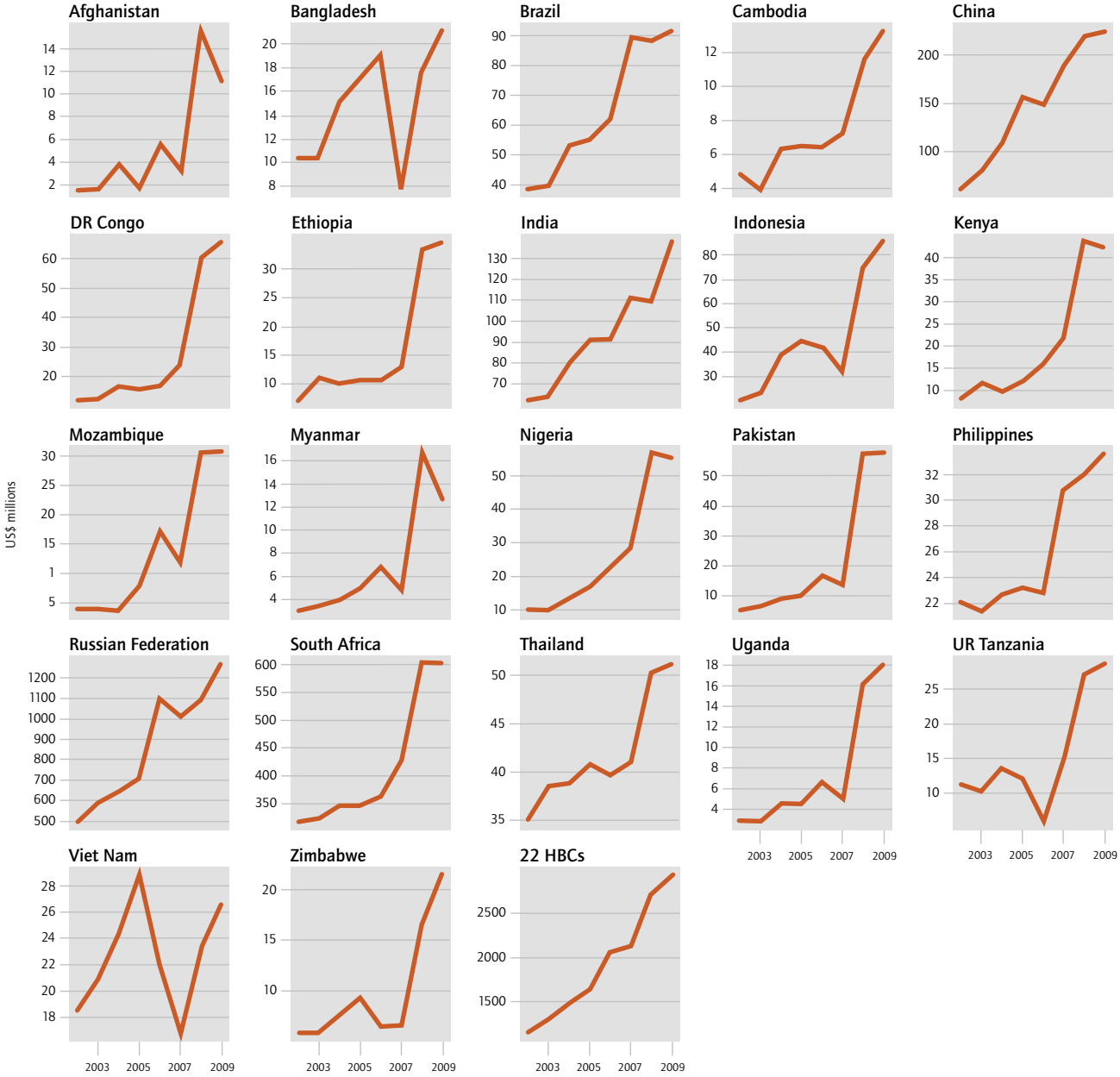


FIGURE 3.10
Total TB control costs by country, high-burden countries, 2002–2009

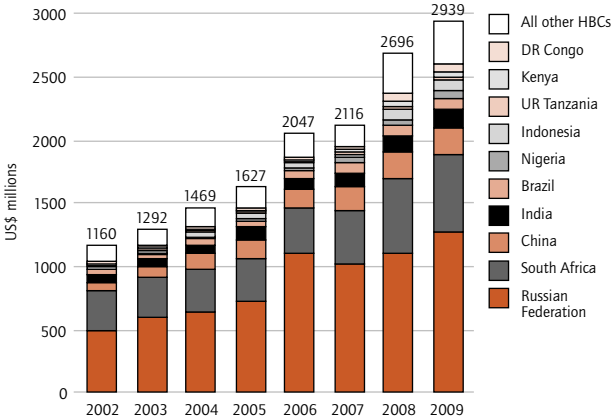
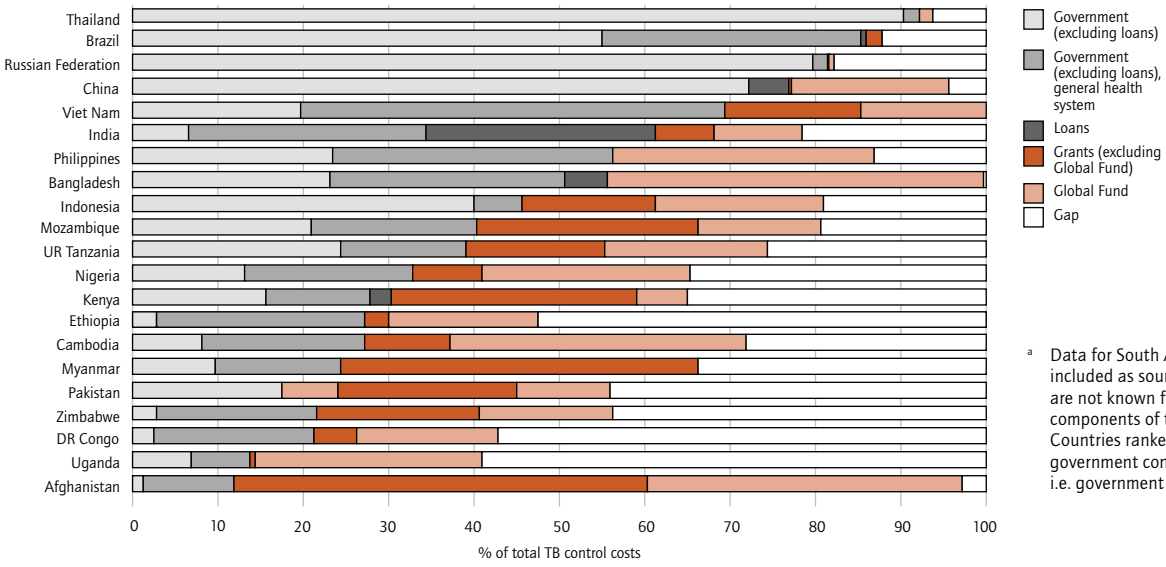


FIGURE 3.11
Total TB control costs by source of funding, 21 high-burden countries,[a] 2009

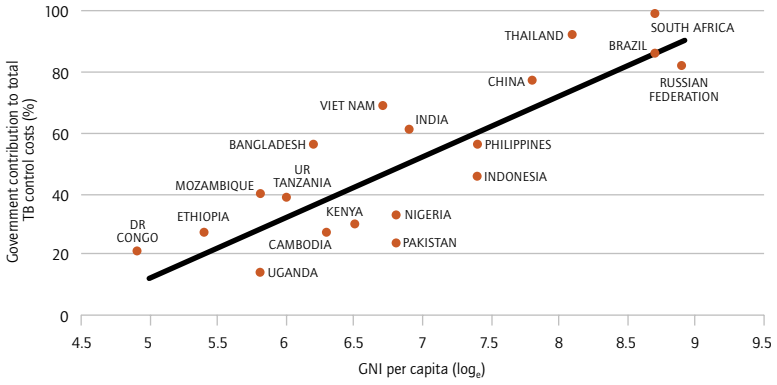


[a] Data for South Africa not included as sources of funding are not known for most components of the budget. Countries ranked according to government contribution, i.e. government plus loans.

gladesh, Cambodia, Mozambique and Myanmar) rely on grants to cover at least 40% of the total resources needed for TB control. In nine HBCs, grant funding accounts for more than 50% of the currently available funding in 2009 (Afghanistan, Cambodia, the Democratic Republic of the Congo, Kenya, Mozambique, Myanmar, Pakistan, Uganda, and Zimbabwe). In contrast, grant financing contributes less than 2% of the total funding required in 2009 in Brazil, the Russian Federation and Thailand.

