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

## A ROADMAP FOR IMPLEMENTATION

World Health Organization

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*Roadmap approved by the Strategic and Technical Advisory Group for Neglected Tropical Diseases in 2011*

*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.

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# 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 that 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***

## Purpose of the roadmap

One of the objectives of the World Health Organization (WHO) *Medium-term strategic plan 2008–2013* is to ensure "effective coordination and support provided to WHO Member States in order to provide access for all populations to interventions for the prevention, control, elimination and eradication of neglected tropical diseases, including zoonotic diseases" (*1*).

The purpose of this roadmap is to guide implementation of the policies and strategies set out in the *Global Plan to combat neglected tropical diseases 2008–2015* (*2*) and developed in *Working to overcome the global impact of neglected tropical diseases* (*3*). These documents highlight the devastating impacts of neglected tropical diseases (NTDs) on human health and the socioeconomic development of many impoverished communities. A growing body of evidence demonstrates that control of these diseases will significantly reduce illness, social exclusion and mortality. Furthermore, prevention and control of NTDs will contribute directly to the attainment of several Millennium Development Goals.

The roadmap's destination can be reached only if two established, interconnected routes are followed. One route is to continue to provide guidance and technical insight to policy-makers and programme managers in governments seeking to prevent, control, eliminate and eradicate the NTDs that are endemic in their countries. The other route is to continue to encourage the community of partners – including donors, pharmaceutical companies, agencies, nongovernmental organizations (NGOs), philanthropists and universities – to maintain and increase their commitments to overcoming NTDs.

A turning point in efforts against these diseases was achieved after the first Global Partners' Meeting (*4*) convened by WHO in 2007 – an initiative outside any formally structured partnership which resulted in the 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 eradication 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.

Following the roadmap will accelerate efforts to control the mortality and morbidity associated with these diseases and reduce transmission of their infective agents.

The ultimate destination of this roadmap is the elimination of NTDs or reductions in their impact to levels at which they are no longer considered public-health problems. Realistic targets to achieve this goal are set out in section 8 of this document.

For many NTDs, a significant reduction in morbidity and transmission is feasible with the proposed short- to medium-term interventions. For most NTDs, sustained elimination is possible only with full access to safe water, waste disposal and treatment, basic sanitation and improved living conditions. However, since this area of work is related to development and

not directly to the work of WHO's Department of Control of Neglected Tropical Diseases, it is not discussed in the roadmap.

A reality facing the entire NTD community is that, at some point, external support and resources will end. Accurate predications of the timing of external withdrawal cannot be made, but steps should be taken to ensure a fair transition process to enable the governments of endemic countries to sustain their work in prevention and control of NTDs. The transition process should include an estimation of financial costs to both countries and donors. WHO is strategically and impartially placed to facilitate the development of transitional arrangements that will meet the needs of donors and individual countries. Strengthening and expanding capacity-building, supportive actions, evaluation, coordination and cross-cutting activities should be in place by the time of transition.

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 1 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 WHO report on NTDs (*3*).

Achieving the roadmap's targets may be challenging given the burden of NTDs, global financial uncertainty and political instability, but prospects for success are well founded. WHO has expertise and experience of these diseases, and the respect and trust of governments and partners. In addition, it benefits from the advice of the Strategic and Technical Advisory Group for NTDs (STAG-NTD) and its working groups, and from collaboration with WHO teams that are responsible for control of specific diseases (for example, Prevention of Blindness and Visual Impairment).

**Table 1. Resolutions of the World Health Assembly (WHA) on elimination and eradication of selected neglected tropical diseases**

| Disease | WHA resolution number | Title | Year |
|---|---|---|---|
| Trachoma | WHA51.11 | Global elimination of blinding trachoma | 1998 |
| Endemic treponematoses (yaws) | WHA31.58 | Control of endemic treponematoses | 1978 |
| Leprosy | WHA51.15 | Elimination of leprosy as a public health problem | 1998 |
| Chagas disease | WHA63.20 | Chagas disease: control and elimination | 2010 |
| Human African trypanosomiasis | WHA57.2 | Control of human African trypanosomiasis | 2004 |
| Leishmaniasis | WHA60.13 | Control of leishmaniasis | 2007 |
| Dracunculiasis | WHA64.16 | Eradication of dracunculiasis | 2011 |
| Lymphatic filariasis | WHA50.29 | Elimination of lymphatic filariasis as a public health problem | 1997 |
| Onchocerciasis | WHA62.1 | Prevention of avoidable blindness and visual impairment | 2009 |
| Schistosomiasis and soil-transmitted helminthiases | WHA54.19 | Schistosomiasis and soil-transmitted helminth infections | 2001 |

## 1. Setting the scene: the landscape of neglected tropical diseases

### 1.1 Burden and severity

The NTD brand has proved to be a useful form of shorthand for communication, but it conceals the diversity of the 17 NTDs described in the first report (*3*) (19 if soil-transmitted helminthiases are counted as three diseases) in terms of their distribution, epidemiology, transmission, vector involvement, zoonotic aspects, pathology, and requirements for prevention and control.

NTDs are endemic in 149 countries with differing populations, economies, resources, political and legal arrangements, health regulations, traditions, cultures, climates, infrastructure and geographies. Overall, it is estimated that millions of people require preventive chemotherapy, a public-health intervention for the treatment of NTDs (Table 2). Importantly, the severity of the public-health problem that an NTD imposes on one country may be different from that in another.

### 1.2 Measuring results towards control, elimination and eradication

Setting universal criteria to be met before elimination of an NTD can be declared is problematic. Why should elimination be taken to mean that transmission has stopped? Elimination of an NTD in a country will depend on that country's assessment of the public-health significance of that NTD. There is no difficulty in agreeing the definition of eradication – defined as the interruption of transmission worldwide and the detection of zero cases in each country so that a country may be certified as free of the disease – as is the case with the eradication of dracunculiasis (guinea worm-disease).

### 1.3 WHO's essential role in guiding work to overcome the global impact of neglected tropical diseases

In 2005, WHO established the Department for Control of Neglected Tropical Diseases (WHO/NTD) at its headquarters in Geneva, Switzerland, following a thorough strategic direction and competency review requested by the late Director-General Dr JW Lee. At that time, there was an important need to find a means of steering the many parties concerned with improving the health of the millions of people suffering from NTDs. The need coincided with the availability of a qualified group of experts within WHO who were able to engage with governments and encourage the international community of partners. The review carried out at headquarters fostered similar reviews in most regional offices. The effectiveness of this global strategic review led by WHO is evident: more resources are available for control, elimination and eradication, more partners – also from pharmaceutical companies – have joined the endeavour, more activities directed at control are in progress and many health benefits are being achieved.

**Table 2. Estimated number of people requiring preventive chemotherapy for lymphatic filariasis, soil-transmitted helminthiases, schistosomiasis and onchocerciasis, 2009[a]**

| WHO region | Year | Number of countries and territories requiring preventive chemotherapy (for at least one disease) | Number of people requiring preventive chemotherapy for: | | | |
|---|---|---|---|---|---|---|
| | | | Lymphatic filariasis | Soil-transmitted helminthiases[b] | Schistosomiasis | Onchocerciasis |
| African | 2009 | 44 | 405 938 634 | 283 784 317 | 215 963 844 | 113 500 000 |
| Americas | 2009 | 30 | 11 349 793 | 45 453 923 | 7 127 425 | 500 000 |
| Eastern Mediterranean | 2009 | 9 | 12 565 325 | 77 952 919 | 14 782 490 | 6 000 000 |
| European | 2009 | 11 | – | 4 277 721 | – | – |
| South-East Asia | 2009 | 11 | 873 264 167 | 371 953 171 | 25 000 | – |
| Western Pacific | 2009 | 25 | 37 929 729 | 99 122 402 | 1 353 766 | – |
| **GLOBAL** | **2009** | **130** | **1 341 047 648** | **882 544 454** | **239 252 524** | **120 000 000** |

[a] *Source: WHO preventive chemotherapy and transmission control databank.*

[b] *Estimates revised in 2011.*

Significant progress will be made if the efforts of the NTD community are focused on following realistic and achievable milestones or targets by 2015. Much will depend, however, on sustaining this strong and universally respected structure at WHO's headquarters and its regional offices.

WHO has an international reputation as a centre of excellence for the services it leads and directs. Crucially, it has attracted funds for NTD control and is determined to continue to do so based on the quality of its work. There is, however, a major problem that must be resolved. In the next few years, senior members of staff working on NTDs will retire.

This position should not be taken as an easy opportunity to make savings. If work to overcome NTDs is to continue and prosper, staff must be replaced to sustain the Organization. WHO/NTD, together with WHO country and regional offices, is well placed to provide governments and the NTD community with the necessary leadership and coordination to direct the roadmap.

The work of WHO in the NTD area and its track record during the past decade are impressive, as recognized by the international experts who serve on the STAG-NTD

- Members of WHO/NTD staff have acquired medical and technical expertise, and credibility in the NTDs of concern in the Global Plan (*2*). No other institution has such a comprehensive resource.
- Through WHO's regional offices and country representatives, WHO/NTD has a communication chain giving access to ministries in countries where NTDs are endemic. No other institution has such an authoritative network.
- Novel intervention strategies for NTDs have been developed and introduced (the paradigm shift as defined in the first chapter of the 2010 first NTD report) (*3*). Experience of using these strategies is accumulating, enabling the department to propose adaptations for their use in an evolving public-health setting.
- Since the first Berlin meeting in 2003 (*5*), WHO/NTD has fostered a strong sense of community and purpose among the various partners. In addition to donors, agencies, NGOs and others, positive outcomes from working with the pharmaceutical companies have helped millions of people to receive free regular treatment for Chagas disease, human African trypanosomiasis, fascioliasis and other foodborne trematodiases, leprosy, lymphatic filariasis, onchocerciasis, schistosomiasis, soil-transmitted helminthiases and trachoma. The importance of donated medicines cannot be over-emphasized.
- WHO/NTD has established an effective, transparent and respected relationship with a number of pharmaceutical companies and has contributed to mobilizing much needed resources as part of the industry's corporate social responsibility.
- Expertise has been acquired in the complex process of procurement, quality assurance and improved access to medicines, again reflecting the important relationship between WHO/NTD and the pharmaceutical companies.
- The WHO Pesticide Evaluation Scheme (WHOPES) is a core normative function of the department. The pesticide quality standards developed by WHOPES are currently being used by more than 96 countries endemic for vector-borne diseases.
- WHO consultations have established that controlling neglected zoonotic diseases (NZDs) is cost effective and can save lives and help secure livelihoods by protecting livestock and other domestic animals. Evidence of the feasibility of preventing, controlling and possibly eliminating "tool ready" NZDs and those for which control packages will be available within 3–5 years of conducting implementation research was reviewed in 2010; it is time to scale up interventions for control of NZDs in selected geographical and epidemiological settings.
- WHO/NTD has established statistical and graphical displays of the distribution and abundance of NTDs in endemic countries for implementation by programmes, and monitoring and evaluation of interventions. Results of interventions together with relevant demographical statistics are maintained. This comprehensive information is edited in the form of "country profiles", is kept up to date, and offers an effective management tool for governments and programme managers.
- WHO/NTD is a leading advocate for bringing the NTD agenda to the affluent developed world. This role is possible because of its compilation of the most accurate statistics of the status of NTDs in each country.
- WHO/NTD collaborates with and provides guidance to other teams in WHO responsible for disease-specific areas of work (trachoma, onchocerciasis), by sharing and presenting its information system, sharing resources and discussing challenges in a collegiate approach.

The work of WHO is guided by the STAG-NTD, which was set up in 2007. The group's mandate is to advise WHO on overall global policies and strategies, ranging from epidemiology, monitoring implementation and research development to delivery of interventions and their linkages with other health interventions.

STAG-NTD advises WHO's Director-General on the following areas:

- adequacy of progress towards the achievement of the goals of the Global Plan (*2*);
- major issues and challenges to be addressed with respect to achieving the goals of the Global Plan;
- WHO's response to current public-health priorities with regard to NTDs;
- major general policies, goals and targets related to NTDs;
- adequacy of WHO's strategic plan and priority activities for controlling NTDs, to achieve the goals consistent with its mandate and considering the comparative advantages and the respective roles of partner organizations;
- intersectoral activities and initiatives related to the control of NTDs, and strategies and linkages with other health interventions;
- WHO's relations with partnerships in the control of NTDs;
- role of WHO in promoting integration of NTD interventions in national health systems.

In 2009, STAG-NTD established three working groups to provide its members and WHO/NTD with detailed information about fundamental activities for successful NTD control. The working groups cover (i) monitoring the efficacy of NTD medicines, (ii) access to quality-assured essential medicines, and (iii) monitoring and evaluation of preventive chemotherapy interventions.

In 2011, a fourth working group on NZDs was established to address issues of priority for their surveillance, burden and integrated control at the human–animal–ecosystems interface.

