



# ACCELERATING WORK TO OVERCOME THE GLOBAL IMPACT OF NEGLECTED TROPICAL DISEASES

## A ROADMAP FOR IMPLEMENTATION

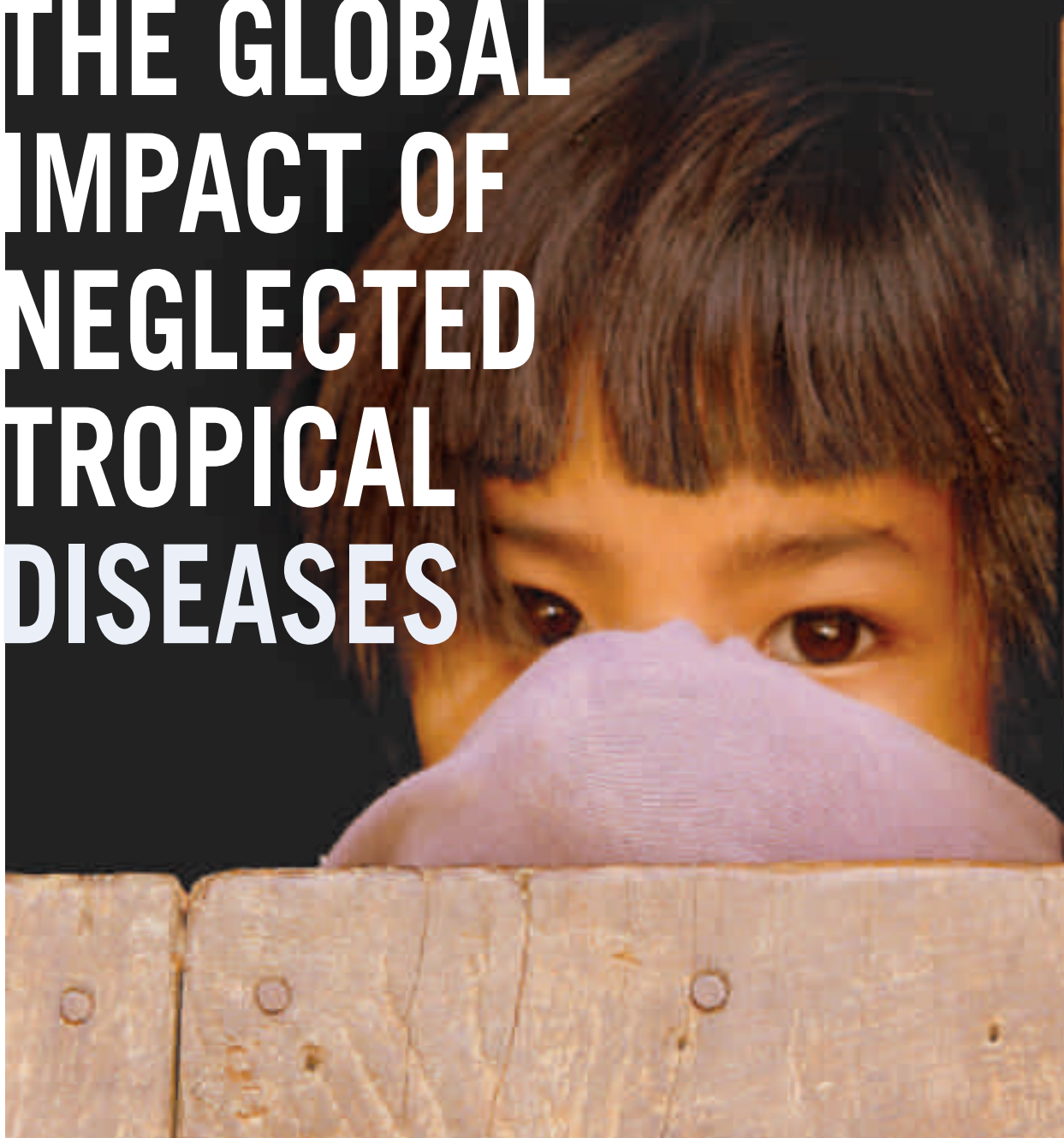
*EXECUTIVE SUMMARY*



**World Health  
Organization**



**ACCELERATING  
WORK TO  
OVERCOME  
THE GLOBAL  
IMPACT OF  
NEGLECTED  
TROPICAL  
DISEASES**



**“THIS ROADMAP FOR  
IMPLEMENTATION  
REPRESENTS THE NEXT  
STEP FORWARD IN  
RELIEVING AND, IN MANY  
CASES, FINALLY ENDING  
THE VAST MISERY CAUSED  
BY THESE ANCIENT  
DISEASES OF POVERTY.”**

*Accelerating work to overcome the global impact of neglected tropical diseases – A roadmap for implementation* was produced under the overall direction and supervision of Dr Lorenzo Savioli (Director, WHO Department of Control of Neglected Tropical Diseases), and Dr Denis Daumerie (Programme Manager, WHO Department of Control of Neglected Tropical Diseases) with contributions from staff serving in the department. The document was edited by Professor David W.T. Crompton.

Regional directors and members of their staff provided support and advice.

Valuable inputs in the form of contributions, peer reviews and suggestions were received by members of the Strategic and Technical Advisory Group for Neglected Tropical Diseases.