The share of the total costs financed by HBC governments is closely related to average income levels (FIGURE 3.12), although there appears to be scope to increase the government contribution in several countries (for example, Indonesia, Pakistan and the Russian Federation).

FIGURE 3.12
Government contribution (including loans) to total TB control costs by gross national income (GNI) per capita, 19 high-burden countries,[a] 2009



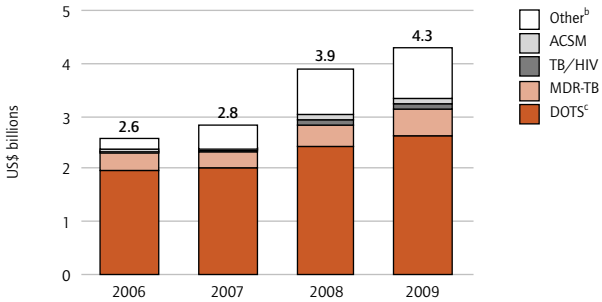
[a] Data on GNI per capita not available for Afghanistan, Myanmar and Zimbabwe.

3.3.2 All countries

Total costs for 2006–2009 can be estimated for 111 countries that collectively account for 93% of TB cases globally (FIGURE 3.13).[1] The total costs of TB control will increase from US$ 2.6 billion in 2006 to US$ 4.3 billion in 2009 (if funding gaps in 2009 can be closed). DOTS implementation accounts for the largest single share of these costs, but the share for MDR-TB and a range of other interventions is increasing. The share of total costs accounted for by collaborative TB/HIV activities and ACSM remains small.

For 89 countries outside the 22 HBCs for which data are available, trends in total costs by region and for all regions combined are shown in FIGURE 3.14. Costs are generally

FIGURE 3.13
Total TB control costs by line item, 22 high-burden countries and 89 other countries,[a] 2006–2009

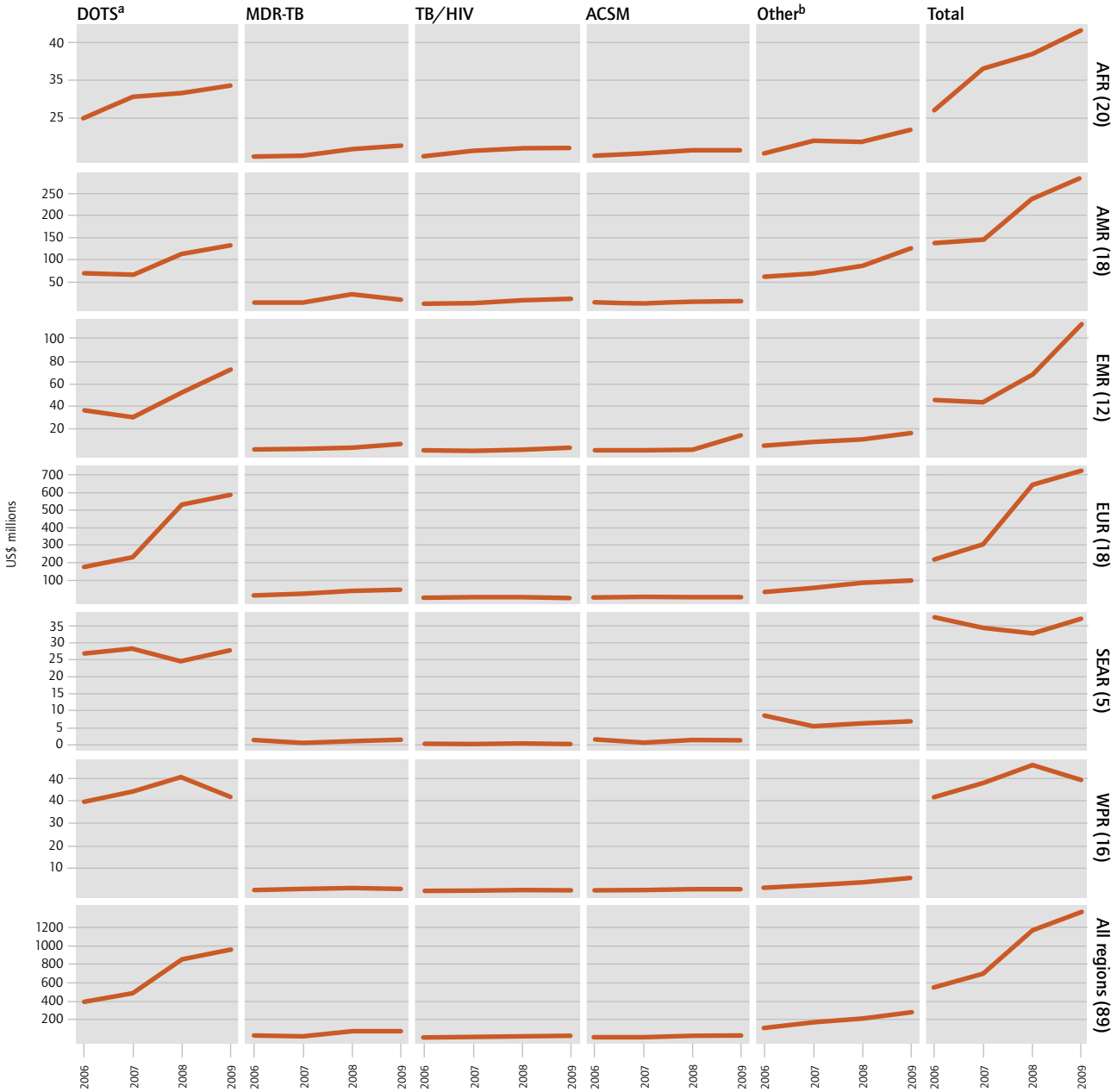


[a] These 111 countries account for 93% of the global total of 9.27 million incident cases of TB estimated in 2007.
[b] "Other" includes PPM, PAL, CBTC, operational research, surveys and other.
[c] DOTS includes the cost of clinic visits and hospitalization.

[1] These 111 countries reported data for at least two of the years 2006–2009. For countries that did not report data in all four years, costs were estimated using data for the two or three years for which data were reported.

FIGURE 3.14

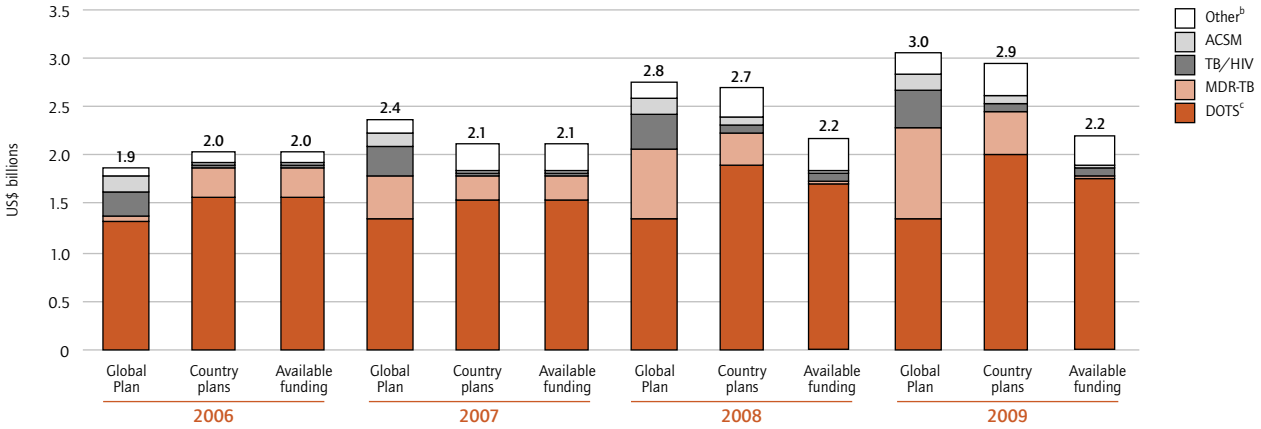
Total TB control costs by region, 89 non high-burden countries, 2006–2009. Numbers in parentheses show the number of countries included in the analysis in each region.