## 2. Interventions to overcome neglected tropical diseases: situation analysis

The first report (*3*) explains the paradigm shift that occurred in planning for NTD control. In 2003, after the first Berlin meeting, WHO began to focus control measures away from specific NTDs to the health needs of poor communities. This led to the introduction of preventive chemotherapy, an intervention that allows the morbidity associated with five common NTDs (lymphatic filariasis, onchocerciasis, soil-transmitted helminthiases, schistosomiasis and trachoma) to be treated with the regular and coordinated administration of three types of quality-assured medicines simultaneously; it embodies integrated large-scale administration of anthelminthic medicines (*6*). The other major intervention, known as intensified case management, is directed at individuals suffering from 10 of the other 12 NTDs. The strength of both interventions is their encouragement for individual and community involvement and delivery.

In support of these interventions are measures to control vectors and their intermediate hosts, veterinary public health, water and sanitation, health awareness and education, and capacity building. There are cases where NTD control can be strengthened when interventions are combined. For example, control and elimination of lymphatic filariasis is amenable to preventive chemotherapy, intensified case management and vector (insect) control. The development of and access to vaccines (for example, for dengue) would make a significant contribution to prevention and control.

The most important components of a successful NTD control programme are national awareness of the problem and the inclusion of NTD control in national health plans, supported by adequate budget lines. Control exemplifies the need for intersectoral collaboration among ministries, communities, NGOs and international partners.

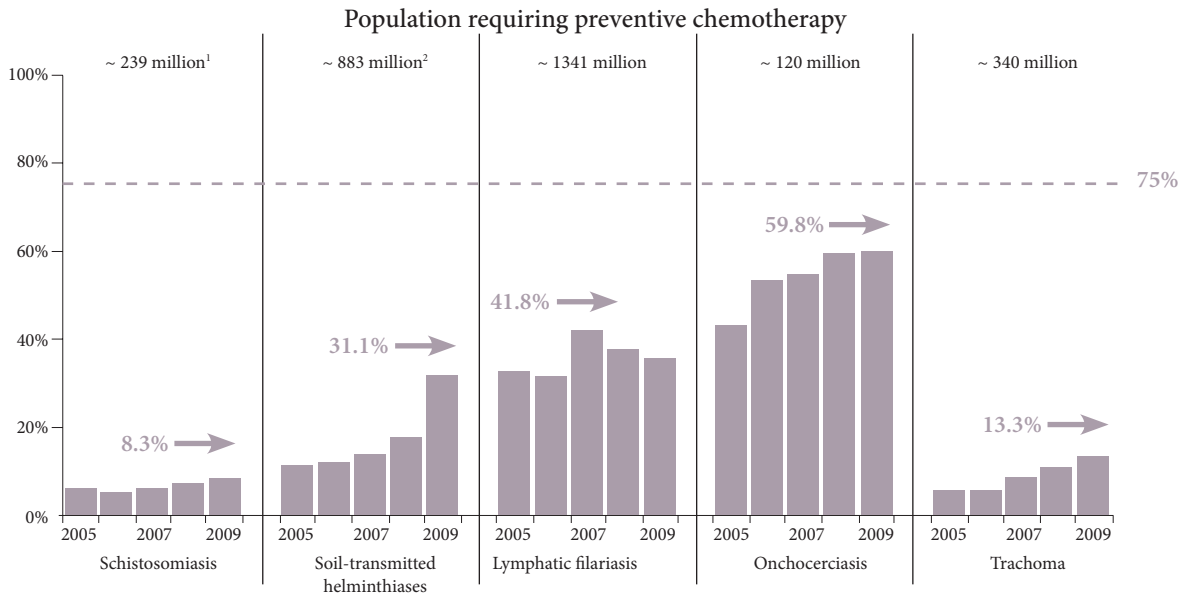
### 2.1 Preventive chemotherapy

Preventive chemotherapy is aimed at optimizing the large-scale use of safe, single-dose medicines and offers the best means of reducing the extensive morbidity associated with four helminthiases (lymphatic filariasis, onchocerciasis, schistosomiasis and soil-transmitted helminthiases) (*6*). Additionally, the large-scale administration of azithromycin – a key component of the SAFE strategy for trachoma (that is, lid surgery (S), antibiotics to treat the community pool of infection (A), facial cleanliness (C) and environmental improvement (E)) – is amenable to close coordination and, in future, possibly co-administration with interventions targeted at helminthiases.

#### 2.1.1 Status of implementing preventive chemotherapy interventions

Since 2001, preventive chemotherapy has been promoted as an intervention with the potential to reduce significantly the morbidity caused by five widely distributed NTDs (four helminthiases plus trachoma). The seemingly realistic target was set of aiming to ensure that at least 65% of endemic populations at risk of lymphatic filariasis and 75% of school-aged children at risk of soil-transmitted helminthiases and schistosomiasis would have access to treatment by 2010. By the end of 2009, 705 million of all the people estimated to require treatment had been reached. Figure 1 shows the global coverage of preventive chemotherapy and the population requiring the intervention as of 2009 for lymphatic filariasis, onchocerciasis, schistosomiasis, soil-transmitted helminthiases and trachoma,

**Figure 1. Global coverage of preventive chemotherapy (PC) for schistosomiasis (SCH), soil-transmitted helminthiases (STH), lymphatic filariasis, onchocerciasis and trachoma, 2009**




[1] *Current estimates of the number of people requiring PC for SCH are being revised.*

[2] *New estimates of the number of people requiring PC for STH – Soil-transmitted helminthiases: estimates of the number of children needing preventive chemotherapy and number treated, 2009.* Weekly Epidemiological Record, *2011, 86:257–268.*

as reported to WHO. The figure also shows the estimated population globally requiring regular treatment.

When the coverage data (limited to the three diseases for which WHO/NTD is directly responsible – lymphatic filariasis, soil-transmitted helminthiases and schistosomiasis) are further analysed by the number of countries that have reached either or all (1–3) of their disease-specific targets, it is clear that the 65–75% coverage target will not be met in all endemic countries. An important question is whether the actual extent of coverage is being reported.

When large-scale donations are in place, the coverage of populations in need is progressing well (as for lymphatic filariasis and onchocerciasis). When donations are limited, progress is slower. The generous donations announced on 14 October 2010, during the launch of the first report (*3*), by the pharmaceutical industry to treat soil-transmitted helminthiases provide an opportunity to increase and accelerate coverage for this group of diseases and should trigger similar action for schistosomiasis. Insufficient availability of quality-assured praziquantel remains the major obstacle to expanding preventive chemotherapy interventions for soil-transmitted helminthiases.

### 2.1.2 Needs for further expanding implementation of preventive chemotherapy interventions

An accurate assessment of populations in Africa requiring preventive chemotherapy for lymphatic filariasis is needed to determine the impact of multiple years of ivermectin distribution as part of the African Programme for Onchocerciasis Control. These two diseases overlap in many countries, and lymphatic filariasis may have been controlled or eliminated as a result. Similarly, heightened efforts to control malaria using bednets and indoor residual spraying can be expected to have reduced transmission of lymphatic filariasis. The global programme generally would benefit from integration with interventions for onchocerciasis and malaria.

Although the 2010 goal for coverage with regular treatment against schistosomiasis and soil-transmitted helminthiases has not been reached, there are grounds for optimism. Despite limited resources, some countries have attained the goal with assistance from WHO/NTD and partners. Such success should encourage others to follow. New initiatives are expected to change the pace of implementation: increased donations of albendazole and mebendazole; increased commitment of donors including the United States Agency for International Development and the United Kingdom Department for

International Development to fund NTD programmes: increased willingness of other partners and NGOs to adopt an integrated approach to preventive chemotherapy rather than isolated disease-specific interventions.

From a global perspective, there remain, in order of priority, four issues to be resolved in order to achieve the necessary expansion of preventive chemotherapy:

(1) Sufficient access to anthelminthic medicines, free to the end user, to be integrated into preventive chemotherapy interventions with good coordination of their global supply. With the pledges for enhanced donations, WHO/NTD will need to play an increased role in coordinating the various donations. With regard to the particular problem of praziquantel, reliance on the generic market has not been able to overcome the shortfall during the past 10–15 years.

(2) Irregular and volatile funding for implementation, as illustrated by the difficulties that endemic countries encounter in sustaining success and reaching their national targets, has occurred for several years in succession. WHO/NTD is developing a strategic plan for implementing preventive chemotherapy interventions by aggregating various disease-specific plans (such as the progress report 2000–2009 and strategic plan 2010–2020 of the Global Programme to Eliminate Lymphatic Filariasis) and the plans under development for schistosomiasis and soil-transmitted helminthiases.

(3) Preventive chemotherapy is not always part of national public-health agendas as a front-line intervention to control morbidity due to NTDs. There is a shortage of managerial capacity in general health services to plan, implement and monitor preventive chemotherapy programmes as routine delivery of public-health services. WHO/NTD and its partners are developing management training courses in preventive chemotherapy for infectious disease managers in ministries of health worldwide to be undertaken on a regular basis.

(4) Difficulties persist in achieving real-time and accurate monitoring of global progress. Data quality, completeness and timely flow from the field level to national, regional and global levels must be improved to match that of the Expanded Programme on Immunization. Emphasis in monitoring global progress should shift from measuring global disease-specific coverage to measuring disease-specific coverage in each of the endemic countries. Adequate monitoring of global progress in implementation can only be achieved if all the disease-specific partnerships and constituencies are fully aligned and their data management systems are closely coordinated. WHO is working to ensure that data management systems are harmonized and agreed between the various disease-specific constituencies.

#### 2.1.3 Opportunities for eliminating neglected tropical diseases eligible for preventive chemotherapy interventions

Elimination is an attractive goal that strongly enhances the drive for action. Preventive chemotherapy interventions, if sustained with high coverage for 5–8 years (up to 2020), will decrease morbidity and halt its recurrence from five targeted NTDs. For diseases such as lymphatic filariasis and, in some local settings, schistosomiasis and onchocerciasis, transmission should also be interrupted, thereby accelerating elimination of these diseases.

#### 2.1.4 Preparing for beyond 2020

By the time the 2020 target of expanded preventive chemotherapy has been reached, with some landmark elimination targets expected to be achieved by 2015, the focus will gradually change from monitoring the progress of interventions to deciding the criteria for scaling down implementation efforts and continuing surveillance for absence of transmission or recrudescence of infection or disease. This future terrain needs to be prepared now, and investment is therefore needed in more research to find appropriate approaches for this purpose. The development of novel epidemiological tools and diagnostics will undoubtedly be a key part of such an investment. Epidemiological modeling to help identify maintenance strategies may be another one.

### 2.2 Intensified case-detection and case management

Intensified case-management involves caring for infected individuals and those at risk of infection. The key processes are (i) making the diagnosis as early as possible, (ii) providing treatment to reduce infection and morbidity, and (iii) managing complications. This intervention is justified as a principal strategy for controlling and preventing those NTDs for which there are no medicines available for preventive chemotherapy. Infection may be asymptomatic for long periods and require confirmation of diagnosis because of the toxicity of medicines. WHO focuses on the prevention and control of Buruli ulcer, Chagas disease, human African trypanosomiasis, leishmaniasis (in its cutaneous, mucocutaneous and visceral forms), leprosy and yaws. For Chagas disease, human African trypanosomiasis and visceral leishmaniasis, diagnosis needs to be simplified and made less invasive without losing sensitivity. For these six and other NTDs, there is an urgent need to shorten the length of time that occurs between suspecting infection and making the diagnosis so that treatment can begin without delay. Innovative work is required to improve diagnostic methods and provide

safer medicines for administration under shorter treatment regiments.

The medicines for treatment of the six target diseases include nifurtimox and benznidazole for Chagas disease; pentamidine, suramin, melarsoprol, eflornithine and nifurtimox for human African trypanosomiasis; pentavalent antimonials (sodium stibogluconate and meglumine antimoniate), amphotericin B, paromomycin and miltefosine for visceral leishmaniasis; multidrug therapy for leprosy using a combination of rifampicin, clofazimine and dapsone for multibacillary leprosy, and rifampicin and dapsone for paucibacillary leprosy; a combination of rifampicin and streptomycin or amikacin for Buruli ulcer; and benzathine penicillin for yaws. Most of these medicines are donated to WHO facilitating the delivery of high-quality treatment free of charge to targeted populations in endemic areas.

### 2.3 Vector and intermediate host control

Vector and intermediate host control is one of five strategies recommended for the prevention and control of NTDs (*3*). Most NTDs involve transmission by vectors (insects) or intermediate hosts (such as aquatic snails). Vector control is the key intervention for control of dengue and Chagas disease, and it plays a major role in preventing some forms of leishmaniasis. Vector control is at the front line of action and containment of outbreaks of vector-borne NTDs.

Control of vectors and their intermediate hosts can contribute to reducing the heavy burden of NTDs targeted for preventive chemotherapy, and has the potential to play a significant role during the elimination phase of diseases such as lymphatic filariasis and schistosomiasis. Where lymphatic filariasis is co-endemic with *Loa loa*, and where preventive chemotherapy is not feasible, vector control is the intervention of choice. Epidemiological and vector surveillance will continue to contribute to the post-elimination phase.