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Printed in France. Reprinted in March 2012 by the WHO Document Production Services, Geneva, Switzerland. WHO/HTM/NTD/2012.1

# ACCELERATING WORK TO OVERCOME THE GLOBAL IMPACT OF NEGLECTED TROPICAL DISEASES

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## A ROADMAP FOR IMPLEMENTATION

### EXECUTIVE SUMMARY

*of roadmap approved by the Strategic and Technical Advisory  
Group for Neglected Tropical Diseases in 2011. Full report  
available at [www.who.int/neglected\\_diseases/en](http://www.who.int/neglected_diseases/en)*

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**A ROADMAP  
FOR IMPLEMENTATI**

## ACCELERATING WORK TO OVERCOME THE GLOBAL IMPACT OF NEGLECTED TROPICAL DISEASES

*Efforts to combat the neglected tropical diseases reached a turning point in 2007, when WHO convened the first meeting of global partners. That meeting produced a shared commitment to support WHO strategies and goals by working together in an innovative, flexible and cost-effective way. The result has been streamlined and integrated approaches have yielded significant gains for public health.*

*This roadmap for implementation represents the next step forward in relieving and, in many cases, finally ending the vast misery caused by these ancient diseases of poverty.*

*Dr Margaret Chan, Director-General, World Health Organization*

### Introduction

The vision of controlling, eliminating and eradicating neglected tropical diseases has gathered significant momentum over recent years.

The World Health Organization (WHO) has produced overwhelming evidence to show that the burden caused by many of the 17 diseases<sup>1</sup> that affect more than 1 billion people worldwide can be effectively controlled and, in many cases, eliminated or even eradicated.

In 2003, WHO began to focus control measures away from specific diseases to the health needs of poor communities.<sup>2</sup> This led to the introduction of two major strategic interventions:

- preventive chemotherapy, an intervention that allows the regular and coordinated administration of quality-assured, safe, single-dose medicines on a large scale for the following diseases: foodborne trematode infections, lymphatic filariasis, onchocerciasis, schistosomiasis, soil-transmitted helminthiases and trachoma;

- intensified disease management, directed at neglected tropical diseases for which simple tools and treatments are not yet available, such as Buruli ulcer, endemic treponematoses (yaws), leprosy (Hansen disease), Chagas disease, human African trypanosomiasis (sleeping sickness), leishmaniasis, cysticercosis and echinococcosis.

Specific intervention approaches are required for dengue, dracunculiasis (guinea-worm disease) and human dog-mediated rabies.

<sup>1</sup>*Dengue, rabies, blinding trachoma, Buruli ulcer, endemic treponematoses (yaws), leprosy (Hansen disease), Chagas disease, human African trypanosomiasis (sleeping sickness), leishmaniasis, cysticercosis, dracunculiasis (guinea-worm disease), echinococcosis, foodborne trematode infections, lymphatic filariasis, onchocerciasis (river blindness), schistosomiasis (bilharziasis), soil-transmitted helminthiases (intestinal worms).*

<sup>2</sup>*Intensified control of neglected diseases: report of an international workshop, Berlin, Germany, 10–12 December 2003. Geneva, World Health Organization, 2004 (WHO/CDS/CPE/2004.45).*

**“ THE ROADMAP SETS TARGETS FOR THE PERIOD 2012–2020. THE WORLD HEALTH ORGANIZATION BELIEVES THAT DESPITE THE COMPLEXITY OF NEGLECTED TROPICAL DISEASES, THE TARGETS ARE ACHIEVABLE. ”**

Other measures to support these interventions involve control of vectors and their intermediate hosts, veterinary public health, water and sanitation, health awareness and education, and capacity building.

A turning point in efforts against these diseases was achieved after the first Global Partners' Meeting<sup>3</sup> convened by WHO in 2007 - an initiative outside any formally structured partnership which resulted in a shared commitment to support WHO's strategies, goals and targets. These have yielded significant gains for public health, including the scale up of control and elimination programmes and enhanced access to medicines, benefitting hundreds of millions of poor and marginalized populations in an innovative and cost effective way of working together.

On 14 October 2010, WHO's Director-General, Dr Margaret Chan, launched the first WHO report on neglected tropical diseases<sup>4</sup> to demonstrate the progress achieved since 2007 with the collaboration of endemic countries and partners. The results are visible, the strategic approaches technically feasible and the investment cost effective.

The first WHO report, however, highlighted gains but also challenges, triggering a wave of additional pledges from public and private partners. Despite a global financial crisis, almost all of these pledges have now been met, enabling Member States, WHO and its partners to accelerate implementation of disease control programmes.

Additional commitment is needed to achieve the targets for control and elimination, and contribute towards

attaining several Millennium Development Goals, notably poverty alleviation (Goal 1), universal primary education (Goal 2), reduced child mortality (Goal 4) and improved maternal health (Goal 5).

In 2011, the WHO Strategic and Technical Advisory Group for Neglected Tropical Diseases and partners adopted a roadmap for control, elimination and eradication. The roadmap sets targets for the period 2012–2020. WHO believes that despite the complexity of neglected tropical diseases, the targets are achievable.

