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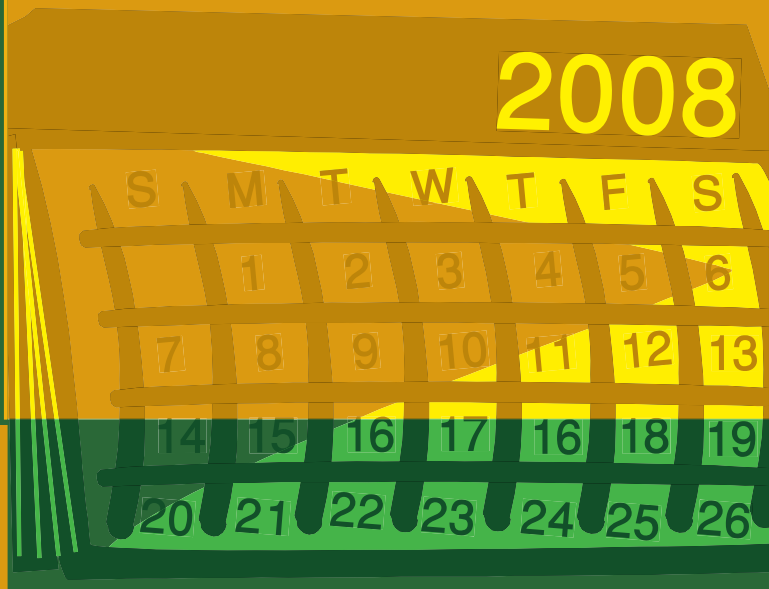
Strategic plan for malaria control and elimination in the WHO Eastern Mediterranean Region 2006–2010



World Health Organization

Regional Office for the Eastern Mediterranean

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Contents

Preface 5

Abbreviations 6

1. Introduction 7

2. Regional malaria situation 8
   2.1 Regional overview 8
   2.2 Malaria control activities 9
3. The regional malaria strategy 2006–2010 10

   3.1 Goal and objectives 10
   3.2 Guiding principles 14

4. The role of WHO and partners 34

4. The role of WHO and partners 35

   4.1 WHO 35
   4.2 Governments 36
   4.3 Communities 36
   4.4 Multilateral and bilateral agencies 37

   4.5 Nongovernmental organizations and the private sector 37
5. Estimated budget 37

Annexes

Annex 1. Population at risk of malaria in the Eastern Mediterranean Region, 2004 39

Annex 2a. Reported malaria cases in countries in Groups 1 and 2 40

Annex 2b. Reported and estimated malaria cases in countries in Group 3 41

Preface

In 1999, the Roll Back Malaria initiative was launched in the Eastern Mediterranean Region. All countries in the Region committed themselves to the objectives of the initiative and updated their national strategies for malaria control and elimination accordingly. The first regional strategic plan for Roll Back Malaria, 2003–2006, was developed in 2002. The objectives of this plan were to: halve the malaria burden in the countries with a severe malaria problem; decrease malaria morbidity and mortality so that it was no longer a public health problem in countries with low to moderate endemicity; eliminate malaria in countries where malaria transmission had been interrupted or had only a few residual foci; and prevent reintroduction of malaria in malaria-free countries. By 2006, the objectives of the regional strategy had been reached in many countries of the Region. The United Arab Emirates was certified as malaria-free, and three additional countries, Morocco, Oman and the Syrian Arab Republic, were reporting no local transmission. There was a significant reduction in the malaria burden in the Islamic Republic of Iran, Iraq and Saudi Arabia, and all three countries had adopted the malaria elimination strategy. Promising progress was also being recorded in several high burden countries such as Sudan and Yemen.

In addition to these changes in the eco-epidemiology of malaria in the Region, new, more affordable and reliable tools are now available for prevention and diagnosis, along with more effective and accessible antimalarial medicines, particularly for chloroquine-resistant falciparum malaria. New sources of funds are also available for highly endemic countries. Afghanistan, Sudan, Somalia and Yemen are receiving grants from the Global Fund to Fight AIDS, Tuberculosis and Malaria. Yemen is also receiving support from countries of the Gulf Cooperation Council. The strategic plan for malaria control and elimination in the WHO Eastern Mediterranean Region 2006–2010 was developed to make use of these opportunities and to address the new era of malaria in the Region. The goal, objectives and targets of the regional strategic plan are fully in line with other internationally agreed goals including the United Nations Millennium Development Goals.