WHO's position for implementing vector control is through its integrated vector management (IVM) approach, a rational decision-making process to optimize use of resources. Since the approach was introduced (*7*), and through WHO's close collaboration with Member States, 68 vector-borne disease endemic countries have established national policies for IVM (*8*).WHO will continue to advance implementation and capacity building for IVM.

Vector control relies on the use of pesticides. The WHO Pesticide Evaluation Scheme (WHOPES) advises Member States on the judicious and low-risk use of pesticides and their sound management. Between 2008 and 2010, WHOPES supported 13 Member States to develop national action plans for sound management of pesticides for public health (*9*). The pesticide quality standards (specifications) developed by WHOPES are being used in 96 countries where vector-borne diseases are endemic (*8*).

Control of vector-borne NTDs requires inter- and intra-sectoral collaboration. In this regard, there are established and well functioning partnerships of the Vector Ecology and Management Unit with the Food and Agriculture Organization and United Nations Environment Programme, the pesticide industry, research institutions and national programmes. Vector control needs environmentally friendly new pesticides to address the growing challenge of insecticide resistance. Rotation of insecticides should also be promoted to address this challenge.

The lack of clear career paths for entomologists in national health systems and the inadequate training of programme managers in vector control and sound management of pesticides in many Member States pose operational challenges and threaten efforts to sustain progress made in control of NTDs and other vector-borne diseases. Capacity for vector control has to be strengthened within WHO and in Member States in order to exploit the full potential of vector control to interrupt transmission and sustain progress made in control of vector-borne NTDs.

### 2.4 Veterinary public health at the human–animal interface

Veterinary public-health activities are those activities conducted at the human–animal interface (*10*) that are required to prevent, control and eliminate suffering and economic loss caused by NZDs in both humans and animals (*11*). As veterinary public health addresses the health of peoples and animals, the close collaboration of veterinary and human health sectors forms the core of successful zoonotic disease control. Application of this concept should provide support to the efforts of the medical sector to prevent, control and eliminate a number of NZDs (such as human dog-mediated rabies, cystic and alveolar echinococcosis, fasciolasis and foodborne trematodiases) and neglected tropical diseases with a zoonotic component (including zoonotic trypanosomiasis, and visceral and cutaneous forms of zoonotic leishmaniasis).

Noticeable progress in prevention and control has been made since the first (*11*) and second (*12*) WHO international conferences on NZDs. The feasibility of preventing and possibly eliminating diseases for which solutions are available – such as dog-mediated human rabies (*13*) – and those for which control packages should be available within 3–5 years – such as porcine cysticercosis (*14*) – is being carefully studied.

Major activities for prevention, control and elimination are (i) expanding or initiating strategy validation field studies in different geographical and epidemiological settings; (ii) building national capacity in disease surveillance and diagnosis; (iii) initiating large-scale control in priority countries; and (iv) mobilizing the necessary resources.

### 2.5 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.

### 2.6 Strengthening capacity to control neglected tropical diseases

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. The first report (*3*) notes the limited expertise in addressing NTDs and the declining knowledge in other areas, particularly in vector control, case-management, pesticide management and veterinary public health. WHO is responsible for formulating appropriate training and strengthening existing capacity in order to respond more effectively to the integrated delivery of control strategies. WHO is developing framework for capacity building at the national level that could extend this expertise to the peripheral level, including:

- assessing the national human resources needed to implement control strategies;
- strengthening national capacity for monitoring and evaluation as well as for research to support evidence-based decision-making for NTD control;
- developing standardized training materials, including materials for community health workers and non-formal care providers, and translating them into local languages based on needs;
- creating in-service training for national NTD and vector control programme managers as well as for prevention of blindness coordinators;
- developing in-service training for health workers involved in implementing control strategies, such as physicians, nurses, laboratory technicians, data managers, vector control staff, veterinary public health workers, epidemiologists and staff of mobile teams;
- collaborating with WHO regions and Member States to develop training materials for community health workers and non-formal care providers;
- working with training institutions to enhance their training capacity;
- consolidating and developing networks to expand dissemination of knowledge and skills to sufficient numbers of health workers in all categories involved in NTD control.

Tools and curricula will be based on training needs and assessments to guarantee continuous learning and the dissemination of newly acquired skills and knowledge.

Volunteers, community leaders and front-line health workers are the backbone of public-health delivery systems and disease surveillance; control of these diseases must therefore involve their active participation. The dracunculiasis eradication programme relies on this structure.

Health workers perform numerous key tasks, including diagnosis, reporting and responding to many health issues. If not adequately trained to apply public-health standards and protocols, front-line health workers will not inspire public trust and confidence, and entire disease control programmes may be jeopardized.

## 3. Eradication

### 3.1 Dracunculiasis (guinea-worm disease)

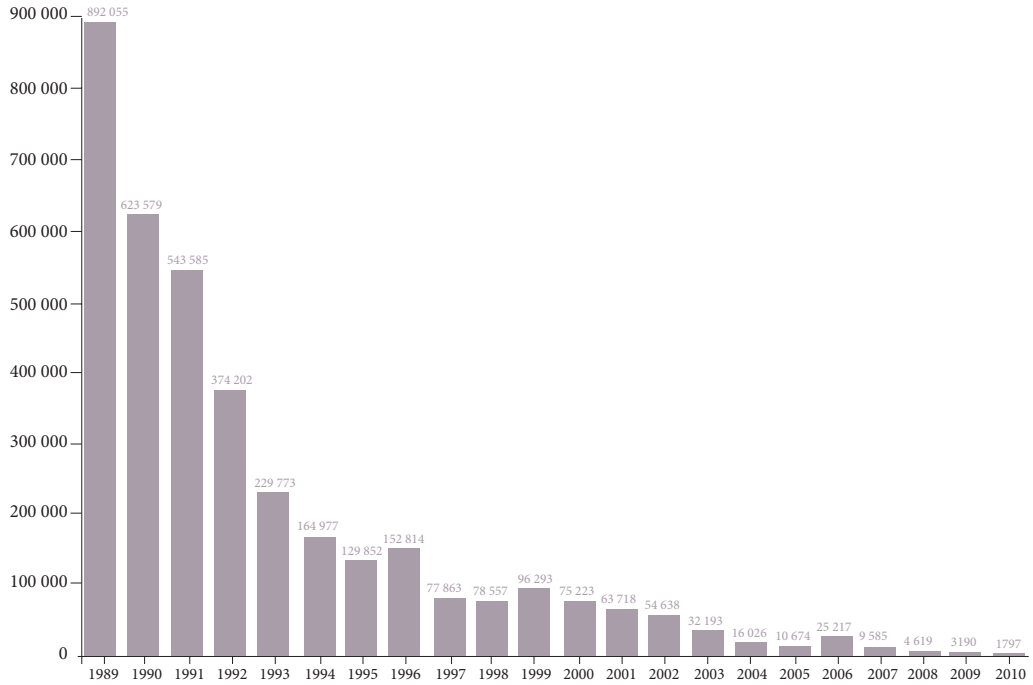
Since the beginning of the dracunculiasis eradication campaign in the early 1980s, there has been a significant decline (more than 99%) in the annual incidence of the disease, from 892 055 cases in 1989 to 1060 in 2011 (provisional data as of 1 January 2012; Figure 2).

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.

The number of villages reporting dracunculiasis cases reduced from a peak of 23 735 in 1991 to 779 in 2010.

**Figure 2. Number of dracunculiasis cases reported to WHO globally, by year, 1989–2010**




Of the 20 previously endemic countries, 15 achieved interruption of transmission by 2010; 94% of the cases that occurred in 2010 were in South Sudan.

With 1698 new cases reported in 2010, South Sudan has made significant progress since full-scale implementation of national programme activities in 2006, when a peak of 20 582 cases were reported. However, with a case containment rate of 74% and security concerns, interrupting transmission in South Sudan remains a major challenge for the global programme. During 2009, 32 incidents confined the programme's workers in South Sudan to their homes or caused their temporary evacuated, thus disrupting their work in areas that together reported about half of all the global cases in 2009.

Ghana, one of the endemic countries in 2010, reported only 8 cases in 2010 and has reported zero cases for over 14 consecutive months since June 2010 indicating interruption of transmission in 2010.

Ethiopia reported 21 cases in 2010 (1 imported from South Sudan), 19 cases (90%) were allegedly contained. All endemic villages were protected with monthly applications of temephos.

In 2010, Mali reported 57 cases from 22 localities restricted to five of the eight endemic regions (Gao, Kidal, Mopti, Ségou and Tombouctou); 45 cases (79%) were contained.

During April–October 2010, Chad, a country in the pre-certification stage, reported an outbreak of 10 cases in eight villages in five districts, all without any reported history of movement outside Chad.

In 2010, Niger, which interrupted transmission in 2007, reported 3 imported cases from neighbouring Mali.

### 3.2 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 4).

## 4. Countries and regions where elimination is feasible by 2015

The scientific debate around definitions of control, intensified control, elimination (including elimination as a public-health problem) and eradication will continue for some time. For the diverse community of agencies working with WHO/NTD to overcome NTDs, sustained action for 3–5 years would significantly reduce the current burden by eliminating some of these diseases (*15*). To quote Ralph H. Henderson, former Assistant Director-General of Communicable Diseases at WHO, "Disease elimination and eradication goals are especially effective in providing rallying points for coalitions of interested parties" (*16*).

### 4.1 Human dog-mediated rabies in Latin America

A coordinated programme of mass dog vaccination campaigns initiated in 1983 in Latin American countries has been very successful. Dog-to-dog transmission has halted in most countries but is still widespread in Cuba, the Dominican Republic, El Salvador, Guatemala, Haiti and the Plurinational State of Bolivia (*17*). By 2003, the number of cases of human dog-mediated rabies had fallen by more than 90% (*18*). The majority of human rabies deaths reported annually in the Region of the Americas continue to result from contact with dogs. The Regional Committee of the Pan American Health Organization/WHO Regional Office for the Americas endorsed in resolution CD49/9 the year 2015 as the target date for eliminating human dog-mediated rabies (*19*). Elimination of human rabies transmitted by dogs and dog-to-dog transmission is achievable by 2015 in all endemic areas in Latin America.

### 4.2 Chagas Disease transmission through blood transfusion interrupted

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.

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.

### 4.3 Human African trypanosomiasis in selected countries

*Trypanosoma brucei gambiense* is endemic in 24 countries of west and central Africa, and causes more than 90% of reported cases of sleeping sickness worldwide. *Trypanosoma brucei rhodesiense* is endemic in 13 countries of eastern and southern Africa, representing less than 10% of reported cases globally. WHO's African Region has the largest proportion of reported cases (90%); the Eastern Mediterranean Region has the remaining 10%. Between 1999 and 2010, the reported number of new cases of the chronic form of the disease (*T. b. gambiense*) fell by 75%, from 27 862 to 6984. During the same period, the number of newly reported cases of the acute form (*T. b. rhodesiense*) also fell by 75%, from 619 to 155.

More than 40% of endemic countries report fewer than 20 cases per year. This absence of cases can be maintained or reached in 50% of countries. Activities to reduce the number of cases in additional endemic countries will be continued. The goal of reaching 2000–3000 cases per year in 2015 is in sight. 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 convened by WHO at the end of 2012).

### 4.4 Onchocerciasis in Latin America

Historically, onchocerciasis occurs in 13 foci in 6 Latin American countries (the Bolivarian Republic of Venezuela, Brazil, Colombia, Ecuador, Guatemala and Mexico). Approximately 500 000 people are estimated to be at risk of the infection in the region. Many of these foci share state or international borders. In the Bolivarian Republic of Venezuela, foci extend along 11 states, with the population most at risk living in remote communities. In 8 foci, including Colombia and Ecuador, transmission appears to have been interrupted nationally following mass drug administration with coverage of at least 85% of the eligible population. A three-year post-treatment surveillance period is under way prior to certification of elimination (*17*). Resolution CD48/10 of the Pan American Health Organization calls for elimination of transmission regionally by 2012.

### 4.5 Schistosomiasis in the Eastern Mediterranean Region, the Caribbean, Indonesia and the Mekong River basin

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 snails 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.

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). Surveillance could also determine when transmission has stopped.

WHO also aims to eliminate *S. mansoni* infections in the Carribean, *S. japonicum* infections in Indonesia and *S. mekongi* infections in the Mekong River basin.