This document is a summary of the roadmap.<sup>5</sup> Two tables show the targets and milestones for eradication and elimination (Table 1a) and for control (Table 1b) of neglected tropical diseases by 2015 and 2020. Targets for neglected zoonotic diseases have been published separately.<sup>6</sup>

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<sup>3</sup>*Report of the first global partners' meeting on neglected tropical diseases: a turning point. Geneva, World Health Organization, 2007 (WHO/CDS/NTD/2007.4).*

<sup>4</sup>*Working to overcome the global impact of neglected tropical diseases: first WHO report on neglected tropical diseases. Geneva, World Health Organization, 2010. (WHO/HTM/NTD/2010.1).*

<sup>5</sup>*Accelerating work to overcome neglected tropical diseases: a roadmap for implementation. Geneva, World Health Organization, 2011 (unpublished report endorsed by STAG-NTD at its April 2011 meeting).*

<sup>6</sup>*Report of the interagency meeting on planning the prevention and control of neglected zoonotic diseases (NZDs), Geneva, 5–6 July 2011 [Annex 1: Interagency roadmap for high-priority neglected zoonotic diseases: expected outcomes by objective by 2015 and 2020]. Geneva, World Health Organization, 2011 (WHO/HTM/NTD/NZD/2011).*



## Strategies

WHO recommends five strategies for the prevention, control, elimination and eradication of neglected tropical diseases:

- **Preventive chemotherapy**

– Preventive chemotherapy aims at optimizing the large-scale use of safe, single-dose medicines, currently against four helminthiases (lymphatic filariasis, onchocerciasis, schistosomiasis and soil-transmitted helminthiases). Additionally, a key component of the SAFE (Surgery, Antibiotics, Facial cleanliness and Environmental improvement) strategy against trachoma – the large-scale administration of azithromycin – is amenable to close coordination (and, in future, possibly co-administration) with interventions targeted at helminthiases.

Implementation of preventive chemotherapy interventions with high coverage will ensure that by 2020 the WHO goals for the five targeted diseases are reached. Some intermediate elimination milestones, as specified in Table 1a, can be reached by 2015. Critical assumptions to reach these objectives are: (1) that solutions be found to make praziquantel widely available along with the other donated medicines in the preventive chemotherapy package; and (2) that funding for implementation accompanies the scaling up of interventions, through sustained commitment of international donors and enhanced in-country support by the health and education sectors.

- **Intensified disease management**

– This intervention targets complex protozoan and bacterial diseases, such as human African trypanosomiasis, leishmaniasis, Chagas disease and Buruli ulcer. The new focus on better access to specialized care through improved case-detection and decentralized

clinical management aims to prevent mortality, reduce morbidity and interrupt transmission.

- **Vector and intermediate host control**

– Vector control serves as an important cross-cutting activity aimed at enhancing the impact of preventive chemotherapy and intensified disease management.

Integrated vector management is a combination of different intersectoral interventions aimed at improving the efficiency, ecological soundness and sustainability of disease control measures against vector-borne neglected tropical diseases, including the sound management of public-health pesticides.

- **Veterinary public health at the human–animal interface**

– Several of the important neglected tropical diseases are caused by agents originating from or involving vertebrate animals in their life cycles. These include cysticercosis, echinococcosis, fascioliasis and other foodborne trematodiases, zoonotic African trypanosomiasis and human dog-mediated rabies. An integrated human and animal health approach will improve the prevention and control of neglected zoonotic diseases.

- **Provision of safe water, sanitation and hygiene**

– Statistics compiled by the United Nations show that 900 million people lack access to safe drinking-water, and 2500 million live without appropriate sanitation. Despite the obvious health benefits that accrue from improved sanitation, the targets of Millennium Development Goal 7 are far from being met, especially in the African and South-East Asia regions.

Until this situation improves, many neglected tropical diseases and other communicable diseases will not be eliminated, and certainly not eradicated.

**“ THE WORLD HEALTH ORGANIZATION RECOMMENDS FIVE STRATEGIES FOR THE PREVENTION, CONTROL, ELIMINATION AND ERADICATION OF NEGLECTED TROPICAL DISEASES. ”**

Table 1a. Targets and milestones for elimination and eradication of neglected tropical diseases, 2015–2020<sup>a</sup>  
At a glance

DISEASE	2015				2020			
	Eradication	Global elimination	Regional elimination	Country elimination	Eradication	Global elimination	Regional elimination	Country elimination
Rabies <sup>b</sup>			✓ Latin America			✓ South-East Asia and Western Pacific regions		
Blinding trachoma					✓			
Endemic treponematoses (yaws)					✓			
Leprosy					✓			
Chagas disease			✓ Transmission through blood transfusion interrupted			✓ Intra-domiciliary transmission interrupted in the Region of the Americas		
Human African trypanosomiasis				✓ In 80% of foci		✓		
Visceral leishmaniasis						✓ Indian subcontinent		
Dracunculiasis	✓							
Lymphatic filariasis						✓		
Onchocerciasis			✓ Latin America	✓ Yemen				✓ Selected countries in Africa
Schistosomiasis			✓ Eastern Mediterranean Region, Caribbean, Indonesia and the Mekong River basin				✓ Region of the Americas and Western Pacific Region	✓ Selected countries in Africa

<sup>a</sup> The order of the diseases follows that of the First WHO report (see part 2, section 5).

<sup>b</sup> Refers to human dog-mediated rabies.