[a] DOTS includes the cost of clinic visits and hospitalization.
[b] "Other" includes PPM, PAL, CBTC, operational research, surveys and other.

FIGURE 3.15

Total TB control costs: the Global Plan compared with country plans[a] and available funding, high-burden countries, 2006–2009



[a] Costs of country plans are based on expenditures (2006–2007) and budgets (2008–2009).
[b] "Other" includes PPM, PAL, CBTC, operational research, surveys and other.
[c] DOTS includes the cost of clinic visits and hospitalization.

increasing (the exception being countries in the South-East Asia Region where the trend is relatively flat) and are mostly accounted for by DOTS implementation.

3.4 Comparisons with the Global Plan

The Global Plan sets out what needs to be done between 2006 and 2015 to achieve the 2015 targets for TB control that have been set within the context of the Millennium Development Goals (MDGs) and by the Stop TB Partnership (see also CHAPTER 1 and CHAPTER 2). To assess the extent to which planning and financing for TB control at country level are aligned with the Global Plan, the financial resources estimated to be required for TB control in the Global Plan can be compared with the financial data reported by countries.

3.4.1 High-burden countries

The cost of TB control and available funding reported by countries during the period 2006–2009 are compared with the funding requirements included in the Global Plan in FIGURE 3.15.[1] In 2006, actual costs (based on expenditure data) were slightly above those estimated to be required in the Global Plan, although there were shortfalls for collaborative TB/HIV activities and ACSM. From 2007 to 2009, the total funding requirements set out in country plans almost match those included in the Global Plan (for example, US$ 2.9 billion and US$ 3.0 billion respectively in 2009). However, available funding falls short of the amounts included in country plans and the Global Plan. The gap was US$ 0.3 billion in 2007 and US$ 0.8 billion in 2009.

For MDR-TB and collaborative TB/HIV activities, the funding estimated to be required in the Global Plan is much higher than the funding estimated to be required by countries. For MDR-TB, the shortfall is mainly accounted for by China and India. In contrast, the funding estimated to be required for DOTS by countries is higher than the funding estimated to be required in the Global Plan.

These aggregated comparisons conceal the fact that five HBCs have planned costs consistent with those detailed in the Global Plan in 2009: Brazil, Cambodia, the Democratic Republic of the Congo, Thailand and the United Republic of Tanzania. In addition, there are five countries in which the discrepancy is due to the mid-2007 revision of the MDR-TB component of the Global Plan to include much more ambitious targets.[2] With the exception of MDR-TB, country plans are consistent with the Global Plan in China, Indonesia, the Philippines, the Russian Federation and Viet Nam (ANNEX 1).

For collaborative TB/HIV activities, the shortfall is mainly in Cambodia, the Democratic Republic of the Congo, Ethiopia, Kenya, India, Mozambique, Myanmar, Nigeria, Uganda and Zimbabwe. In these countries, the shortfall is exaggerated because the funding requirements for several collaborative TB/HIV activities (including the most costly ones such as ART) are part of the budgets of national AIDS control programmes, rather than NTPs.[3] For ACSM, there are five countries with ACSM budgets comparable to or larger than those indicated in the Global Plan: Brazil, Cambodia, Kenya, Pakistan and the Philippines.

Country-by-country comparisons with the Global Plan are presented in ANNEX 1.

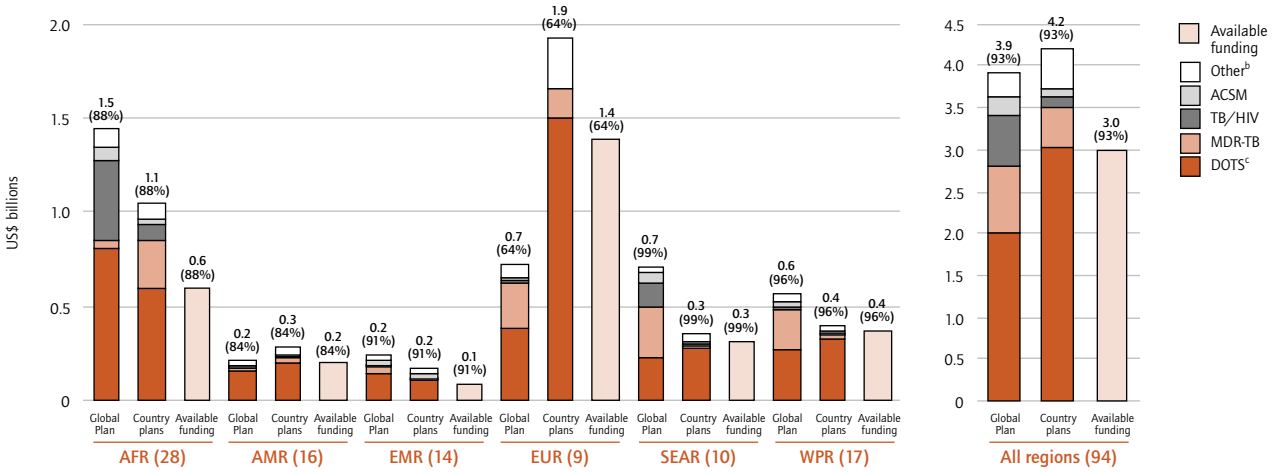
3.4.2 All countries

The financial data submitted to WHO allow total TB control costs for 2009 to be estimated for 94 of the 171 countries that were included in the Global Plan (22 HBCs and 72 other countries).[4] These 94 countries account for 93% of all incident cases of TB arising each year.[5]

[1] See ANNEX 2 for an explanation of how costs for individual countries were derived from the Global Plan.
[2] *The Global MDR-TB & XDR-TB response plan, 2007–2008*. Geneva, World Health Organization, 2007 (WHO/HTM/TB/2007.387).
[3] In most of the countries that reported data, the costs of HIV testing, co-trimoxazole preventive therapy and antiretroviral treatment were part of the budgets of national AIDS control programmes rather than the budgets of NTPs.
[4] Of the 103 countries included in FIGURE 3.6, nine were not considered in the Global Plan cost estimates.
[5] All of the 171 countries included in the Global Plan accounted for 98% of TB cases globally in 2004.

FIGURE 3.16

Total TB control costs in 22 high-burden countries and 72[a] other countries: the Global Plan compared with country plans and available funding, 2009. Numbers in parentheses above bars show the percentage of all estimated incident cases of TB in the region that are accounted for by the countries included in the bar. Numbers in parentheses on the x-axis show the number of countries contributing to each bar.



[a] Canada, Cyprus, Malta, the Netherlands, Portugal, Serbia, Slovakia, the former Yugoslav Republic of Macedonia and Switzerland are excluded because they were not included in the Global Plan.

[b] "Other" includes PPM, PAL, CBTC, operational research, surveys and other.

[c] DOTS includes the cost of clinic visits and hospitalization.

A regional comparison of costs planned by countries with the costs included in the Global Plan is shown for these 94 countries in FIGURE 3.16. Overall, country plans indicate planned costs of US$ 4.2 billion in 2009 (up from US$ 3.1 billion in 2008 and US$ 2.3 billion in 2007), compared with US$ 3.9 billion in the Global Plan, and available funding of US$ 3.0 billion. Of the available funding of US$ 3.0 billion, 87% is funding from governments (including loans), 9% is funding from Global Fund grants and 4% is funding from donors other than the Global Fund.