## 5. Countries and regions where elimination is feasible by 2020

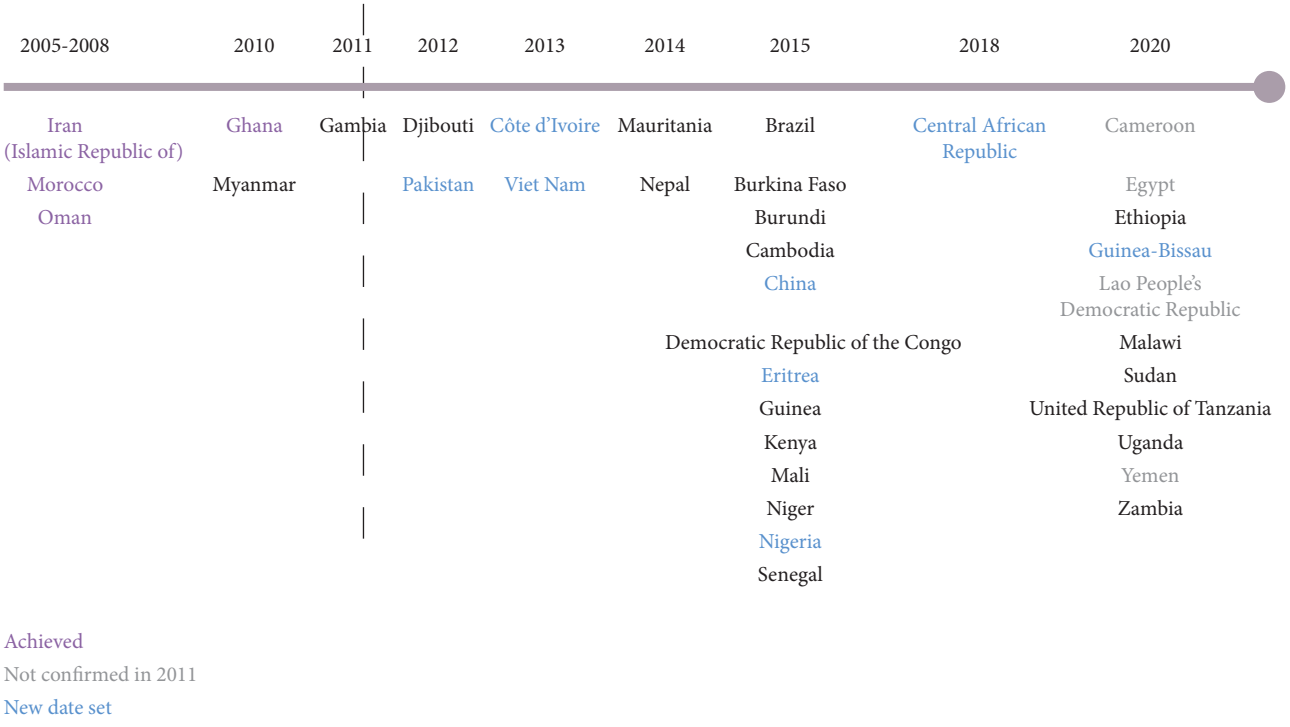
### 5.1 Human dog-mediated rabies in the South-East Asia and Western Pacific Region

By 2020, elimination of human rabies transmitted by dogs and dog-to-dog transmission can be achieved 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.

### 5.2 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. While some countries and regions may achieve elimination ahead of the 2020 target, remaining countries must be supported to achieve their targets within the deadline set by resolution WHA51.11. Targets set by individual governments for reaching their elimination targets are shown in Figure 3. Plans to achieve the targets are available or being

**Figure 3. Target dates for eliminating blinding trachoma**



updated. There remain some countries where the work needs to start with WHO. The same is true for those countries moving from control to surveillance, in order to identify the resources needed to verify sustained elimination and elimination to be certified by WHO.

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.

### 5.3 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 specificity of diagnosis, notably for paucibacillary leprosy, will enhance the elimination strategy.

### 5.4 Chagas disease in most Latin America countries

A milestone will be reached when peri-domiciliary infestation has been eliminated in Latin America by 2020. Surveillance and control of oral transmission and congenital infection need to be sustained.

### 5.5 Human African trypanosomiasis

A new strategy for sustaining case detection at the peripheral level using an effective reference system in countries with low endemicity and foci is being implemented. This early detection and response system will be developed in each focus where the disease is reaching a very low level of prevalence and where it is not possible to maintain mobile teams. Intensive efforts must be maintained in areas where endemicity is high (mainly the Democratic Republic of the Congo, representing 80% of cases, but regularly decreasing) and other countries such as Angola, the Central African Republic, Chad, Côte d'Ivoire, South Sudan and Uganda, even if prevalence becomes lower than a few years ago.

Now that an effective epidemiological system has been developed, based on a complete geo-referenced atlas, the monitoring of elimination activities can be completed. It can be expected that new tools, mainly medicines and diagnostic techniques, will become available in the coming years to facilitate the elimination process. Regular training of specialized technicians must be provided to ensure sustained competences. Recently renewed agreements with pharmaceutical industries will ensure donations of medicines and financial support until the end of 2017. 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 to achieve elimination in 100% of foci by 2020 (criteria to be defined by an elimination committee convened by WHO, end of 2012).

### 5.6 Visceral leishmaniasis in the Indian subcontinent

High-level political commitment was confirmed in the Memorandum of Understanding signed by the governments of Bangladesh, India and Nepal in 2005. Use of simple and rapid diagnostic tools coupled with new treatment options, as prioritized by the Expert Committee on Leishmaniasis (*20*), which all have high cure rates, is proving effective. If passive surveillance for case detection complemented by vector control activities is scaled up, elimination should be achieved. One insect species (*Phlebotomus argentipes*) serves as the sole vector and there are no known animal reservoirs (*20*).

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. With sustained efforts in the Indian subcontinent, 100% case-detection and treatment is feasible by 2020, implying that less than 1 case per 10 000 population at district and subdistrict levels can be achieved.

### 5.7 Lymphatic filariasis

The first decade of the Global Programme to Eliminate Lymphatic Filariasis was characterized by increased coverage of mass drug administration, which now reaches some 695 million people. During the next decade, the basic principles of the programme's strategic approach will remain unaltered, and

its overall goal and targets will remain unchanged. However, the global health environment has changed dramatically since 2000. The Global Programme to Eliminate Lymphatic Filariasis is now part of a comprehensive programme of NTD control, in which preventive chemotherapy, vector control and morbidity management are increasingly integrated and delivered as multi-intervention packages at the global, national and local levels. The opportunities presented by such an intersectoral and integrated approach hold the promise of developing even greater synergy among elimination programmes for lymphatic filariasis and other health programmes, and of further extending the benefits of the global programme to neglected populations who invariably suffer from several overlapping diseases linked to poverty (*21*).

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.

With sustained efforts in the Indian subcontinent, 100% case-detection and treatment is feasible by 2020, implying that less than 1 case per 10 000 population at district and subdistrict levels can be achieved.

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

### 5.8 Schistosomiasis in Brazil, the Western Pacific Region and from several countries of the African Region

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

In WHO's Western Pacific Region, elimination of schistosomiasis mekongi from the two endemic provinces of Cambodia has probably been achieved and should be confirmed by appropriate surveys; elimination from the two endemic provinces of the Lao People's Democratic Republic should be feasible with regular administration of praziquantel, together with snail and behaviour control.

Schistosomiasis (and in particular *Schistosoma mansoni*) is not yet scheduled for elimination in sub-Saharan Africa even by 2020, mainly due to a lack of means – primarily a chronic lack of sufficient amounts of (non-donated) medicines, which is hampering progress towards elimination. However, steps should be taken towards elimination in selected countries or parts of countries where conditions are appropriate. One example would be the Zanzibar archipelago (United Republic of Tanzania), where a concerted effort has begun; treatments are delivered at least annually, and in places twice a year, to achieve elimination. Recent evidence in Africa (Uganda, Burkina Faso and Niger, where large-scale preventive chemotherapy programmes have been ongoing for at least 5 years) confirms that the China or Egypt model can be replicated in Africa, provided that sufficient means are made available and political commitment is strong. Therefore, if praziquantel becomes available in the quantities needed, its delivery is co-implemented with that of anthelminthic medicines for soil-transmitted helminthiases (see 2015–2020 targets and milestones in Table 5) 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.

## 6. Cost and benefits of control

Approximately 90% of all NTDs can be treated with medicines that are administered once or twice annually. 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.

The first WHO report on NTDs (*3*) considers various economic aspects of interventions to prevent and control NTDs. These include estimating the costs of treating school-aged children in seven varied selected countries (US$ 70 000 per million children) (*22*) to the overall economic costs of a range of NTDs and the cost per DALY averted in response to expenditure on interventions (*23*).

While sample costs of implementing treatment interventions have been identified for certain diseases, no comprehensive analysis is available for estimating the cost of global NTD control. Global control would require a comprehensive response to the 17 NTDs recognized by WHO to include: vector control and other forms of prevention; routine testing and diagnosis; treatment in health-care settings, including increased access to available medicines and capacity for surgical

**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 |
| AmBisome | 445 000 vials from Gilead for visceral leishmaniasis control in high endemic countries is 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 to be 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 now intends to continue its efforts to fight schistosomiasis indefinitely with an amount of 50 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 |

or other interventions where necessary; surveillance; and research and development. Advocacy and the continuation of resource provision will be strengthened if reliable information about expenditure and benefits is forthcoming.

Three components of studies of health economics would help to inform resource allocation to and among NTDs. One component of this work is conceptual. Refining the calculation of DALYs for chronic diseases that cause disability rather than high fatality rates requires consideration. Such work, combined with improved surveillance and special studies, will generate more precise estimates of the disease burden of NTDs, and generate benchmarks for measuring the progress of control efforts.

A second component concerns the cost of illness studies. This approach seeks to quantify the cost of illness and control efforts in monetary terms. For example, the economic cost of dengue in the Americas works out at US$ 2.1 billion per year (*24*).

A third component involves studies of cost-benefit and cost-effectiveness. Such studies inform strategic decisions, such as comparisons between NTDs and other health problems, and tactical decisions, such as refining approaches (for example, numbers of rounds of chemotherapy and optimizing integration between preventive chemotherapy and vector control). Advocacy and the continued provision of resources will be strengthened with better information about expenditure and benefits. The diversity of political and social factors in countries where NTDs are endemic precludes drawing general conclusions about costs and economic benefits. Calculations and predictions for one country may not apply in another. A specific NTD may have greater impact in one country than in another.

STAG-NTD has recognized the need for a better understanding of economic aspects of NTDs. At its meeting in 2010 it discussed costs of illness and benefits in relation to dengue and lymphatic filariasis. Analysis of these aspects can help to inform strategy. Increasing evidence is being published and is summarized below:

- Research on lymphatic filariasis in India has quantified the problem of compliance. Although 73.4% of the target population was treated by community distributors, some did not receive the correct dose or did not ingest the medicines. Taking that into account, only 59.3% of the target population ingested the correct dose (*25*). To address such gaps, NTD control can learn from other diseases. Important successes include the Mass Media and Health Practices project (which promoted use of oral rehydration therapy against diarrhoeal diseases); smoking cessation against tobacco use; promoting condom use against transmission of HIV infection and AIDS; and addressing obesity in middle- and upper-income countries. One insight is that the barrier to increased compliance is not usually lack of awareness of the health problem or lack of knowledge about actions, but the challenge of persuading people of importance to initiate action, and so promote implementation of the decision.
- For lymphatic filariasis, economic studies show that the financial costs per person treated (financial costs include all costs except donated materials) ranged from US$ 0.06 to US$ 2.23 while economic costs (that is financial cost plus the value of donated materials) varied between US$ 0.40 and US$ 5.87 (*26*).
- For soil-transmitted helminthiases, economic studies evaluated the cost of intervention in school on average at US$ 0.06 including drug cost (US$ 0.02) and economic costs (US$ 0.02) corresponding to the value of the time spent by teachers and health workers in the programme (*22*). In the case of distribution of benzimidazoles to preschool-aged children during child health days, the cost is even lower, corresponding to an average of US$ 0.03, including the drug cost (US$ 0.02) (*27*).
- While currently there are no published studies yet to show that external expenditure on NTDs are reduced if interventions are combined, current research on HIV/AIDS demonstrates favourable synergies. Empirical studies in Rwanda found that facilities introducing AIDS services expanded their non-AIDS services at least as rapidly (*28*).

## 7. Financing

During the past decade, global health and development has become a priority in developed countries, and funding for related efforts has increased.

While development assistance for health increased during 2000–2003 from US$ 7 billion to US$ 10.7 billion, some US$ 27 billion was reckoned to be needed by 2007, and US$ 38 billion by 2015, according to the 2001 Report of the Commission on Macroeconomics and Health (*29*). The European Union has agreed to double its development aid to poorer countries in 2010, to US$ 80 billion, with a special focus on Africa. A number of global partnerships for health, such as GAVI and the Global Fund to Fight AIDS, Tuberculosis and Malaria, aim to mobilize increased resources for priority health problems. There is concern that large commitments to vertical programmes may

be absorbing staff and resources from the horizontal health system (*30*).

Control of NTDs was expanded thanks to generous donations from 2000 by the Bill & Melinda Gates Foundation to the partners of the Global Programme to Eliminate Lymphatic Filariasis, to the International Trachoma Initiative for trachoma, and to the Schistosomiasis Control Initiative for schistosomiasis and soil-transmitted helminthiases. From 2006, the Bill & Melinda Gates Foundation funded studies to integrate vertical NTD programmes. Geneva Global provided US$ 9 million to integrate control of NTDs in Burundi and Rwanda. In 2008, the Government of the United Kingdom, through its Department for International Development, committed UK£ 50 million to control dracunculiasis (in collaboration with The Carter Center and WHO), onchocerciasis, lymphatic filariasis, schistosomiasis and soil-transmitted helminthiases during 2010–2015; and support for research to the Drugs for Neglected Diseases initiative during 2008–2013.