Table 1b. Targets and milestones for control of neglected tropical diseases, 2015–2020<sup>a</sup>

DISEASE	2015	2020
<b>Dengue</b>	<ul style="list-style-type: none"> <li>Sustainable dengue vector control interventions established in 10 endemic priority countries</li> </ul>	<ul style="list-style-type: none"> <li>Dengue control and surveillance systems established in all regions</li> <li>Number of cases reduced by more than 25% (2009–2010 as base line) and deaths by 50%</li> </ul>
<b>Buruli ulcer</b>	<ul style="list-style-type: none"> <li>Study completed and oral antibiotic therapy incorporated into control and treatment</li> </ul>	<ul style="list-style-type: none"> <li>70% of all cases detected early and cured with antibiotics in all endemic countries</li> </ul>
<b>Cutaneous leishmaniasis</b>	<ul style="list-style-type: none"> <li>70% of all cases detected and at least 90% of all detected cases treated in the Eastern Mediterranean Region</li> </ul>	
<b>Taeniasis/cysticercosis and echinococcosis/hydatidosis</b>	<ul style="list-style-type: none"> <li>Validated strategy for control and elimination of <i>T. solium</i> taeniasis/cysticercosis available</li> <li>Pilot projects to validate effective echinococcosis/hydatidosis control strategies implemented in selected countries as a public-health problem</li> </ul>	<ul style="list-style-type: none"> <li>Interventions scaled up in selected countries for <i>T. solium</i> taeniasis/cysticercosis control and elimination</li> <li>Validated strategy available for echinococcosis/hydatidosis and interventions scaled up in selected countries for their control and elimination</li> </ul>
<b>Foodborne trematode infections</b>	<ul style="list-style-type: none"> <li>Foodborne trematode infections included in mainstream preventive chemotherapy strategy</li> <li>Morbidity due to foodborne trematode infections controlled where feasible</li> </ul>	<ul style="list-style-type: none"> <li>75% of population at risk reached by preventive chemotherapy</li> <li>Morbidity due to foodborne trematode infections controlled in all endemic countries</li> </ul>
<b>Soil-transmitted helminthiases (intestinal worms)</b>	<ul style="list-style-type: none"> <li>50% of preschool and school-aged children in need of treatment are regularly treated</li> <li>100% of countries have a plan of action</li> </ul>	<ul style="list-style-type: none"> <li>75% of preschool and school-aged children in need of treatment are regularly treated</li> <li>75% coverage achieved in preschool and school-aged children in 100% of countries</li> </ul>

<sup>a</sup> The order of the diseases follows that of the First WHO report (see part 2, section 5).

Providing conditions for the development of essential skills to effectively manage national NTD control programmes is a key activity in capacity building. WHO is responsible for formulating appropriate training and strengthening existing capacity in order to respond more effectively to the integrated delivery of control strategies.

Monitoring and evaluation and disease surveillance are essential components of WHO's work, providing a core set of tools used to verify and improve the quality of interventions at various stages of implementation. Monitoring and evaluation provides robust and credible evidence on performance and, crucially, on whether the specific programme is achieving its expected outcomes.

## Policy framework

The targets contained in the roadmap are based on the recommendations made by Member States in several World Health Assembly resolutions. These resolutions have been complemented by several Regional Committee resolutions and declarations.

Table 2 summarizes key resolutions related to eradication and elimination of selected neglected tropical diseases. A full list of resolutions and declarations can be found in the first NTD report.<sup>7</sup>

<sup>7</sup>Working to overcome the global impact of neglected tropical diseases: first WHO report on neglected tropical diseases. Geneva, World Health Organization, 2010 (WHO/HTM/NTD/2010.1).

**Table 2. Resolutions of the World Health Assembly (WHA) on elimination and eradication of selected neglected tropical diseases**

Disease	WHA resolution number	Title	Year
Trachoma	WHA 51.11	Global elimination of blinding trachoma	1998
Endemic treponematoses (yaws)	WHA 31.58	Control of endemic treponematoses	1978
Leprosy	WHA 51.15	Elimination of leprosy as a public health problem	1998
Chagas disease	WHA 63.20	Chagas disease: control and elimination	2010
Human African trypanosomiasis	WHA 57.2	Control of human African trypanosomiasis	2004
Leishmaniasis	WHA 60.13	Control of leishmaniasis	2007
Dracunculiasis	WHA 64.16	Eradication of dracunculiasis	2011
Lymphatic filariasis	WHA 50.29	Elimination of lymphatic filariasis as a public health problem	1997
Onchocerciasis	WHA 62.1	Prevention of avoidable blindness and visual impairment	2009
Schistosomiasis and soil-transmitted helminthiasis	WHA 54.19	Schistosomiasis and soil-transmitted helminth infections	2001

## Diseases

The order of the information presented below reflects the increasing molecular and structural complexity of infectious agents responsible for neglected tropical diseases. Of the 17 diseases, 9 are caused by microparasites and 8 by macroparasites. This arbitrary classification elucidates principles governing the population dynamics, epidemiology and courses of infection of pathogens that severely impair human health.<sup>8</sup>

Overcoming infections caused by a number of microparasites and macroparasites is made more difficult because their survival and transmission often exploits a zoonotic component. Zoonotic infections are those in which humans – through behaviour, culture or food supply – have become incorporated into the transmission cycle of pathogens responsible for diseases in wild or domesticated animals.

### 1. Dengue

Dengue fever continues to affect millions of people worldwide. In 2010, all six WHO regions recorded dengue fever and indigenous outbreaks were reported for the first time in Europe.

The principal vectors, *Aedes aegypti* and *Aedes albopictus*, have continued to expand their range of distribution especially in the European and African continent. Concerted efforts are required in priority endemic countries to control the spread of the vectors and apply sustainable control measures to stem the tide by 2015.

The increasing incidence, severity and frequency of dengue epidemics are linked to trends in human ecology, demography and globalization and are further influenced by climate change.