The total of US$ 4.2 billion required for full implementation of country plans in these countries in 2009 is mostly for DOTS (US$ 3.0 billion, or 72%). The other major components are MDR-TB (US$ 0.5 billion, or 12%; 76% of the total for MDR-TB is accounted for by the Russian Federation and South Africa), collaborative TB/HIV activities (US$ 120 million, or 3%) and ACSM (US$ 100 million, or 2%). The remaining 11% includes PPM, surveys of the prevalence of TB disease, community TB care and a variety of miscellaneous activities.

The apparent similarity between the Global Plan and country plans when data are aggregated for all countries is distorted by the comparatively high cost of country plans in the European Region. As FIGURE 3.16 makes clear, the funding estimated to be required for MDR-TB in country plans falls far short of Global Plan estimates in the South-East Asia and Western Pacific regions. This is consistent with the relatively small number of cases of MDR-TB that countries in these regions (notably China and India) expect to diagnose and treat in 2009 (as documented in CHAPTER 2). Country plans also indicate lower planned spending on collaborative TB/HIV activities compared with the Global Plan in the African Region, which has 79% of the estimated global total of HIV-positive TB cases. This is consistent with data on the current level of implementation of collaborative TB/HIV activities (CHAPTER 2), although the difference (as noted above) is exaggerated because the planned activities and associated funding of national AIDS control programmes are not included in the data reported by NTPs.[1] It is only in the Eastern Mediterranean Region and the Region of the Americas that country plans appear to be consistent with the Global Plan.

Excluding the European Region, the funding gaps reported by countries amount to US$ 0.6 billion in 2009 (US$2.3 billion required compared with US$ 1.7 billion available). Compared with the needs set out in the Global Plan, the gap is US$ 1.6 billion (US$ 3.2 billion required according to the Global Plan compared with available funding of US$ 1.6 billion). In the European Region, the funding available in 2009 exceeds the funding estimated to be required in the Global Plan. One explanation is the reductions anticipated in the Global Plan in the use of hospitalization during treatment, which are not happening in practice.

These differences between the funding requirements set out in country plans and the Global Plan suggest that country planning, budgeting and financing lag behind the Global Plan in three major areas: DOTS and collaborative TB/HIV activities in Africa, and diagnosis and treatment of MDR-TB in the European, South-East Asia and Western Pacific regions (and within these regions, in the Russian Federation, India and China in particular).

[1] This may also explain the higher costs of collaborative TB/HIV activities in the Global Plan compared with country plans in the South-East Asia Region. For example, the only TB/HIV-related costs included in the NTP budget in India are those for HIV testing of TB patients, which is a relatively inexpensive intervention. In India, it is not known to what extent other activities are budgeted for and funded by the national AIDS control programme.

WHO has developed a planning and budgeting tool that is designed to help countries to align their plans and budgets with the Stop TB Strategy and the targets set out in the Global Plan, as well as to produce more accurate country-specific estimates of the financial resources required to achieve these targets.[1] The development and use of this tool is described in BOX 3.1.

3.5 Budgets and costs per patient

Budgets and costs per patient in HBCs are shown in TABLE 3.2. The budget for first-line anti-TB drugs per patient is lowest in Cambodia (US$ 18) and highest in Brazil (US$ 121), Thailand (US$ 161) and the Russian Federation (US$ 308). In most countries, the budget is in the range US$ 20–40, with a median of US$ 33.

The budget per patient for DOTS treatment also varies. Only two countries (India and Myanmar) have budgets below US$ 100 per patient. A total of four countries have budgets in the range US$ 100–200 per patient, four are in the range US$ 200–300 and seven are in the range US$ 300–600.[2] The four countries with a budget per patient exceeding US$ 600 are Brazil, Mozambique, the Russian Federation and Thailand. Of these, all except Mozambique are middle-income countries where budgets are expected to be higher, although the budget of US$ 9292 per patient in the Russian Federation is exceptionally high compared with all other HBCs. As noted in SECTION 3.2, these high costs can be explained by extensive use of hospitalization during treatment.

In 2009, the total cost per patient treated in a DOTS programme is estimated at under US$ 100 in only one country: Myanmar. It is in the range US$ 100–300 in seven countries, and US$ 300–500 in nine countries (up from three in 2007 and 2008). Four countries have much higher costs: Brazil, Mozambique, the Russian Federation and Thailand. As already noted, three of these countries are middle-income countries with generally higher prices for the inputs needed for TB control, while the Russian Federation also has large budgets for MDR-TB treatment as well as maintenance of hospital infrastructure. The relatively high cost for Mozambique relative to other African countries is mainly due to comprehensive budgeting for collaborative TB/HIV activities.

Among the low-income countries, there is no obvious relationship between the cost per patient treated and GNI per capita. For example, in India the cost per patient treated is low relative to income levels, while in the Democratic Republic of the Congo and Mozambique this cost 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 350% per patient in the NTP budget per patient and a median increase in the total cost per patient of 240% (although the median increase for first-line drugs was only 20%).

[1] See http://www.who.int/tb/dots/planning_budgeting_tool/en/index.html

[2] Figures were not calculated for South Africa because the financial data available for 2009 were not complete. See also FIGURE 3.1.

BOX 3.1

Planning and budgeting for TB control: the WHO TB planning and budgeting tool

The WHO TB planning and budgeting tool is designed to help countries to develop comprehensive plans and budgets for TB control within the framework of the Stop TB Strategy and the Global Plan to Stop TB, and to use these as the basis for resource mobilization from national governments and donors. The tool was developed with support from USAID's TB Control Assistance Program, and can be downloaded (together with accompanying documentation) from the Stop TB Department's web site http://www.who.int/tb/dots/planning_budgeting_tool/en/.

Major advantages of using the tool include: (i) it allows plans and budgets to be set out comprehensively in one place in a standardized format; (ii) it offers a ready-made list of inputs and activities to consider when planning and budgeting for each component of the Stop TB Strategy; (iii) it includes epidemiological and demographic projections as well as information about the targets set out in the Global Plan; (iv) it provides a solid foundation for resource mobilization from national and local governments as well as donors such as the Global Fund; (v) it is easy to revise or update plans and budgets because it is set out in Excel; and (vi) it automatically produces summary analyses in the form of figures and tables. Overall, these benefits should help to improve the quality of planning and budgeting.

A draft version of the tool was developed in April–May 2006. Following extensive field-testing in countries in the African and South-East Asia regions and the Region of the Americas, a final version with was produced by January 2007. The tool was translated into English, French, Spanish and Russian.

Promotion and practical application of the tool started in 2007. Four planning and budgeting workshops were conducted: two in the African Region for a total of 34 countries; one in the South-East Asia region for nine countries: and one in the Region of the Americas for 11 countries. Two training workshops have also been conducted: one for seven countries in Latin America and one for three countries in the Western Pacific Region. During these workshops, feedback about the tool was very positive. Other examples of how the tool has been disseminated include presentations at workshops for the development of Global Fund proposals, presentations at international meetings and regional NTP manager meetings; a training workshops for technical partners and staff from WHO regional and country offices, and inclusion of the tool in an international course on management and budgeting organized annually by the International Union Against Tuberculosis and Lung Disease.

To date, 27 countries are known to have used the tool to budget their national strategic plans for TB control. The Democratic Republic of the Congo, Ethiopia, Kenya, Mozambique, Myanmar, Thailand and Zambia are examples of countries that have developed particularly comprehensive and detailed plans and budgets using the tool. Most of the countries that have attended one of the workshops have used the tool to budget at least some of the components of the Stop TB Strategy. Others have used it to develop the budget component of a Global Fund proposal. A recent example is Indonesia, whose proposal was rated Category 1 (recommended for funding with no or minor clarifications).