In 2006, the United States Government, through its Agency for International Development, began an integrated two-year US$ 30 million NTD control programme that concentrated on only 7 of the 17 NTDs identified by WHO. In 2008, the United States Presidential Initiative for Neglected Tropical Diseases was introduced, calling for a commitment of US$ 350 million over five years for NTD control. The White House budget request proposed US$ 70 million for NTDs in 2010. The initiative expanded the available funding and aimed to increase the number of countries to approximately 30 by 2013 while still targeting 5 of the 14 diseases. To progress in the fight against the NTDs *already identified* in the initiative, it is hoped that the Government of the United States will invest a further US$ 1.2 billion to support the duration of the Global Health Initiative.

Several countries have gratefully accepted assistance from donors, including the Bill & Melinda Gates Foundation, the United States Agency for International Development, Geneva Global and the United Kingdom Department for International Development, to implement NTD control programmes. Each country has contributed towards implementation by creating a line item and/or a significant in-kind contribution. For example, Burkina Faso, Ghana, Niger, Uganda and the United Republic of Tanzania have actively embraced NTD control programmes by providing staff, offices and other support. Financing of research and development required to accelerate control and elimination of NTDs has been detailed in several reports (*31*).

External assistance plays a crucial role in supporting the health sector in low-income countries, but some evidence indicates that assistance could be used more effectively. Foreign aid could place more emphasis on strengthening national capacity to reinforce health outcomes over the long term. While donor programmes are likely to have greater impact in the short term, they may draw human and financial resources away from broader health systems. Because of their narrow targets, disease-specific approaches may fail to consider solutions that would increase the efficiency of the overall health system. Several health and development experts argue that health systems of recipient countries must be strengthened if NTD programmes supported by donors are to be sustained (*30*).

Steps should start to be taken to ensure a fair transition process so that the governments of disease-endemic countries can sustain the work of the prevention and control of NTDs. WHO/NTD is strategically and impartially placed to facilitate the development of transition arrangements that meet the needs of both donors and individual countries. Making such arrangements would mean that health systems are strengthened thereby developing community understanding and compliance.

## 8. Summary of milestones and targets

**Action points, main targets and milestones for accelerating work to overcome the global impact of neglected tropical diseases**

**Action points with immediate effect *(not in order of priority)***

- Finalize strategic plans for dengue, schistosomiasis and soil-transmitted helminthiases.
- Advocate for and leverage resources to expand and reinforce control of vectors and their intermediate hosts.
- Dedicate action to increase the prevention and control of schistosomiasis in Africa. The focality of the infection and the severity of the disease justify flexible approaches to control in different endemic settings.
- Obtain additional donations of high-quality medicines to ensure efficient treatment of Chagas disease, leishmaniasis and schistosomiasis.
- Encourage WHO to expand prequalification activities to essential NTD medicines.
- Review the relationship between countries and implementing agencies, and propose guidelines for best practice.
- Convene sessions with representatives of governments and partners to develop a framework for transition strategies, thereby enabling governments to sustain control achievements during the gradual withdrawal of partners.
- Identify and engage experts to investigate the full costs of NTD control and the benefits to development.
- Convene an expert panel to define clearly the concept of elimination according to the different epidemiological characteristics of each disease.

- Convene the second global meeting of NTD partners in 2013.
- Intensify support for development and implementation of national policies for IVM and for sound management of public health pesticides, including availability of innovative technologies and pesticide products for vector control.
- In consultation with all relevant stakeholders, develop WHO strategic plan and framework for action, for sustainable dengue prevention and control.

**By 2015**

- Sustained dengue vector control interventions are established in at least 10 endemic priority countries, in line with existing country cooperation strategies.
- Study completed and oral antibiotic therapy incorporated into control and treatment of Buruli ulcer.
- 70% of all cutaneous leishmaniasis cases detected and at least 90% of all detected cases treated in the Eastern Mediterranean Region.
- Validated strategy for control and elimination of *T. solium* taeniasis/cysticercosis available.
- Pilot projects to validate effective echinococcosis/hydatidosis control strategies implemented in selected countries as a public-health problem.
- Foodborne trematode infections included in mainstream preventive chemotherapy strategy.
- Morbidity due to foodborne trematode infections controlled where feasible.
- 50% of people in need of preventive chemotherapy, including children (preschool-aged and school-aged children) are regularly treated.
- 100% of countries have a plan of action for integrated preventive chemotherapy.

**By 2020**

- Dengue control and surveillance systems are well established in all WHO regions to assess the burden of the disease.
- The number of dengue cases has reduced by more than 25% (2009–2010 as baseline) and that of deaths by 50%. Data average of 3 years will be used to avoid seasonal anomaly.
- 70% of all Buruli ulcer cases detected early and cured with antibiotics in all endemic countries.
- Interventions scaled up in selected countries for *T. solium* taeniasis/cysticercosis control and elimination.
- Validated strategy available for echinococcosis/hydatidosis and interventions scaled up in selected countries for their control and elimination.
- 75% of population at risk of foodborne trematode infections reached by preventive chemotherapy.
- Morbidity due to foodborne trematode infections controlled in all endemic countries.
- 75% of preschool-aged and school-aged children in need of treatment are regularly treated.
- 75% coverage with preventive chemotherapy achieved in preschool-aged and school-aged children in 100% of countries.

Table 4. Targets and milestones for elimination and eradication of neglected tropical diseases, 2015–2020[a]
At a glance

| DISEASE | 2015 | | | | 2020 | | | |
|---|---|---|---|---|---|---|---|---|
| | Eradication | Global elimination | Regional elimination | Country elimination | Eradication | Global elimination | Regional elimination | Country elimination |
| Rabies[b] | | | ✓ 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 |

[a] *The order of the diseases follows that of the First WHO report (see part 2, section 5).*

[b] *Refers to human dog-mediated rabies.*

Table 5. Targets and milestones for control of neglected tropical diseases, 2015–2020[a]

| DISEASE | 2015 | 2020 |
|---|---|---|
| **Dengue** | • Sustainable dengue vector control interventions established in 10 endemic priority countries | • Dengue control and surveillance systems established in all regions<br>• Number of cases reduced by more than 25% (2009–2010 as base line) and deaths by 50% |
| **Buruli ulcer** | • Study completed and oral antibiotic therapy incorporated into control and treatment | • 70% of all cases detected early and cured with antibiotics in all endemic countries |
| **Cutaneous leishmaniasis** | • 70% of all cases detected and at least 90% of all detected cases treated in the Eastern Mediterranean Region | |
| **Taeniasis/cysticercosis and echinococcosis/hydatidosis** | • Validated strategy for control and elimination of *T. solium* taeniasis/cysticercosis available<br>• Pilot projects to validate effective echinococcosis/hydatidosis control strategies implemented in selected countries as a public-health problem | • Interventions scaled up in selected countries for *T. solium* taeniasis/cysticercosis control and elimination<br>• Validated strategy available for echinococcosis/hydatidosis and interventions scaled up in selected countries for their control and elimination |
| **Foodborne trematode infections** | • Foodborne trematode infections included in mainstream preventive chemotherapy strategy<br>• Morbidity due to foodborne trematode infections controlled where feasible | • 75% of population at risk reached by preventive chemotherapy<br>• Morbidity due to foodborne trematode infections controlled in all endemic countries |
| **Soil-transmitted helminthiases (intestinal worms)** | • 50% of preschool and school-aged children in need of treatment are regularly treated<br>• 100% of countries have a plan of action | • 75% of preschool and school-aged children in need of treatment are regularly treated<br>• 75% coverage achieved in preschool and school-aged children in 100% of countries |

[a] *The order of the diseases follows that of the First WHO report (see part 2, section 5).*

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# Annexes

## Annex 1 Neglected tropical 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.[1]

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 of 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 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 rabies transmitted by dogs 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 in the number of human rabies deaths in these two regions by 2015.

### 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.

[1] *Anderson RM, May RM.* Infectious diseases of humans: dynamics and control. *Oxford, Oxford University Press, 1991.*

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 4).

**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 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 causing neurocysticercosis when the cysts develop in the central nervous system. This disease 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 *Taenia solium* infections in people 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 *Taenia 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 1060 in 2011 (provisional data as of 1 January 2012).

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 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 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.

WHO is working to expand the preventive chemotherapy strategy to include these diseases among those targeted by preventive chemotherapy 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 trematodiases 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.

The first empirical evidence on the feasibility of eliminating onchocerciasis with ivermectin treatment is now available from studies in three foci in Mali and Senegal. These studies show that after 15–17 years of treatment (annual treatment in two foci and 6-monthly treatment in one focus), the prevalence of infection and the intensity of transmission had fallen below postulated threshold values for elimination. Treatment was stopped, and follow-up data over a 3-year period showed no evidence of new infection or transmission. The studies provide the first evidence that ivermectin treatment can eliminate onchocerciasis infection and transmission, and that treatment can be safely stopped, at least in settings similar to those where interruption of transmission has been demonstrated.[2] Substantial further work is needed to determine the extent to which onchocerciasis could be eliminated in sub-Saharan Africa and when interventions could be stopped. It is obvious that such work has to take into account co-endemicity with lymphatic filariasis, as interventions for both diseases overlap. By 2020, it will be possible to determine the extent of elimination in some selected African countries, taking into account co-endemicity with *Loa-loa* and lymphatic filariasis.

**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.

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.

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[2] Diawara L et al. Feasibility of onchocerciasis elimination with ivermectin treatment in endemic foci in Africa: first evidence from studies in Mali and Senegal. 2009, *PLoS Neglected Tropical Diseases*, 3(7):e497.

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 anthelminthic medicines for soil-transmitted helminthiases (see 2015–2020 targets and milestones in Table 5) 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.

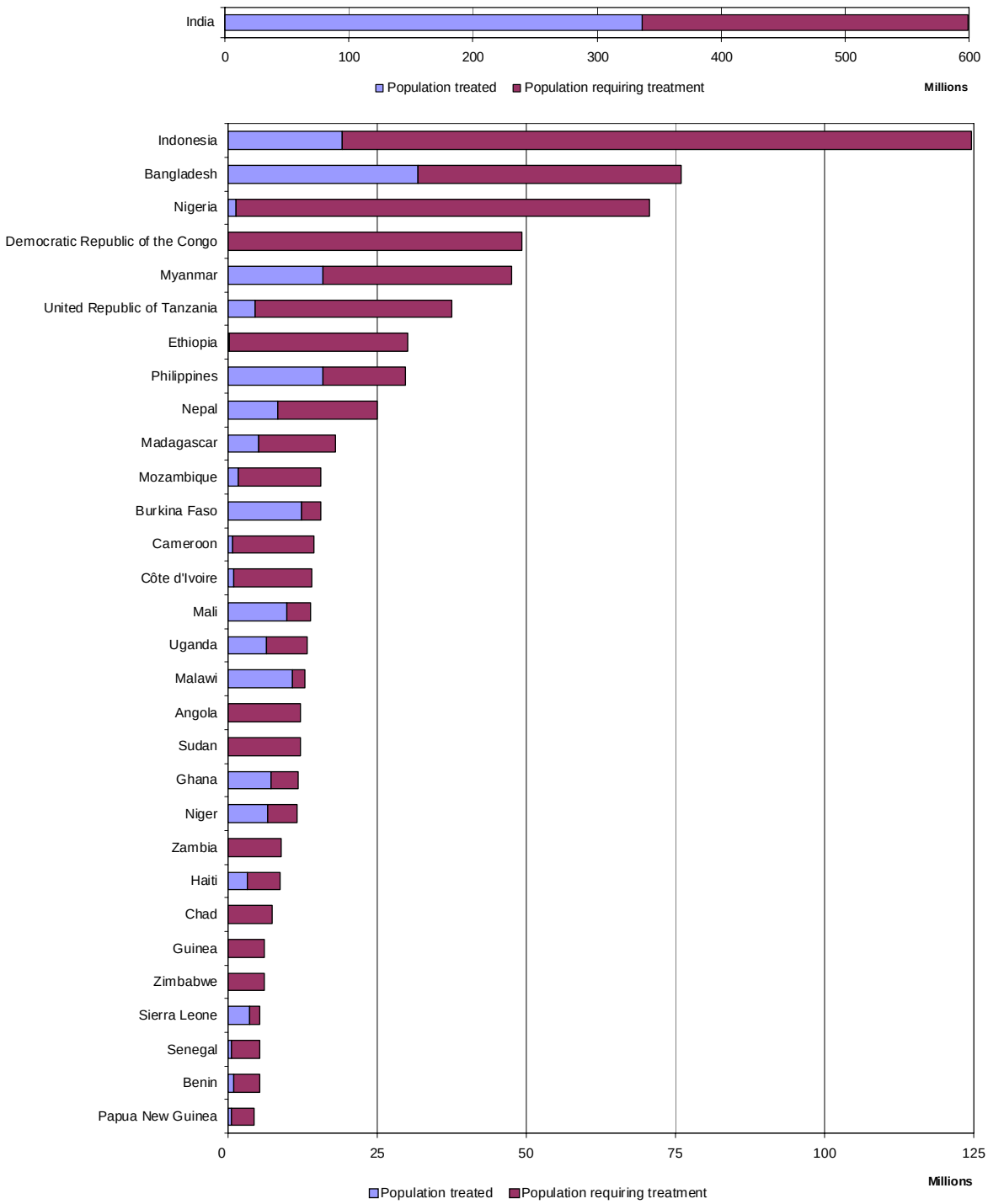
Over the past 10 years, significant progress has been made in controlling these infections. In 2010, about 314 million preschool-age and school-aged children (representing 31% of all children in the world at risk of soil-transmitted helminthiases) were dewormed.