Although dengue is most closely associated with poor populations and crowded urban and periurban areas,

it also affects affluent neighbourhoods of tropical and sub-tropical countries, and there is evidence of increasing rural transmission. With new tools for diagnosis and vector control, better case management and focused research on medicines and vaccines, an integrated vector management approach should reduce rates of morbidity by at least 25% and mortality by 50% by 2020.

### 2. Human dog-mediated rabies

More than 99% of all human deaths from rabies occur in the developing world, with domestic dogs the source of the vast majority of human cases. From age-stratified incidence rates, on average, between 30% and 50% of human dog-mediated rabies cases (and therefore human rabies deaths) occur in children aged under 15 years. In some areas, significant losses to livestock, especially cattle, have been recorded.

It is estimated that some 55 000 people die from dog-mediated rabies every year in Africa and Asia. More than 14 million people worldwide receive post-exposure prophylaxis following bites from suspected rabid animals. The economic burden can be reduced and the disease eliminated by controlling the disease in dogs.

Pilot studies coordinated by WHO in the Philippines, South Africa and the United Republic of Tanzania aim to demonstrate the cost-effectiveness of dog immunization in preventing dog-mediated rabies in humans.

Elimination of human dog-mediated rabies and dog-to-dog transmission is achievable by 2015 in all endemic areas in Latin America; and by 2020 in all affected countries in WHO's South-East Asia and Western Pacific regions. Intensified control and enhanced surveillance should lead to a 50% reduction of the number of human rabies deaths in these two regions by 2015.

**“ OF THE 17 DISEASES, 9 ARE CAUSED BY MICROPARASITES AND 8 BY MACROPARASITES. ”**

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<sup>8</sup> Anderson RM, May RM. Infectious diseases of humans: dynamics and control. Oxford, Oxford University Press, 1991.

### 3. Blinding trachoma

More than 40 million people in over 50 countries are affected by trachoma, and over 8 million are at immediate risk of irreversible blindness. The prevalence of trachoma has declined since 1998 as a result of the implementation of the SAFE strategy (that is, Surgery of the lids, Antibiotics to treat the community pool of infection, Facial cleanliness and Environmental improvement).

Ghana, the Islamic Republic of Iran, Morocco, Oman and the Gambia have reported reaching their elimination targets, but a major effort is still required to reach the goal of elimination of the disease by 2020. Since the distribution of the disease is associated with extreme poverty and lack of access to treatment, governments, international partners and the private sector have collaborated to provide the needed services and the necessary medicines.

In order to achieve the global elimination goal by 2020, 10% of endemic countries are expected to have achieved the Ultimate Intervention Goal (UIG) by 2013. By 2016, 40% of endemic countries should have achieved this goal and entered post-endemic surveillance. By 2020, all countries will have achieved the UIG and be free from blinding trachoma as a public-health problem.

In 2016, 40% of endemic countries should have met the criteria to stop large-scale medicine interventions and entered post-endemic surveillance; and by 2020, 75% of countries will have been verified as free from blinding trachoma as a public-health problem.

### 4. Buruli ulcer

In 2004, WHO recommended combined antibiotic treatment with rifampicin and streptomycin, which radically changed treatment prospects for Buruli ulcer.

During 2004–2010, nearly 36 000 people benefited from this new treatment, 50% of whom were children aged under 15 years.

Combined antibiotic treatment has almost halved the need for surgery, which was the standard of case-management before 2004. Today, surgery is performed only on late-stage and severe cases.

In 2012, WHO plans to initiate a study to develop oral antibiotic therapy for full incorporation into control and treatment by 2015. WHO aims to cure 70% of all cases with antibiotics in all endemic countries by 2020.

### 5. Endemic treponematoses (yaws)

In 1995, WHO estimated that 460 000 infectious cases of yaws occurred worldwide: 400 000 in west and central Africa, 50 000 in South-East Asia and the remainder in other tropical regions.

In 2007, WHO launched a new global initiative to eliminate yaws and other endemic treponematoses. Since then, more than 100 000 cases have been treated with benzathine penicillin, which is provided by WHO to some endemic countries. Yaws mainly affects children and has been eliminated in many countries, including India (in 2006).

The South-East Asia Region has prioritized yaws and set 2012 as the goal for regional elimination in the two remaining endemic countries (Indonesia and Timor-Leste). Since 2004, India has reported no new cases. In the Western Pacific Region, three countries remain endemic (Papua New Guinea, the Solomon Islands and Vanuatu).

Large-scale administration of oral azithromycin is expected to increase the prospects for elimination. The aim is to eliminate the disease in the Western Pacific and South-East Asia regions and to complete epidemiological assessments in Africa by 2015.

Elimination of yaws in Africa is feasible by 2020, therefore leading to global eradication (Table 1a).

## 6. Leprosy (Hansen disease)

Of the 122 countries considered endemic for leprosy, 119 have eliminated the disease as a public-health problem (defined as achieving a prevalence of less than 1 case/10 000 population).

The 213 000 cases known to remain are confined mostly to 17 countries reporting more than 1000 cases annually. This number reflects the more than 90% reduction in the number of cases detected since 1985, mainly as a result of timely case-finding and multidrug therapy.

Transmission continues in limited geographical areas of several countries that were previously highly endemic. Vigorous case-finding and treatment would lead to global interruption of transmission by 2020, and reduce grade 2 disabilities in newly detected cases to below 1/million population at global level.