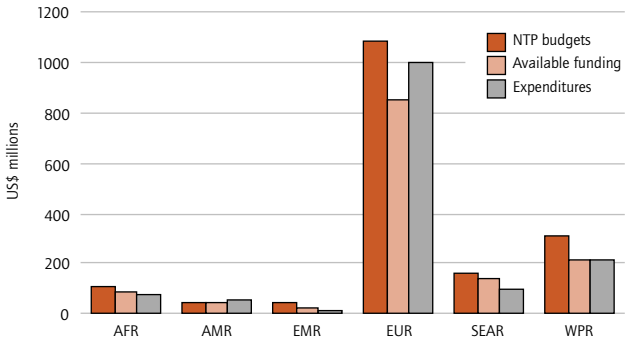
In future, the tool could provide the basis for National Strategy Applications (NSAs) to the Global Fund.

TABLE 3.2
Total TB control costs and NTP budgets per patient for DOTS treatment, high-burden countries, 2009

	2009 (US$)			CHANGES SINCE 2002, (FACTOR[a])		
	FIRST-LINE DRUGS BUDGET	NTP BUDGET (EXCLUDING MDR-TB)	TOTAL COST (EXCLUDING MDR-TB)	FIRST-LINE DRUGS BUDGET	NTP BUDGET (EXCLUDING MDR-TB)	TOTAL COST (EXCLUDING MDR-TB)
1 India	22	80	111	2.2	3.5	1.9
2 China	28	226	226	1.7	1.7	1.7
3 Indonesia	48	288	307	1.5	2.5	2.3
4 Nigeria	25	351	442	0.5	2.7	2.0
5 South Africa	–	–	–	–	–	–
6 Bangladesh	24	104	144	1.2	1.3	1.2
7 Ethiopia	24	166	220	0.9	3.8	3.4
8 Pakistan	58	205	221	1.0	4.5	2.4
9 Philippines	34	112	193	0.7	0.9	1.0
10 DR Congo	27	359	447	0.8	3.9	2.6
11 Russian Federation	308	9292	9491	4.7	2.0	2.5
12 Viet Nam	50	120	254	1.5	1.4	1.3
13 Kenya	21	331	378	0.6	6.4	3.9
14 Brazil	121	812	1234	2.7	4.9	2.6
15 UR Tanzania	28	407	480	0.7	5.0	2.6
16 Uganda	74	327	351	1.4	7.0	5.2
17 Zimbabwe	68	396	491	2.3	12	7.0
18 Thailand	161	810	827	–	–	–
19 Mozambique	28	679	847	1.3	9.8	6.2
20 Myanmar	33	73	87	1.9	3.5	1.6
21 Cambodia	18	264	329	0.4	2.0	1.7
22 Afghanistan	37	329	368	0.5	1.1	3.2
High-burden countries (median value)	**33**	**327**	**351**	**1.2**	**3.5**	**2.4**

– Indicates not available.
[a] Calculated as 2009 value divided by 2002 value.

FIGURE 3.17
NTP budgets, available funding and expenditures by region, 19 high-burden countries,[a] 2007



[a] AFR excludes South Africa and Uganda. SEAR excludes Thailand.

3.6 Expenditures compared with available funding and changes in the number of patients treated

Countries that have received large increases in funding face two important challenges: to spend the extra money, and to translate extra spending into improved rates of case detection and treatment success. To date, WHO has been able to conduct analyses for the HBCs only.

The ability to mobilize resources can be assessed by comparing available funding with budgets, and the ability to use financial resources can be assessed by comparing expenditures with available funding (TABLE 3.3; FIGURE 3.17; FIGURE 3.18). The latest year for which data are available for all three indicators is 2007. In 2007, Bangladesh, Ethiopia, India and Indonesia were the most successful of the HBCs in mobilizing funds for their budgets, while Afghanistan, Cambodia, Myanmar and Uganda were least successful (TABLE 3.3). Most HBCs reported spending a high proportion of their available funding, and in some cases the funds that were raised and spent exceeded the original budget (TABLE 3.3).[1] Three countries had expenditures that appeared to be particularly low relative to available funding: Bangladesh, Mozambique and Viet Nam. Review of the financial data reported by these

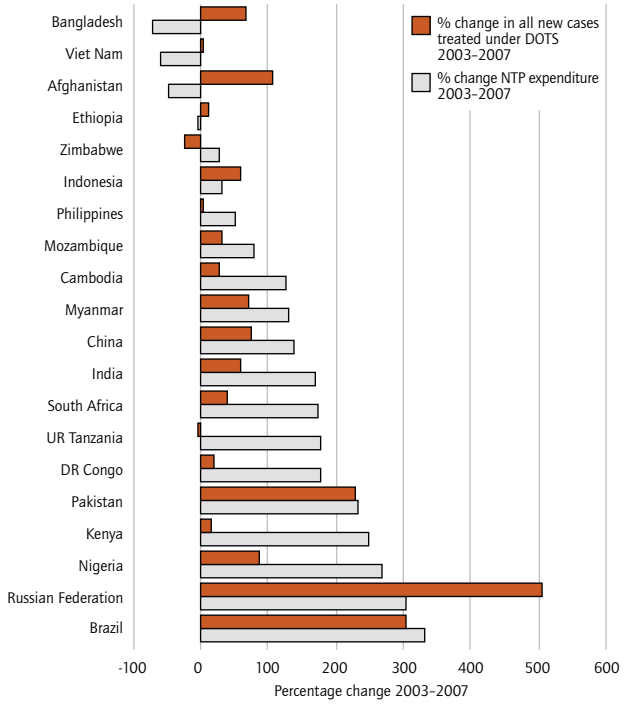
[1] This explains why the value of expenditures in 2007 as a percentage of the available funding prospectively reported in 2007 (final column of TABLE 3.3) exceeds 100.

TABLE 3.3
NTP budgets, available funding and expenditures (US$ millions), high-burden countries, 2007

	NTP BUDGET	AVAILABLE FUNDING[a]	EXPENDITURES[b]	AVAILABLE FUNDING AS % OF NTP BUDGET	EXPENDITURES AS % OF AVAILABLE FUNDING[c]
1 India	63	63	67	100	106
2 China	272	181	188	66	104
3 Indonesia	59	59	27	100	46
4 Nigeria	29	20	21	69	105
5 South Africa	378	–	–	–	–
6 Bangladesh	21	21	2.2	100	11
7 Ethiopia	8.9	8.9	8.2	100	92
8 Pakistan	29	18	10	62	55
9 Philippines	19	17	20	89	117
10 DR Congo	24	15	15	62	105
11 Russian Federation	1 078	846	991	78	117
12 Viet Nam	16	12	4.3	77	35
13 Kenya	29	18	18	63	97
14 Brazil	51	42	59	82	140
15 UR Tanzania	8.2	–	11	–	–
16 Uganda	11	4.2	–	38	–
17 Zimbabwe	3.9	2.6	2.2	68	83
18 Thailand	–	–	40	–	–
19 Mozambique	11	8.9	3.5	78	40
20 Myanmar	16	3.1	3.1	19	100
21 Cambodia	8.5	4.0	5.0	47	124
22 Afghanistan	14	3.2	2.2	22	71
High-burden countries	**2 151**	**1 347**	**1 498**	**70[d]**	**86[d]**

– Indicates not available.
[a] Based on budget data, reported prospectively in 2007.
[b] Based on actual expenditures, reported in 2008.
[c] Figures can be above 100% when additional funds were mobilized after reporting of data about budgets and sources of funding in 2007.
[d] Mean values.

FIGURE 3.18
Change in NTP expenditure and change in all types of patients treated under DOTS, 20 high-burden countries,[a,b,c] 2003–2007



[a] Countries ranked by percentage change in NTP expenditure.
[b] Expenditure data not available for Thailand and Uganda. Comparison for Kenya is between 2007 and 2004. For South Africa the comparison is between 2006 and 2005.
[c] Expenditure data for Afghanistan, Bangladesh and Viet Nam appear incomplete. See also FIGURE 3.9.