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.

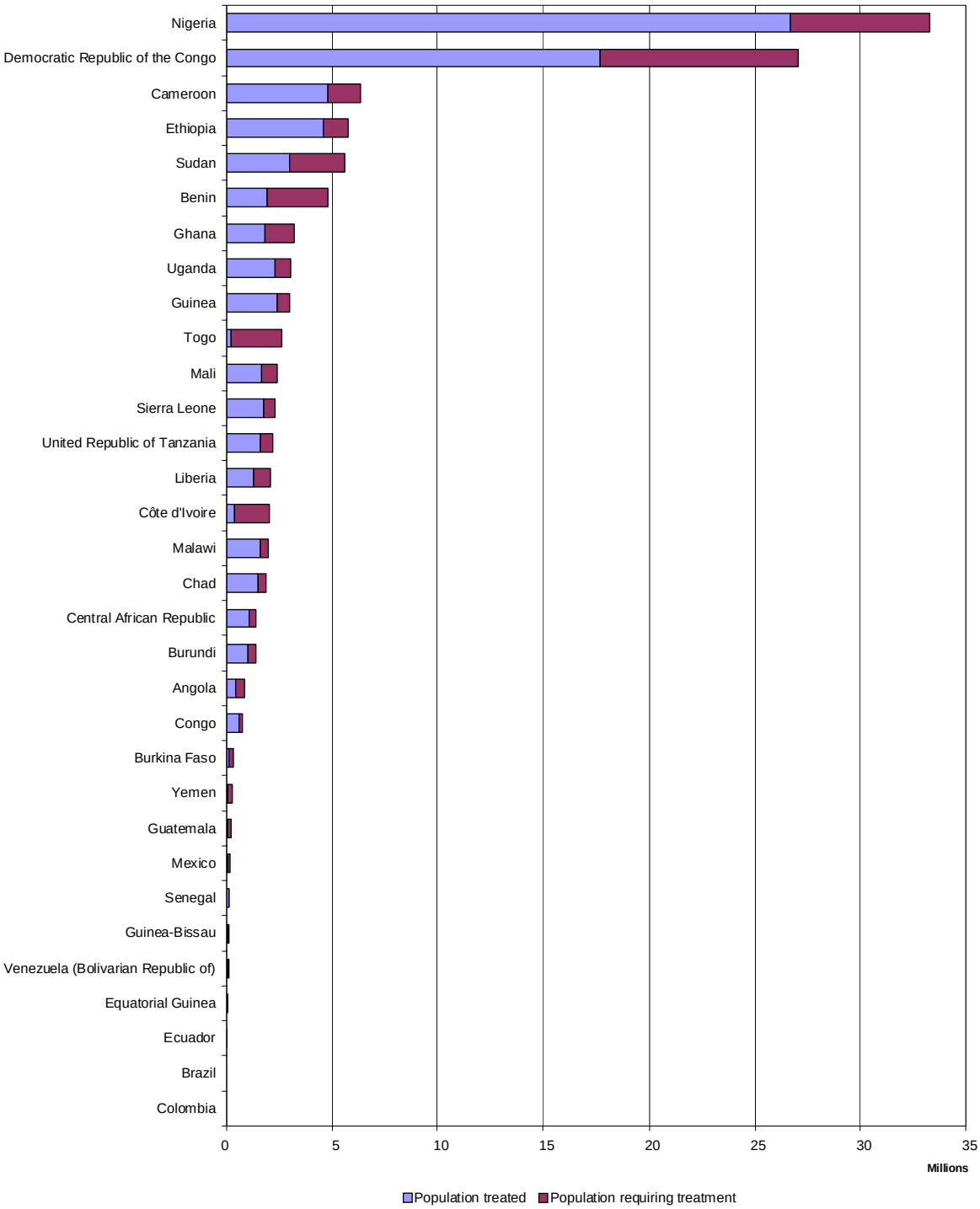
WHO considers these unique opportunities as a positive indicator that 75% coverage will be reached in all countries by 2020. A strategic plan towards this objective is being finalized in collaboration with partners.

Annex 2 Population requiring preventive chemotherapy and number of people treated for lymphatic filariasis in 2009, or latest available data.

For the complete list of countries, please see the WHO preventive chemotherapy and transmission control databank at: http://www.who.int/neglected_diseases/preventive_chemotherapy/lf/en/index.html

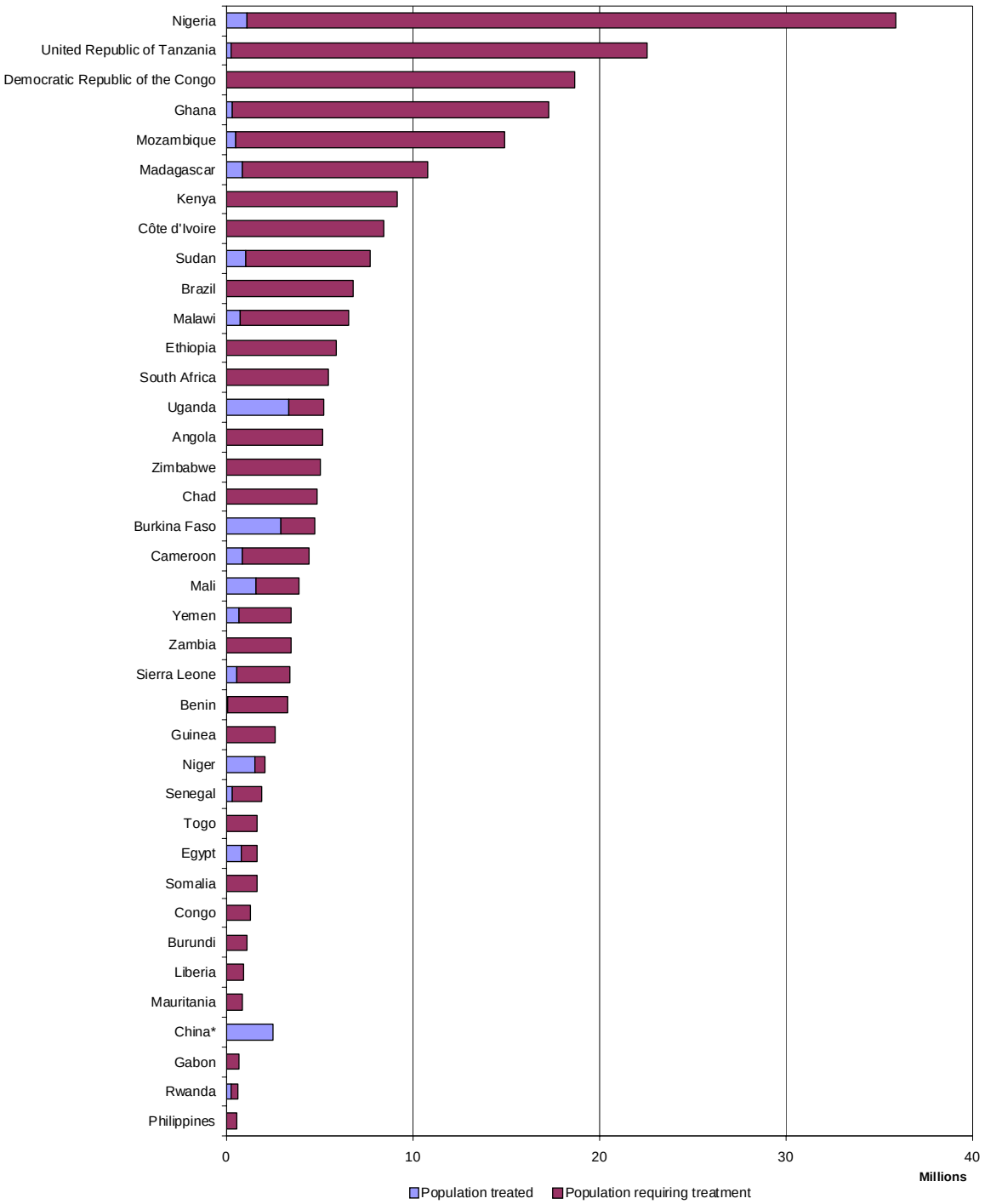


Annex 3 Population requiring preventive chemotherapy and number of people treated for onchocerciasis in 2009, or latest available data



Annex 4 Population infected and number of people treated for schistosomiasis in 2009, or latest available data

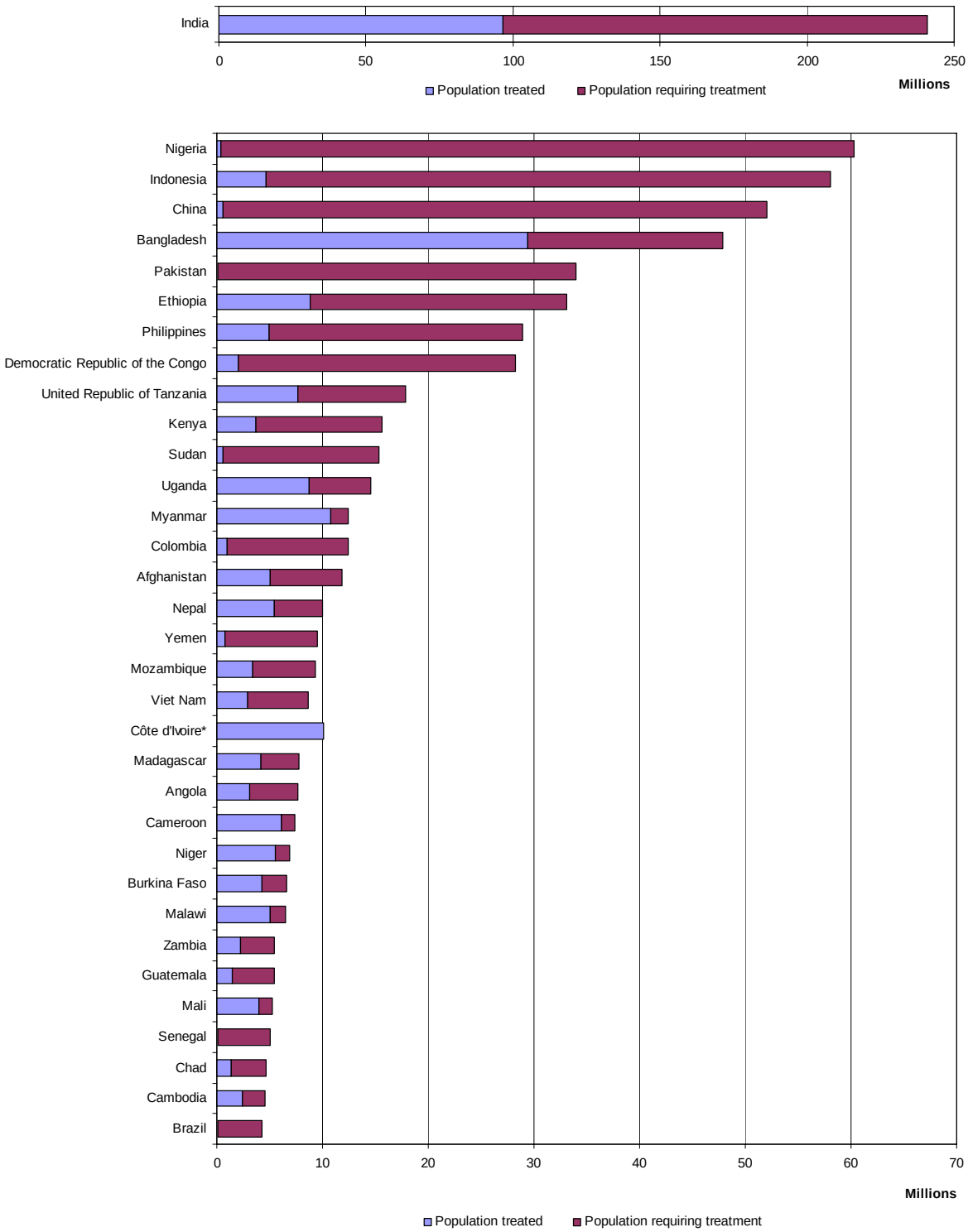
For the complete list of countries, please see the WHO preventive chemotherapy and transmission control databank at: http://www.who.int/neglected_diseases/preventive_chemotherapy/sch/en/index.html




* Countries treating more individuals than those requiring preventive chemotherapy interventions.