The development of methods to increase the specificity of diagnosis, notably for paucibacillary leprosy, will enhance the elimination strategy.

## 7. Chagas disease

During 2007–2010, two million nifurtimox tablets were distributed for second-line treatment of Chagas disease. During the same period, 30 000 patients in endemic countries received first-line treatment with benznidazole.

Over the years, sustained vector control has largely contributed to reducing transmission in Latin America – and saving millions of people from chronic impairments. The objective now is to interrupt transmission via intra-domiciliary vectors in Latin America and transmission via blood transfusion in Latin America, Europe and the Western Pacific by 2015.

A milestone will be reached when peri-domiciliary infestation has been eliminated in Latin America by 2020. WHO is leading a global awareness campaign and aims to certify global

interruption of transmission through blood transfusion and global interruption of transmission through organ transplantation. Surveillance and control of oral transmission and congenital infection need to be sustained.

## 8. Human African trypanosomiasis (sleeping sickness)

Successful advocacy programmes during the late 1990s enabled WHO to secure access to diagnosis and treatment as well as funding and medicines to support endemic countries.

The objective now is to expand and sustain control and surveillance activities using the best tools available to eliminate the disease as a public-health problem. WHO is doing everything necessary to enhance wider patient accessibility and aims to eliminate the disease in 80% of foci by 2015 and achieve elimination in 100% of foci by 2020 (criteria to be defined by an elimination committee to be convened by WHO at the end of 2012).

## 9. Leishmaniasis

Regional leishmaniasis control programmes and the elimination of visceral leishmaniasis in the Indian subcontinent over the past five years have strengthened capacity, improved access to medicines and enhanced surveillance.

Control programmes are also being implemented in the Region of the Americas, the Eastern Mediterranean Region and the European Region.

WHO promotes early case-finding and prompt treatment of leishmaniasis, which in its various forms affects populations in more than 90 countries. Proper treatment averts death from visceral leishmaniasis or the stigma of its cutaneous forms.

Through its current strategy, WHO aims to detect at least 70% of all cases of cutaneous leishmaniasis and treat at least 90% of all these detected cases in the Eastern Mediterranean Region by 2015. With sustained efforts on the Indian

sub-continent, 100% case-detection and treatment of visceral leishmaniasis is feasible by 2020, implying that less than 1 case per 10 000 population at district and sub-district levels can be achieved.

### 10. Cysticercosis

Cysticercosis is a disease caused by the development of *Taenia solium* cysticerci in human tissues. Neurocysticercosis is caused by cysticerci that develop in the central nervous system. Cysticercosis is present in all six WHO regions. More than 80% of the world's 50 million people who are affected by epilepsy live in developing countries, many of which are endemic for *T. solium* infections in humans and pigs. Among the endemic countries, only China has a national surveillance and control programme in place.

Elimination of cysticercosis requires improvements in sanitary conditions, especially prevention of open defecation, chemotherapy for humans, pig husbandry and marketing practices, and pig treatment combined with vaccination using a newly developed recombinant vaccine.

A validated strategy for the control and elimination of *T. solium* taeniasis/ cysticercosis will be available by 2015; and interventions for control and elimination scaled up in selected countries in Africa, Asia and Latin America by 2020.

### 11. Dracunculiasis (guinea-worm disease)

Since the beginning of the dracunculiasis eradication campaign in the early 1980s, there has been a significant decline (more than 99%) in the annual incidence of the disease, from 892 055 cases in 1989 to 1058 in 2011.

Village-based active searches, prompt case-containment, enhanced surveillance and access to improved drinking-water have helped to drastically reduce the number of reported cases. Dracunculiasis is now on the verge of eradication.

In order to achieve interruption of transmission by 2015, heightened surveillance should be enforced and momentum maintained – even when a country or area within an endemic country has interrupted transmission – until global eradication is achieved.

### 12. Echinococcosis

Echinococcosis is a zoonotic disease caused by the larval stages of the dog tapeworm *Echinococcus granulosus*. The disease has a global distribution and causes serious morbidity and death in humans if untreated. The annual cost of treatment and economic losses to the livestock industry are estimated at US\$ 2 billion. Some 200 000 new cases of cystic echinococcosis are diagnosed annually.

Interventions such as treating dogs regularly, carrying out strict controls during the slaughter of livestock, destroying infected offal and public education have stopped transmission in developed countries and island settings. These intensive programmes may not work in low or middle-income countries, where much of the disease burden occurs. An alternative strategy involving the vaccination of sheep in addition to classical interventions could improve chances of success in countries affected by cystic echinococcosis.

Pilot projects to validate the effectiveness of echinococcosis/hydatidosis control strategies will be implemented in selected countries by 2015. Scale up of interventions in selected countries in Central Asia, North Africa and Latin America for control and elimination as a public-health problem will be in place by 2020.

### 13. Foodborne trematode infections

Recent estimates indicate that at least 56 million people suffer from one or more foodborne trematode infections (clonorchiasis, opisthorchiasis, fascioliasis, paragonimiasis and others) worldwide.

“ THE WORLD HEALTH ORGANIZATION HAS PRODUCED OVERWHELMING EVIDENCE TO SHOW THAT THE BURDEN CAUSED BY MANY OF THE 17 DISEASES THAT AFFECT MORE THAN 1 BILLION PEOPLE WORLDWIDE CAN BE EFFECTIVELY CONTROLLED AND, IN MANY CASES, ELIMINATED OR EVEN ERADICATED. ”



WHO is working to expand preventive chemotherapy to include foodborne trematode infections and ensure that their worst consequences (cancers of the bile duct) are fully prevented. All foodborne trematode infections can be treated with praziquantel or triclabendazole.