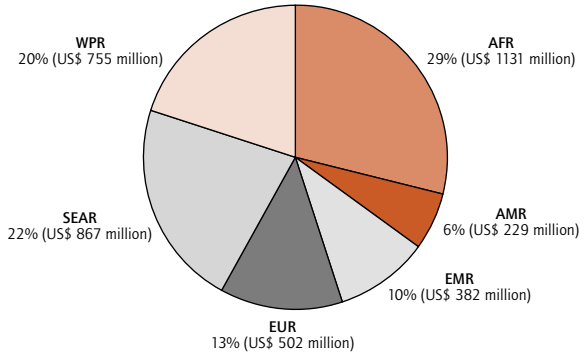
countries suggests that this reflects underreporting of expenditure data, at least in Bangladesh and Viet Nam (see also FIGURE 3.9).

When country data for the HBCs are aggregated by region (FIGURE 3.17), the ability to mobilize resources was best in the South-East Asia Region and the Region of the Americas, and worst in the Eastern Mediterranean Region. The ability to spend available resources was best in the Western Pacific Region and the Region of the Americas. It appeared to be worst in the South-East Asia, but this finding is affected by apparent underreporting of expenditures in Bangladesh and a temporary cessation of funding from a Global Fund grant in Indonesia.

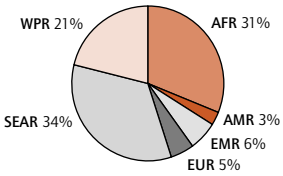
The ability to translate spending into an increased number of detected and treated patients can be assessed by comparing changes in expenditures 2003–2007 with changes in the number of TB patients treated in 2003–2007 (FIGURE 3.18; 2007 is the most recent year for which both case notification and expenditure data are available). Of the 20 HBCs for which data were available, all except one (the United Republic of Tanzania) of the 16 countries that increased spending between 2003 and 2007 also increased the number of new cases that were detected and treated in DOTS programmes (a similar relationship applied for new smear-positive cases specifically; data not shown). For the United Republic of Tanzania, the explanation may be that much of the increased expenditure was for collaborative TB/HIV activities, which (with the exception of intensified TB case-finding in people who are HIV-positive) are not expected to increase the number of cases detected and treated in DOTS programmes.

The relationship between increased expenditure and changes in the total number of patients treated was, however, variable. In Brazil, Indonesia, Pakistan and the Russian Federation, the increase in the number of patients treated under DOTS exceeded or approached the increase in expenditures. In Brazil and the Russian Federation, increasing the number of cases treated under DOTS should be easier than in other countries, since it requires mainly a substitution of DOTS for non-DOTS treatment rather than an increase in total case notifications. There was an almost one-to-one relationship between increased expenditures and increased notifications of new cases under DOTS in Pakistan. At the other end of the spectrum, four countries (Afghanistan, Bangladesh, Ethiopia and Viet Nam) reported lower expenditures in 2007 compared with 2003, although none of these countries reported a fall in the number of cases treated. While the data

FIGURE 3.19
Global Fund commitments for TB control by region, as of end 2008[a]

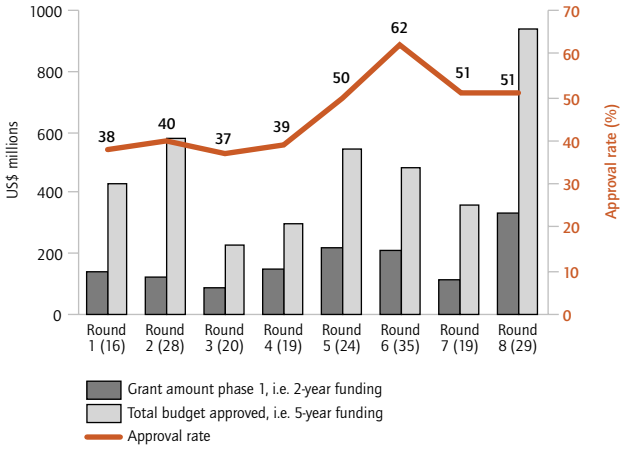


Proportion of estimated global incident cases of TB that are accounted for by each region



[a] Refers to the total budgets approved in rounds 1–8.

FIGURE 3.20
Global Fund commitments and proposal approval rate by round. Numbers under bars show the number of TB proposals approved in each round.



are plausible for Ethiopia (given high investments in 2003), it seems likely that expenditures have been underreported in the other three countries.

3.7 Global Fund financing

3.7.1 High-burden countries

After eight rounds of proposals, the total value of approved proposals in the HBCs is US$ 2.3 billion; the amounts in the Phase 1 grant agreements (that is, for grants covering the first two years of the proposal) total US$ 632 million (data not shown). The Global Fund is the single most important source of external financing in HBCs (65% of total grant financing); seven countries (Afghanistan, Bangladesh, Cambodia, Nigeria, the Philippines, Uganda and Viet Nam) rely on grants from the Global Fund to finance more than 25% of their NTP budgets. Only Myanmar does not have a Global Fund grant.

By the end of 2008, US$ 719 million had been disbursed. Across all grants and countries, the actual disbursement rate is very similar to the expected rate,[1] although there is variation among countries. Disbursements were higher than expected in 16 out of 56 grants, similar to what is expected in six grants and less than expected in 34 grants (data not shown). Countries for which disbursements are particularly low in relation to the expected disbursement of funds include Bangladesh (round 5), India (round 3), Indonesia (round 5, probably linked to a temporary cessation of funding in 2007), Kenya (round 2) and Uganda (round 6).

3.7.2 All countries

In eight funding rounds between 2002 and 2008, the Global Fund approved proposals worth a total of US$ 3.9 billion for TB control in 102 countries, out of total commitments for HIV, TB and malaria of around US$ 15 billion.[2] The African Region has the single largest share of grants for TB control, at 29% (FIGURE 3.19), which is similar to its share of the global burden of TB (31%). 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 (42% of total funding compared with 55% of estimated cases). The share of total funding approved for the Eastern Mediterranean Region, the European Region and the Region of the Americas (10%, 13% and 6% respectively) is much higher than these regions' share of the global burden of TB (6%, 5% and 3%).

The value of approved proposals for TB control was highest in absolute terms in round 8 and relatively high in rounds 2, 5 and 6 (FIGURE 3.20). The percentage of proposals that were approved was highest in round 6, at 62%.[3]

[1] The expected rate assumes that disbursements are spread evenly over the two- or five-year period of the grant agreement following the programme start date.

[2] The Global Fund has committed US$ 15.2 billion in rounds 1–8 for HIV, TB and malaria; grant agreements worth US$ 10.3 billion have been signed and US$ 7.2 billion has been disbursed. See www.theglobalfund.org/en/commitmentsdisbursements.

[3] Calculated as the number of proposals approved divided by the number of proposals reviewed by the Global Fund's Technical Review Panel.

An analysis of the components of TB control for which countries requested funding in rounds 6 to 8 is presented in BOX 3.2.

3.8 Funding gaps and the global financial crisis

The global financial crisis that developed in 2008 has been followed by either a halt to economic growth or an economic recession in most of the world's biggest economies, including the United States, Japan, Germany, the United Kingdom, Italy, Spain and the European Union as a whole. The International Monetary Fund has predicted that the global economy will grow by just 0.5% in 2009 (compared with 3.4% in 2008), its lowest rate for 60 years.[1] The consequences of economic slowdown and recession will be widespread, and the likely implications for global health are already being debated.[2,3] The consequences for financing of TB control specifically are unpredictable, but while funding in 2009 is slightly higher than in previous years, funding gaps are likely to become more difficult to fill. In the next 2–3 years, the WHO financial monitoring system set up in 2002 will allow changes in the total level of funding as well as sources of funding in the aftermath of the global financial crisis to be identified.