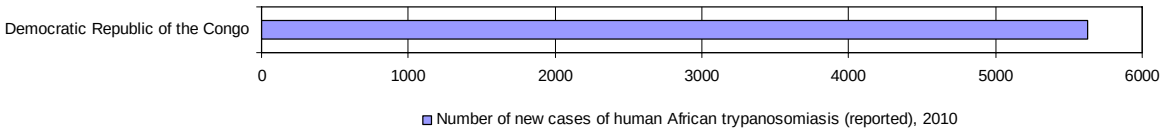
Annex 5 Population requiring preventive chemotherapy and number of people treated for soil-transmitted helminthiases in 2009, or latest available data

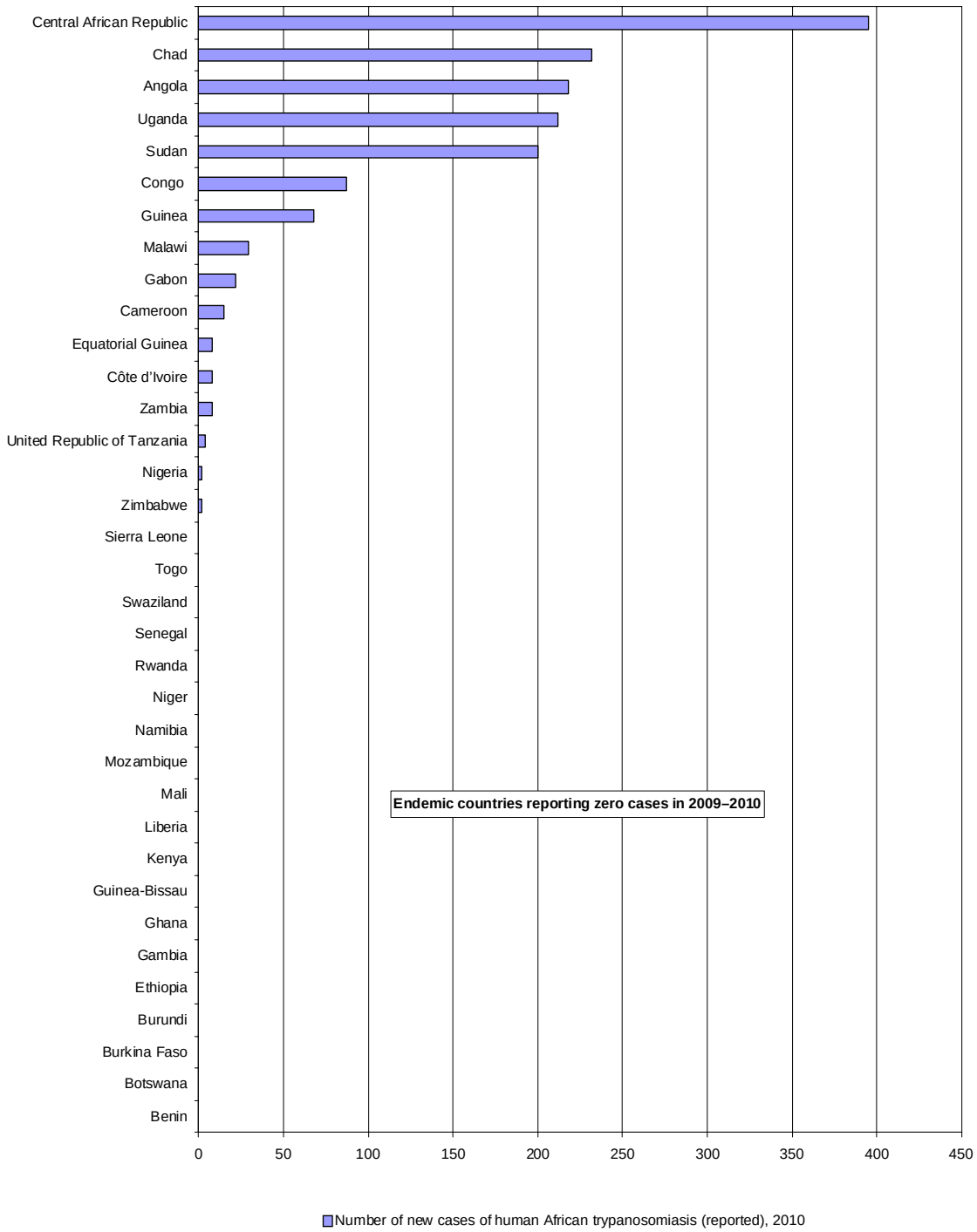
For the complete list of countries, please see the WHO preventive chemotherapy and transmission control databank at: http://www.who.int/neglected_diseases/preventive_chemotherapy/sth/en/index.html



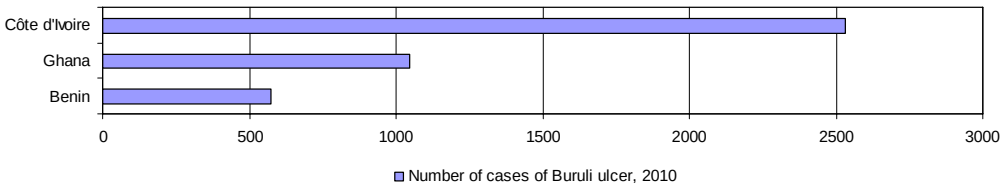

* Countries treating more individuals than those requiring preventive chemotherapy interventions.

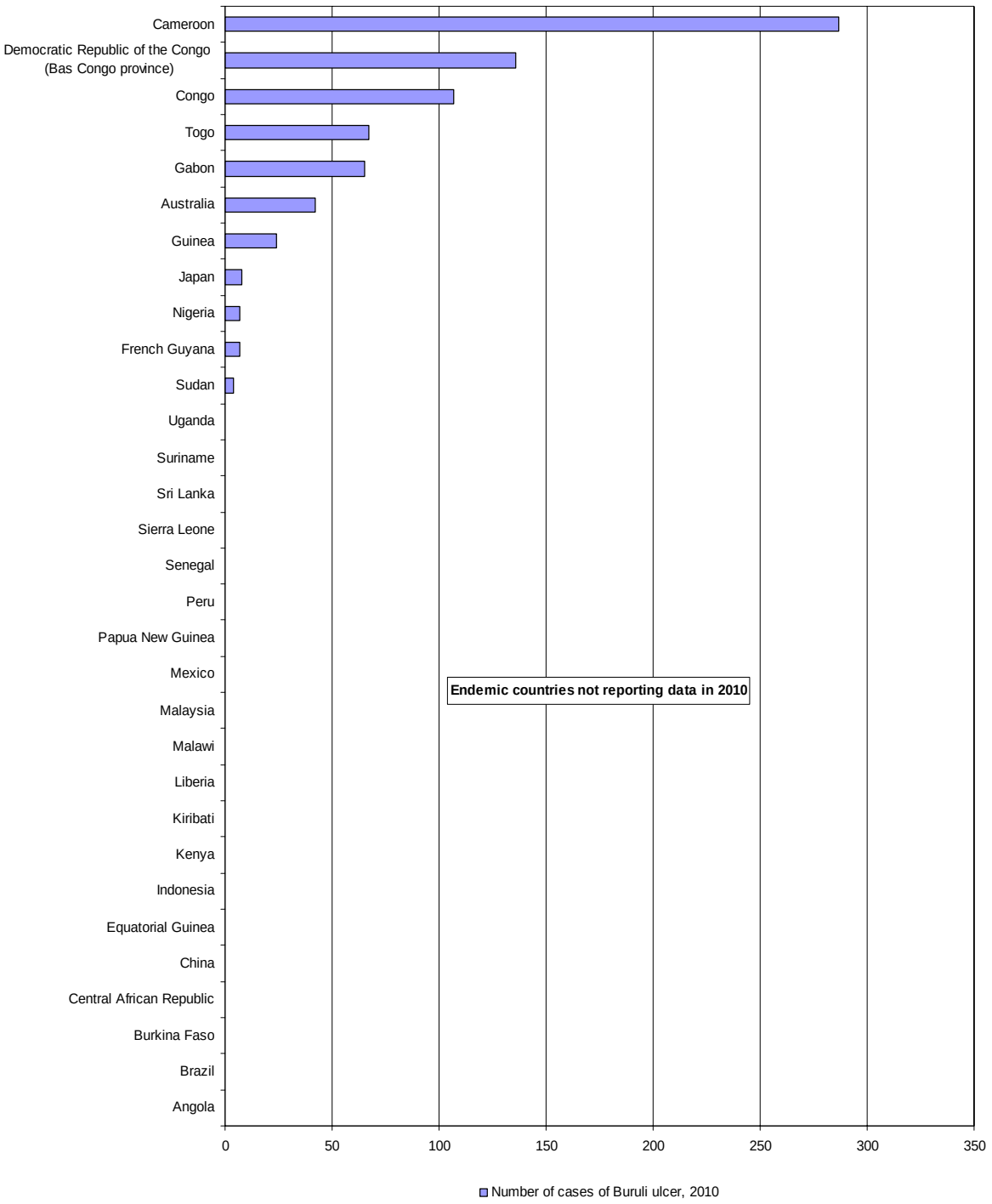
Annex 6 Number of new cases of human African trypanosomiasis in 2010, or latest available data