By 2015, WHO aims to control morbidity due to foodborne trematodiasis where feasible. This will follow the inclusion of these infections in the mainstream preventive chemotherapy strategy with the necessary veterinary public-health support.

By 2020, 75% of the at-risk population will have been reached by preventive chemotherapy and morbidity associated with foodborne trematode infections will be under control in 100% of the endemic countries.

#### 14. Lymphatic filariasis

The Global Programme to Eliminate Lymphatic Filariasis remains a vital player in efforts to control lymphatic filariasis and interrupt transmission through regular treatment with mass-drug administration. In some countries, this intervention may need to be supported by vector (insect) control.

Despite significant successes, achieving the goal of elimination as a public-health problem by interrupting transmission remains challenging in the many places where clinical cases persist. If current levels of interventions are maintained, elimination in all Pacific Islands, excluding Papua New Guinea, can be achieved by 2015.

By 2017, 70% of all 81 endemic countries will have met the criteria to stop interventions and entered the post-intervention surveillance phase.

By 2020, 100% of all endemic countries will have been verified as free of transmission or will have entered post-intervention surveillance.

#### 15. Onchocerciasis

In the Region of the Americas, the onchocerciasis elimination programme is working to interrupt transmission and thereby stop infection and the development of the disease. Elimination by 2015 is feasible in Latin America (13 foci in 6 endemic countries – the Bolivarian Republic of Venezuela, Brazil, Colombia, Ecuador, Guatemala and Mexico).

Clinic-based ivermectin treatment of severe skin lesions (sowda) has been implemented successfully in Yemen during the past decade. A national action plan has been developed in 2010 aiming at onchocerciasis elimination in the country by 2015 through mass distribution of ivermectin and vector control.

Control of onchocerciasis in Africa is the responsibility of the African Programme for Onchocerciasis Control (APOC), established in 1995. A total of 75.8 million people had been treated in 2010 in APOC countries. However, surveillance activities and mass drug administration (with ivermectin) are still ongoing in the former Onchocerciasis Control Programme in West Africa (OCP). It is currently estimated that, by 2020, 12 APOC countries and 11 ex-OCP countries may have achieved elimination, out of a total of 31 countries affected by onchocerciasis on the African continent.

#### 16. Schistosomiasis (bilharziasis)

There is an immediate need to step up praziquantel treatment in Africa to reach the goal of treating at least 75% of school-aged children in all endemic countries. This means 76 million school-aged children should receive praziquantel treatment, whereas in 2010 only 33.3 million people of all age groups had been treated.

In the African Region, efforts are under way to eliminate *Schistosoma haematobium* from Zanzibar (United Republic of Tanzania). Surveillance will confirm the interruption of transmission of this infection in Mauritius.

“ THE WORLD HEALTH ORGANIZATION IS STRATEGICALLY AND IMPARTIALLY PLACED TO FACILITATE THE DEVELOPMENT OF TRANSITIONAL ARRANGEMENTS TO MEET THE NEEDS OF DONORS AND INDIVIDUAL COUNTRIES. ”

**“ WHO ESTIMATES THAT AN ADDITIONAL US\$ 2 BILLION IS NEEDED TO PREVENT AND TREAT ALL PEOPLE AT RISK OF CONTRACTING A COMMON NEGLECTED TROPICAL DISEASE BY 2015. ”**

In the Eastern Mediterranean Region, elimination of *S. haematobium* is feasible by 2015 in Egypt, Libya, Saudi Arabia and the Syrian Arab Republic. Strengthened surveillance systems, including snail surveillance, will be needed to identify remaining foci for interventions. Surveillance should confirm that transmission has stopped in the Islamic Republic of Iran, Jordan and Morocco.

WHO also aims at eliminating *S. mansoni* infections in the Caribbean, *S. japonicum* infections in Indonesia and *S. mekongi* infections in the Mekong River basin.

In the Region of the Americas, establishing surveillance systems in the Bolivarian Republic of Venezuela, Saint Lucia and Suriname should detect transmission foci, thereby facilitating more efficient targeting of interventions (treatment, sanitation and safe water).

By 2020, Brazil will have eliminated *S. mansoni* infections and *S. japonicum* infections will have been eliminated in the Western Pacific Region.

Therefore, if praziquantel becomes available in the quantities needed, its delivery is co-implemented with that of anthelmintic medicines for STH (see 2015–2020 targets and milestones in table 1b) and WHO takes advantage of the experience available in countries that have eliminated the disease or come close to doing so – schistosomiasis could be “eliminated as a public health problem” in multiple countries in Africa by 2020, and globally by 2025.

### **17. Soil-transmitted helminthiases (intestinal worms)**

More than 1 billion people are infected with nematodes that cause soil-transmitted helminthiases.

Over the past 10 years, significant progress has been made in controlling these infections. In 2010, about 314 million preschool and school-aged children

(representing 31% of all children in the world at risk of soil-transmitted helminthiases) were dewormed.

Despite this result in coverage, the target of reaching 75% of school-aged children by 2010 was not reached. However, in the past few years a number of partners have focused efforts on control, and the private sector has donated large amounts of medicines for control of these infections.