The 22 HBCs have reported a combined funding gap for TB control in the range of US$ 0.5–0.7 billion in 2009, while the funding gap reported for 111 countries (the 22 HBCs plus 89 other countries) amounts to US$ 0.9–1.1 billion in 2009. The main options for filling these funding gaps are (i) increasing the number and size of grants awarded for TB control by the Global Fund and other major donors and (ii) an increase in domestic funding.

There does appear to be potential to increase grants from the Global Fund. The US$ 3.9 billion committed thus far for TB control (SECTION 3.7) represents 25% of total commitments to date. If funds were split evenly among the three global health priorities supported by the Global Fund (AIDS, TB and malaria), grants for TB control would be US$ 5.0 billion, or US$1.1 billion more than their existing level. With commitments currently spread over 11 years, this would be equivalent to around US$ 460 million per year, instead of the current value of approximately US$ 350 million per year.

An increase in financing for TB control from the Global Fund to US$ 500 million per year would reduce but certainly not eliminate the funding gaps that have been reported. However, if funding gaps in four middle-income countries with greater domestic resources (Brazil, China, the Russian Federation and South Africa) are excluded, the gaps reported by HBCs fall to about US$ 200 million in 2009. In the

BOX 3.2

Funding requested from the Global Fund in rounds 6 to 8

The Global Fund issued eight calls for proposals between 2002 and 2008. For rounds 6–8, it is possible to analyse the components of TB control for which countries sought funds according to the major components of the Stop TB Strategy.

In rounds 6–8, the Global Fund approved 85 TB proposals. Most of the funding that was approved was for DOTS (56%), which was defined to include programme management and supervision, laboratory strengthening, training, patient support, human resource development, first-line drugs and monitoring and evaluation. In round 8, there was a clear increase in the total funds approved for DOTS compared with previous rounds. This increase was mainly accounted for by increased funding for laboratory strengthening and an increase in the expected number of patients to be treated in DOTS programmes. Management of MDR-TB, including coordination activities, second-line drugs and laboratory strengthening specific to the diagnosis of drug resistance, was the second largest component (20%). The funds approved for MDR-TB increased steadily in absolute terms between round 6 and round 8, linked to an increase in the planned number of patients to be treated for MDR-TB. ACSM and community-based TB care accounted for 11% of requested funding in rounds 6 to 8.

The remaining funding that was approved in rounds 6 to 8 was accounted for by health system strengthening, including the Practical Approach to Lung Health (5%), activities to control TB in high-risk populations and infection control (4%), collaborative TB/HIV activities (3%) and activities to engage all care providers (1%). Although it is likely that some of the costs for public–private mix initiatives are included under other headings (such as first-line drugs and programme management), the amount appears surprisingly small given the need to ensure that all providers diagnose and treat TB patients according to the International Standards for Tuberculosis Care. A possible explanation for the small amount of funding requested for collaborative TB/HIV activities is that funds were requested mainly for coordination activities, while the funds for interventions such as CPT and ART are requested via HIV proposals. In future, the funding requested for infection control is expected to increase, linked to new policy guidance.

[1] *IMF Survey Magazine* [Online magazine] (available at http://www.imf.org/external/pubs/ft/survey/so/2009/res012809a.htm; accessed February 2009).

[2] *The Financial Crisis and Global Health. Report of a High-Level Consultation, World Health Organization, Geneva, 19 January 2009* [Information Note 2009/1]. Geneva, World Health Organization, 2009 (available athttp://www.who.int/mediacentre/events/meetings/2009_financial_crisis_report_en_.pdf; accessed February 2009).

[3] The global financial crisis: an acute threat to health. *Lancet*, 2009, 373:355–356.

TABLE 3.4
Financial indicators,[a] high-burden countries, 2009

	NTP BUDGET PER CAPITA (US$)	TOTAL TB CONTROL COSTS PER CAPITA (US$)	FUNDING GAP PER CAPITA (US$)	GOVERNMENT EXPENDITURE ON HEALTH PER CAPITA (US$)[b]	TOTAL EXPENDITURE ON HEALTH PER CAPITA (US$)[b]	GOVERNMENT HEALTH SPENDING USED FOR TB CONTROL (%)[c]	TB GAP AS PERCENTAGE OF GENERAL GOVERNMENT HEALTH SPENDING[c]
1 India	0.08	0.1	0.02	6.8	36	1.8	0.4
2 China	0.2	0.2	0.01	31	81	0.5	0.02
3 Indonesia	0.3	0.4	0.1	12	26	3.2	0.6
4 Nigeria	0.3	0.4	0.1	8.4	27	4.6	1.6
5 South Africa	7.2	12.3	–	182	437	–	–
6 Bangladesh	0.1	0.1	0.001	3.4	12	4.0	0.02
7 Ethiopia	0.3	0.4	0.2	3.9	6.4	11	5.9
8 Pakistan	0.3	0.3	0.1	2.5	15	14	6.3
9 Philippines	0.2	0.4	0.05	14	37	2.9	0.4
10 DR Congo	0.8	1.0	0.6	1.7	5.0	64	37
11 Russian Federation	8.9	9.0	1.6	171	277	5.2	0.9
12 Viet Nam	0.1	0.3	0	9.6	38	3.3	0
13 Kenya	0.9	1.1	0.4	11	24	11	3.7
14 Brazil	0.3	0.5	0.1	164	371	0.3	0.04
15 UR Tanzania	0.6	0.7	0.2	9.5	17	7.9	2.0
16 Uganda	0.5	0.6	0.3	6.4	22	9.9	5.8
17 Zimbabwe	1.3	1.6	0.7	9.2	21	18	7.8
18 Thailand	0.8	0.8	0.05	63	98	1.3	0.1
19 Mozambique	1.1	1.4	0.3	9.2	15	16	3.2
20 Myanmar	0.2	0.3	0.1	0.4	4.0	62	21
21 Cambodia	0.7	0.9	0.3	6.9	29	14	3.9
22 Afghanistan	0.3	0.4	0.01	4.0	20	11	0.3
High-burden countries (mean value)	**1.2**	**1.5**	**0.2**	**33**	**73**	**13**	**4.8**

– Indicates not available.

[a] For definition of how financial indicators are calculated see ANNEX 2. Data for South Africa are for 2008.

[b] Latest data available are for 2005. Source: *National health accounts* [online database]. Geneva, World Health Organization, 2008.

[c] The indicators in these columns will be overestimates if government health expenditure has increased since 2005. Furthermore, there is uncertainty around the denominator used to calculate these indicators.

89 non-HBCs that reported data, funding gaps amount to US$ 120 million in 2009 (instead of US$ 423 million) when upper middle-income countries (defined as those with a GNI per capita of ≥US$ 3706) are excluded. Filling funding gaps via the Global Fund appears much more feasible in this context, but still depends on (i) the submission of high-quality and sufficiently ambitious proposals including well-justified budgets and (ii) the criteria used to determine which countries are eligible to apply for funding.

While funding gaps currently identified by low and lower-middle income countries could in theory be closed via applications to the Global Fund, closing gaps in upper-middle income countries as well as the additional gap that will open up if all countries plan in line with the Global Plan will require other sources of funding. The two other major options are external resource mobilization from donors other than the Global Fund and an increase in domestic financing.

Besides grant funding from the Global Fund, the (United States) President's Emergency Plan for AIDS Relief is the other major source of donor funding for health. The plan supports HIV prevention, treatment and care, of which collaborative TB/HIV activities is one part, in most of the African HBCs as well as Viet Nam. With billions of dollars per year available through this plan, it is important that collaborative TB/HIV activities and related aspects of TB control (for example, laboratory strengthening) are supported as much as possible. UNITAID[1] is also a source of donor funding for TB diagnostics and anti-TB drugs. At the end of 2008, UNITAID had committed support for first-line and second-line anti-TB drugs in 66 countries up to 2011. This support includes funding for first-line anti-TB drugs provided through the Global Drug Facility (GDF) for 876 000 patients during the period 2007–2009 and for a further 4530 patients for the first two years of grants approved in round 6 of the Global Fund; funding for second-line anti-TB drugs for the treatment of 4716 patients with MDR-TB during 2007–2011; and funding for paediatric anti-TB drugs provided through the GDF for 750 000 patients during 2007–2010.