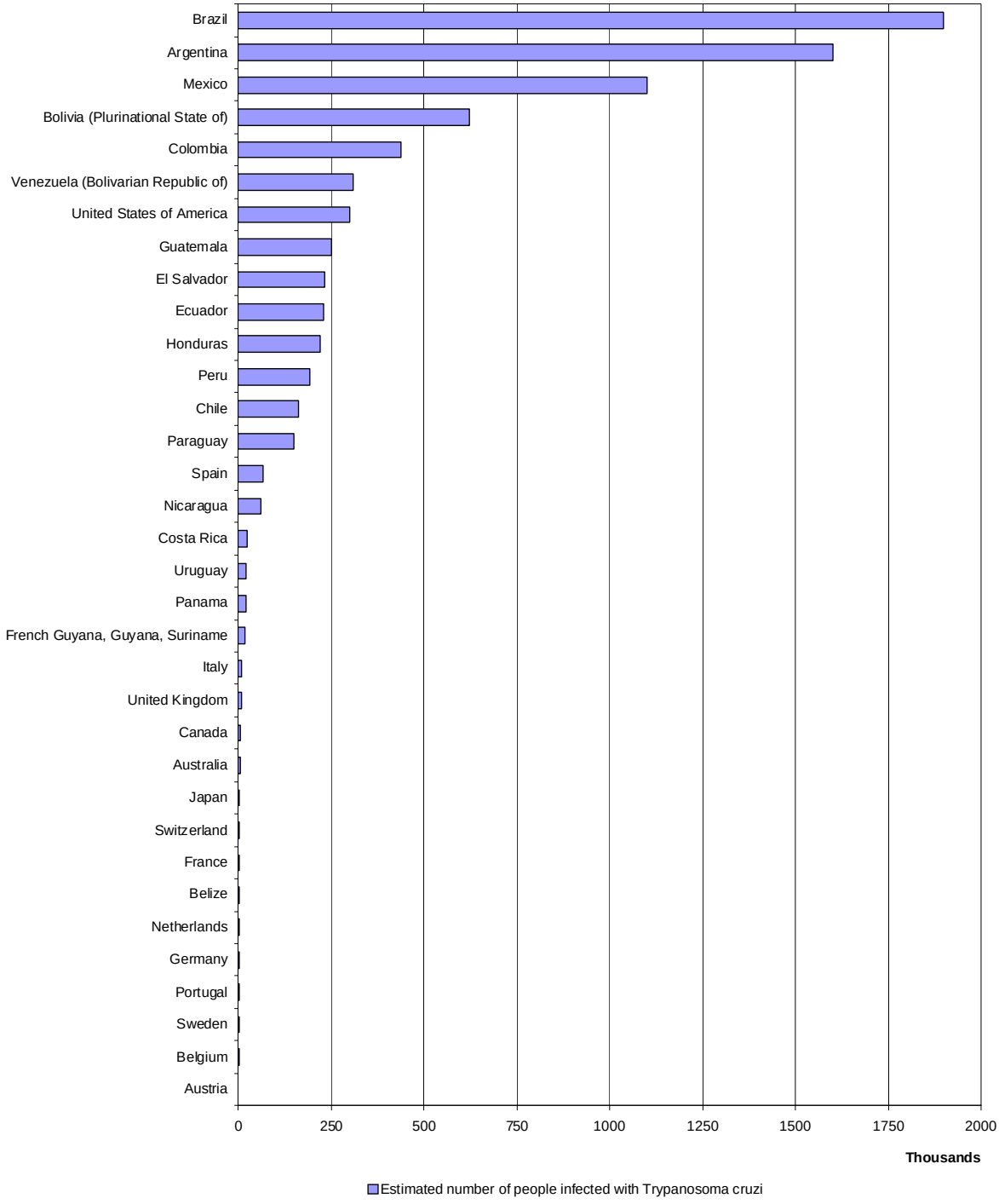



Annex 7 Number of cases of Buruli ulcer, 2010

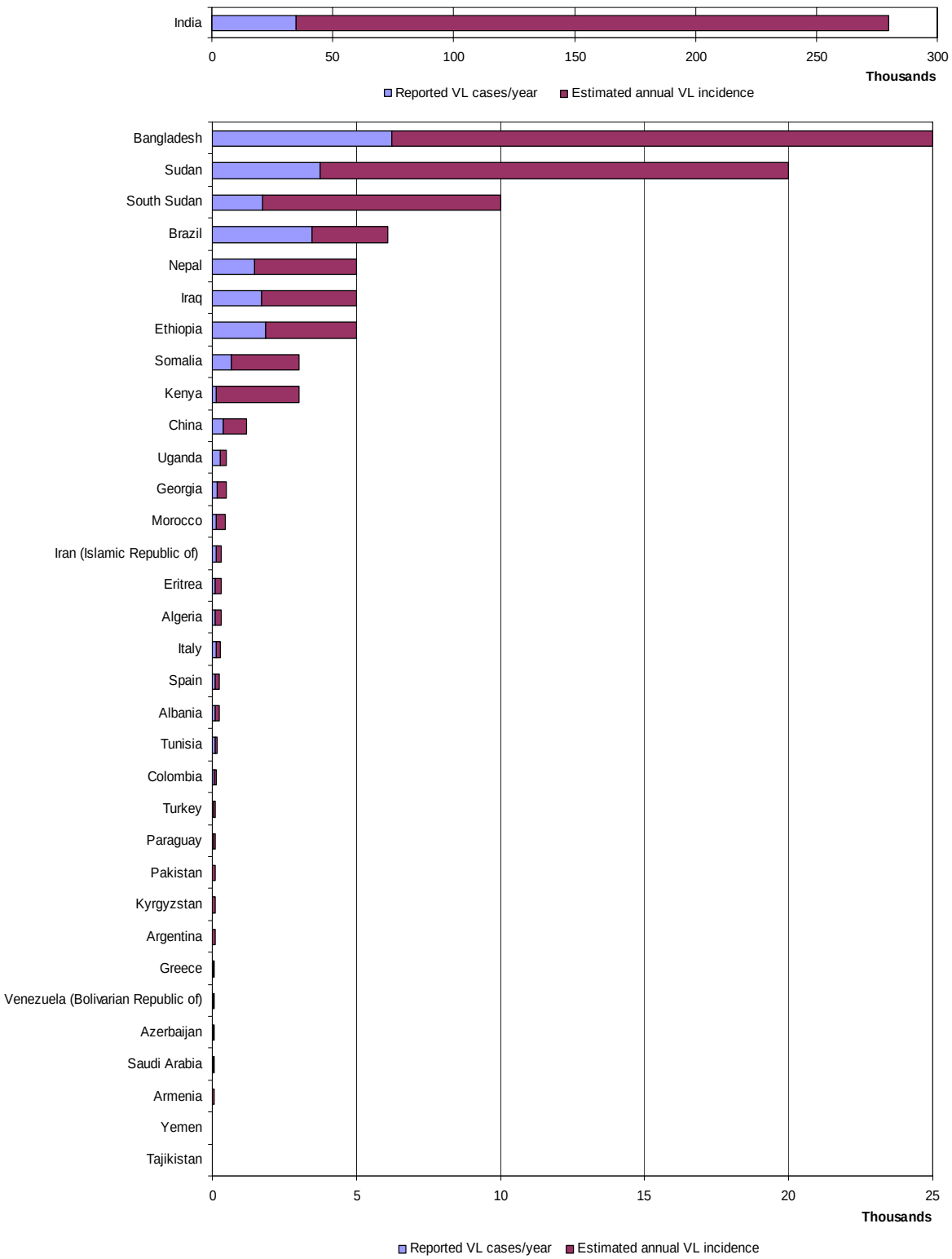


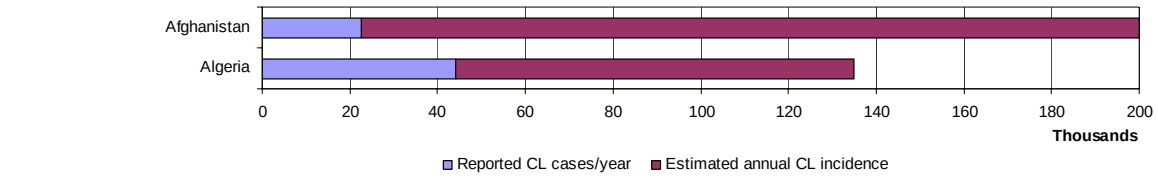
Annex 8 Estimated number of people infected with *Trypanosoma cruzi*, 2006–2010

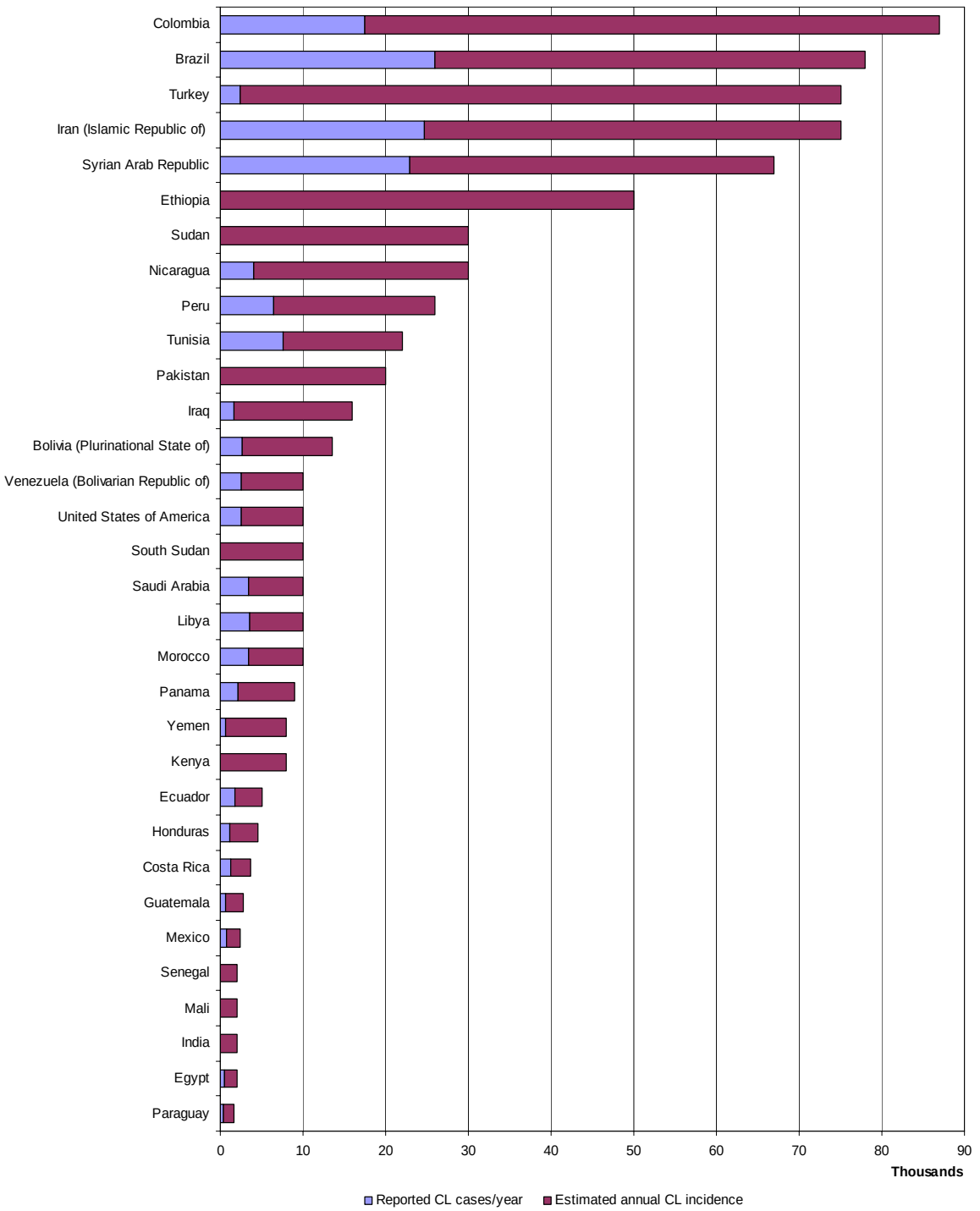


Annex 9 Estimated number of incident cases vs reported cases of visceral leishmaniasis (VL), 2010



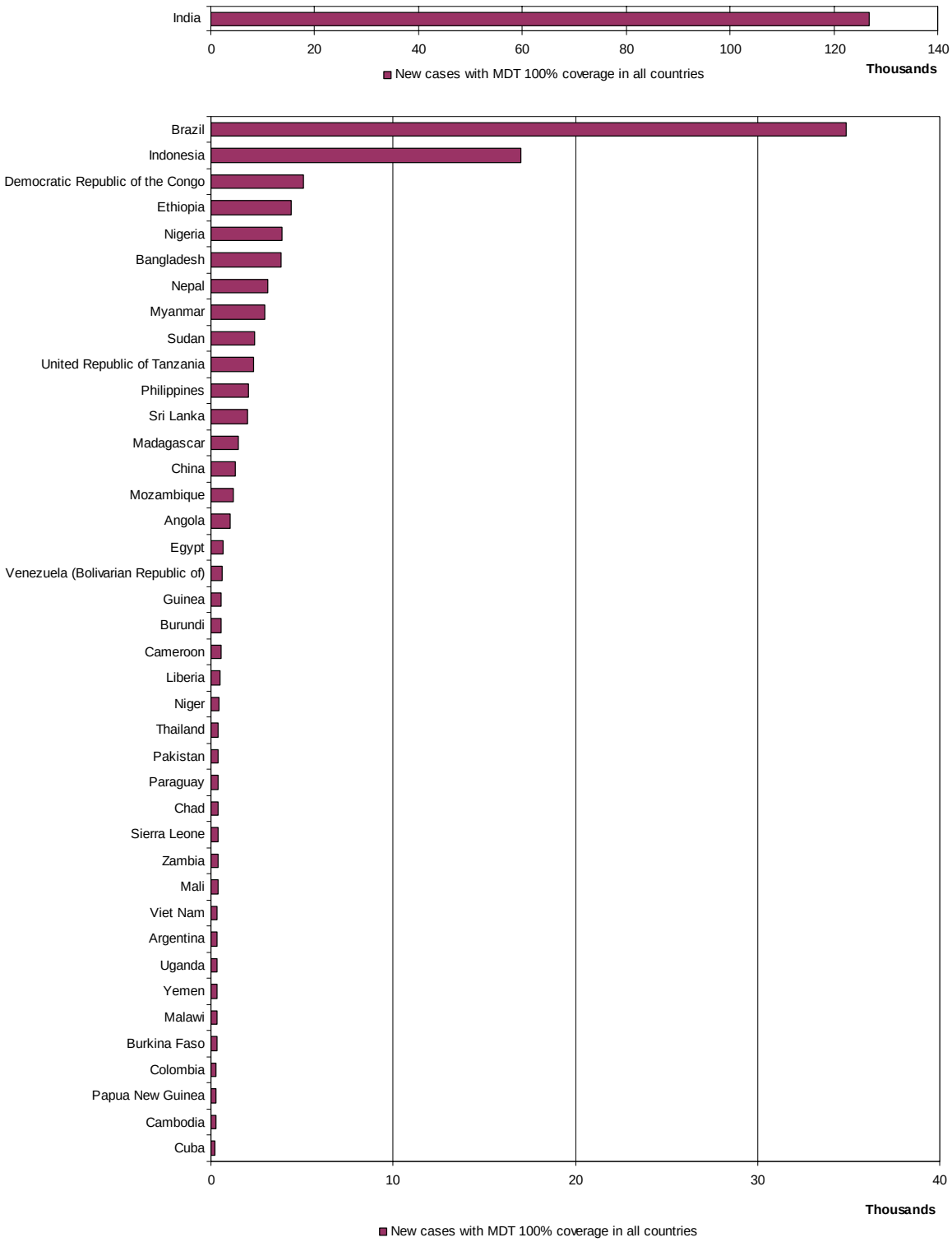
Annex 10 Estimated number of incident cases vs reported cases of mucocutaneous leishmaniasis (CL), 2010



Annex 11 Number of new cases of leprosy and multidrug therapy (MDT) coverage, 2010

For the complete list of countries, please see the WHO Global Health Observatory (GHO) at: http://www.who.int/gho/neglected_diseases/leprosy/en/index.html



## *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.***

WHO/HTM/NTD/2012.1 F