WHO considers these unique opportunities as a positive indicator that 75% coverage will be reached in all countries by 2020. A strategic plan towards this objective is being finalized in collaboration with partners.

### **Costs**

WHO estimates that in addition to the generous contribution of industry (Table 3), a further US\$ 2 billion is needed to prevent and treat all people at risk of contracting a common neglected tropical disease by 2015.

For the complex diseases, such as human African trypanosomiasis, Buruli ulcer, Chagas disease and leishmaniasis, there is need for early diagnosis, intensified treatment, increased access to available medicines and capacity for surgical interventions.

Dengue is the only neglected tropical disease that has emerged or re-emerged over the past 10 years. It continues to exert a huge burden on populations, health systems and economies in most tropical countries of the world.

WHO is strategically and impartially placed to facilitate the development of transitional arrangements to meet the needs of donors and individual countries. Such arrangements would strengthen health systems and foster community understanding and compliance.

**Table 3. Major donations of medicines for controlling neglected tropical diseases made by the pharmaceutical industry**  
(update January 2012)

Medicine	Donation
Albendazole	Unlimited supply for as long as needed from GlaxoSmithKline for lymphatic filariasis worldwide and up to 400 million doses per year for soil-transmitted helminthiases school-age children worldwide; donations made through WHO
Amphotericin B liposome	445 000 vials from Gilead for visceral leishmaniasis control in high endemic countries in South-East Asia and East Africa; donation made through WHO – preferential price for WHO for other countries (18 USD/vial)
Azithromycin	Donated by Pfizer in the context of full SAFE strategy for the elimination of blinding trachoma; donated through the International Trachoma Initiative (ITI)
DEC (diethylcarbamazine)	Up to 2.2 billion tablets of 100 mg tablets by Eisai Co., Ltd., for the period 2013-2020; donation made through WHO
Eflornithine	Unlimited quantity until 2016 from Sanofi for human African trypanosomiasis; donation made through WHO
Ivermectin	Unlimited supply for as long as needed donated directly to countries by Merck & Co., Inc., for lymphatic filariasis and onchocerciasis; donated through the Mectizan Donation Program (MDP)
Multidrug therapy (rifampicin, clofazimine and dapsone in blister packs) and loose clofazimine	Unlimited supply for as long as needed for leprosy and its complications from Novartis; donation made through WHO
Mebendazole	200 million tablets annually from Johnson & Johnson for soil-transmitted helminthiases control programmes for children
Melarsoprol	Unlimited quantity until 2016 from Sanofi for human African trypanosomiasis; donation made through WHO
Nifurtimox	900 000 tablets (120 mg) per year by 2017 from Bayer for treatment of Chagas disease and human African trypanosomiasis; donation made through WHO
Pentamidine	Unlimited quantity by 2016 from Sanofi for human African trypanosomiasis; donation made through WHO
Praziquantel	In 2007, Merck KGaA had committed to donate 200 million tablets of 600 mg praziquantel for distribution primarily at African school children. Having originally planned to end the project in 2017, Merck KGaA will continue its efforts to fight schistosomiasis indefinitely with an amount of 250 million tablets per year; donation made through WHO
Suramin	Unlimited quantity by 2016 from Bayer for human African trypanosomiasis; donation made through WHO
Triclabendazole	From Novartis for fascioliasis; donation made through WHO

## Conclusion

Evidence provided throughout the road map demonstrates that steady progress is being made. The effort is directed towards achieving the targets for the control of neglected tropical diseases set by the World Health Assembly that will in turn contribute to attaining the Millennium Development Goals in 2015 and further elimination targets by 2020.

However, millions of people still need free high-quality treatments and millions more still need care and treatment for human dog-mediated rabies, echinococcosis, leishmaniasis and other NTDs seemingly difficult to treat. Country level capacity needs to be strengthened through well-trained health care providers and managers for the sustained implementation of efficient control programmes. Strengthened

epidemiological surveillance systems need to be in place to allow effective monitoring and evaluation of programmes.

Vector control must be scaled-up and coordinated, in many cases linked with water supply, sanitation and water development projects. As many neglected tropical diseases are rooted in poverty, lasting measures such as better sanitation and improved supply of safe water in deprived communities will ensure long term economic growth and brighter prospects for food production.

Despite several remaining obstacles and challenges, the targets set out in this roadmap are ambitious but nevertheless reachable.

WHO's duty is to secure the future of generations to come, by sustaining the achievements beyond 2020.



## **NEGLECTED TROPICAL DISEASES**

*are a diverse group of diseases with distinct characteristics found mainly among the poorest populations of the world.*

*The 17 diseases targeted by WHO share a common stranglehold on those populations left furthest behind by development: they perpetuate poverty. Most of those who suffer from more than one of these diseases at any given time are also mired in poverty, perpetuating a doubly intolerable and unacceptable situation destined to live in permanent disability.*

*The international community is committed to rooting out these diseases. The roadmap proposes the way forward.*

*Although the global financial crisis may negatively impact the resources available to support control and elimination programmes, evidence has shown that the cost of treating one or more neglected tropical diseases is negligible compared with that associated with other diseases.*

*Evidence clearly shows that overcoming neglected tropical diseases makes economic and development sense, and that the prospects for achieving the roadmap's targets are ambitious but well-founded.*

*Scaling up interventions will bolster recent progress made in tackling neglected tropical diseases and result in the eradication of dracunculiasis and yaws and the elimination of several others by 2015 and 2020.*