Increasing domestic financing for TB control would mean a major shift from trends during the period 2002–2009, when almost all of the increase in domestic funding among the 22 HBCs was accounted for by Brazil, China and the Russian Federation. Two ways to assess the extent to which countries can mobilize more domestic funds are (i) to compare the percent-

[1] http://www.unitaid.eu/

age of funding being provided from domestic sources with a country's national income (measured as GNI per capita) to assess differences between countries with similar income levels (FIGURE 3.12) and (ii) to compare costs and funding gaps per capita with total government health expenditure per capita (TABLE 3.4).

Comparing countries with similar income levels and a similar TB burden suggests that there is scope for increasing domestic funding in several countries, including Indonesia (compared with the Philippines), Pakistan (compared with India) and Kenya (compared with Viet Nam). Comparing costs and funding gaps per capita with government health expenditure suggests that the countries with the most capacity to fund TB control from domestic resources are Brazil, China and Thailand, followed by India, the Philippines, Indonesia and the Russian Federation. The countries with the least capacity to increase funding from domestic sources include the African countries (except South Africa) as well as Cambodia and Myanmar. Furthermore, much of the gap between the expectations set out in the Global Plan and existing country plans is accounted for by MDR-TB treatment in China and India. While affected by the global financial crisis, these countries' economies are still expected to grow by 6.75% and 5% respectively in 2009.[1]

3.9 Summary

The financial data reported to WHO in 2008 are the most complete since financial monitoring began in 2002, with more than 100 countries that collectively account for 93% of the world's estimated TB cases providing the entire budget and funding data that were requested. Expenditure data continue to be more challenging to report, but 92 countries submitted a complete report in 2008.

The data show that funding for TB control has increased year-on-year since 2002. Among 94 countries that reported complete data, which account for 93% of TB cases globally and which were among the 171 countries considered in the Global Plan, available funding reached US$ 3.0 billion in 2009. Most of this funding (87%) will be provided by national governments, with the remainder provided by the Global Fund (9%) and other donors (4%). Among the 22 HBCs in which 80% of incident cases of TB occur, a total of US$ 2.2 billion is available in 2009, a small increase of US$ 27 million compared with 2008 but substantially above the US$ 1.2 billion that was spent on TB control in 2002. Most of the increased funding in HBCs since 2002 has come from domestic funding in Brazil, China and the Russian Federation, and external financing from the Global Fund. Of the US$ 2.2 billion available in the 22 HBCs in 2009, 88% is from HBC governments, 8% (US$ 169 million) is from the Global Fund and 4% (US$ 94 million) is from grants from sources other than the Global Fund. The distribution of funding sources is strikingly different when the Russian Federation and South Africa are excluded: the government contribution to available funding drops to 70%, the Global Fund contribution increases to 19% and grants from sources besides the Global Fund account for 11%.

Despite the increase in funding for TB control that has occurred over the past eight years, large funding gaps remain. Countries have identified funding gaps of US$ 1.2 billion in 2009. The gap is larger still, at US$ 1.6 billion, when available funding is compared with the funding requirements for 2009 that were estimated in the Global Plan. To close these funding gaps, additional resources will need to be mobilized from domestic sources as well as donors. This will be a major challenge in the context of a global financial crisis.

[1] IMF Survey Magazine [Online magazine] (available at http://www.imf.org/external/pubs/ft/survey/so/2009/res012809a.htm; accessed February 2009).

Conclusions

The main purpose of WHO's annual report on global TB control is to provide a comprehensive and up-to-date assessment of the TB epidemic and progress in controlling the disease at global, regional and country levels, in the context of global targets set for 2015.

The latest estimates of the global burden of TB are that there were 9.3 million incident cases of TB and 13.7 million prevalent cases of TB in 2007. There were also 1.3 million deaths from TB among HIV-negative people in 2007, and an additional 456 000 deaths among HIV-positive TB cases – equivalent to 23% of the total deaths attributed to HIV. The number of incident cases is increasing slowly in absolute terms due to population growth, with 86% of incident cases in Africa and Asia. Nonetheless, the number of incident cases per capita is falling slowly, both globally (with a rate of decline of less than 1% per year) and in all six WHO regions except the European Region (where rates are approximately stable). Incidence rates appear to have peaked globally in 2004, and if this is confirmed by further monitoring MDG Target 6.c – to halt and reverse incidence by 2015 – will have been achieved ten years ahead of the target date. Prevalence and mortality rates are also falling globally and in all six WHO regions. At least three of the six WHO regions – the Eastern Mediterranean and South-East Asia regions as well as the Region of the Americas – are on track to achieve the Stop TB Partnership's targets of halving prevalence and mortality rates by 2015 compared with their level in 1990. The Western Pacific Region is on track to halve the prevalence rate by 2015, but the mortality target may be narrowly missed. The African and European regions are far from achieving both targets, and for this reason it is unlikely that 1990 prevalence and death rates will be halved by 2015 for the world as a whole.

The Stop TB Strategy is WHO's recommended approach to reducing the burden of TB in line with global targets; the Stop TB Partnership's Global Plan to Stop TB has set out the scale at which the interventions included in the strategy need to be implemented in each year 2006 to 2015.

To date, DOTS is the component of the strategy that is most widely implemented and for which progress is closest to the milestones included in the Global Plan. In 2007, 5.5 million cases were notified by DOTS programmes, including 2.6 million new smear-positive cases. This is equivalent to a case detection rate of 63%, 7% short of the WHA target of detecting at least 70% of incident cases of smear-positive TB and 5% less than the Global Plan milestone of 68% for 2007. In 2006, 85% of the new smear-positive TB patients that were detected by DOTS programmes were successfully treated, exactly meeting the second WHA target. There has also been progress in scaling up collaborative TB/HIV activities, especially in the African Region. Globally, 1 million TB patients (16% of notified cases) knew their HIV status in 2007, including 37% of notified cases in the African Region. Of the 250 000 TB patients who were known to be HIV-positive in Africa, 0.2 million were enrolled on CPT and 0.1 million were started on ART. Just under 30 000 cases of MDR-TB were notified to WHO in 2007, mostly by European countries and South Africa, and the number of cases of MDR-TB diagnosed and treated according to international guidelines is expected to increase to 14 000 in 2009. Even so, the implementation of collaborative TB/HIV activities falls short of milestones set in the Global Plan, and the expansion of diagnosis and treatment of MDR-TB falls far short of Global Plan milestones, notably in the three countries where almost 60% of the world's 0.5 million estimated cases of MDR-TB occur: China, India and the Russian Federation.

The extent to which other components of the Stop TB Strategy are being implemented is less well understood, because to date progress is more difficult to quantify. However, the integration of diagnosis and treatment into primary health care in most countries, reported alignment of strategic planning for TB control with broader health sector planning frameworks, examples of how public-private mix initiatives can contribute to increased case detection in countries such as Pakistan and the Philippines, and increased attention to advocacy, communication and social mobilization are encouraging.

Despite reductions in the global burden of TB, an estimated 37% of cases of smear-positive TB are not being treated in DOTS programmes; more than 90% of incident cases of MDR-TB are not being diagnosed and treated according to international guidelines; the majority of HIV-positive TB cases do not know their HIV status; and the majority of HIV-positive TB patients who do know their HIV status are not yet accessing ART. To accelerate progress in global TB control, these numbers need to be reduced using the range of interventions and approaches included in the Stop TB Strategy, with the necessary financial backing. In 2009, US$ 3 billion is available for TB control, which is US$ 1.2 billion less than countries' own estimates of their funding requirements and US$ 1.6 billion short of the funding required according to the Global Plan. Most of the extra funding required according to the Global Plan is for MDR-TB diagnosis and treatment in the South-East Asia and Western Pacific regions (mostly in India and China), and for DOTS and collaborative TB/HIV activities in Africa. In the context of a global financial crisis, closing these funding gaps will be a major challenge.