Abbreviations

ACT	Artemisinin-based combination therapy
AGFUND	Arab Gulf Programme for United Nations Development Programmes
AIDS	Acquired immunodeficiency syndrome
ECHO	Humanitarian aid department of the European Commission
EMRO	WHO Regional Office for the Eastern Mediterranean
EPI	Expanded Programme on Immunization
G6PD	Glucose-6-phosphate dehydrogenase
GFATM	Global Fund to fight AIDS, Tuberculosis and Malaria
GIS	Geographic information systems
HANMAT	Horn of Africa Network for Monitoring Antimalarial Treatment
HIV	Human immunodeficiency virus
IEC	Information, education and communication
IMCI	Integrated management of childhood illness
IPT	Intermittent preventive therapy
IPTi	Intermittent preventive therapy in infants
IRS	Indoor residual spraying
ITN	Insecticide-treated net
IVM	Integrated vector management
LLIN	Long-lasting insecticidal net
MDGs	Millennium Development Goals
RBM	Roll back malaria
RDT	Rapid diagnostic test
SP	Sulfadoxine–pyrimethamine
TDR	UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHA	World Health Assembly
WHO	World Health Organization

1. Introduction

The strategic plan for malaria control and elimination in the WHO Eastern Mediterranean Region 2006–2010 was developed by the WHO Regional Office for the Eastern Mediterranean in consultation with Member States of the Region. It builds on the progress made in malaria control and elimination in the Region during 2003–2006, and is intended for ministries of health, national malaria programme managers and other stakeholders in malaria control. The goal, objectives and targets of the strategic plan are fully in line with the United Nations Millennium Development Goals, specifically those aiming to reduce maternal mortality by three quarters and child mortality by two thirds of their current rates (Goal 2), and to halt or reverse the spread of HIV/AIDS, malaria and other diseases (Goal 6). The strategic plan is also well-placed within the action framework of the Decade (2001–2010) to Roll Back Malaria in Developing Countries, particularly in Africa, adopted by the United Nations General Assembly in resolution 59/256 and reaffirmed by the Health Assembly in resolution WHA58.2 (2005). In its resolution, the Health Assembly urged Member States to establish national policies and operational plans to ensure that at least 80% of those at risk of, or suffering from, malaria benefit from major preventive and curative interventions by 2010 in accordance with WHO technical recommendations so as to ensure a reduction in the burden of malaria of at least 50% by 2010 and 75% by 2015.

This strategic plan sets out specific objectives for three groups of countries in the Region. It identifies six main strategic approaches for implementation, monitoring and evaluation of malaria control and elimination interventions, with time-bound targets and appropriate indicators for each approach. It also describes the roles of WHO, national authorities and other stakeholders in implementation of malaria control activities, and provides budgetary estimates for implementation of the national and regional strategic plans. The number and percentage of population at risk of malaria in each country of the Region are shown in Annex 1. Reported malaria cases in countries of the Region are shown in Annex 2.

2. Regional malaria situation

2.1 Regional overview

The WHO Eastern Mediterranean Region comprises 22 countries located in north Africa (Egypt, Libyan Arab Jamahiriya, Morocco, Tunisia), sub-Saharan Africa (Djibouti, Somalia and Sudan) and south-west Asia (Afghanistan, Bahrain, Iraq, Islamic Republic of Iran, Jordan, Kuwait, Lebanon, Oman, Pakistan, Palestine, Qatar, Saudi Arabia, Syrian Arabian Republic, United Arab Emirates, Yemen). The total regional population is 513 million.

Communicable diseases are quite prevalent in the Region and account for about 32% of the regional burden of disease, as assessed in disability-adjusted life years (DALYs). In addition, infections such as malaria result in loss of productivity and school absenteeism.

In total, 48% of the regional population (approximately 248 million people), reside in areas at various risk of malaria transmission (Annex 1). Reported malaria cases (about 6.1 million in 2000, 4.5 million in 2003 and 2.7 million in 2005) (Annex 2) represent only a fraction of true incidence. It is estimated that about 10.5 million malaria episodes and 49 000 malaria-related deaths occur every year in the Region. Pregnant women and children of young age are at higher risk in areas of stable malaria transmission, such as in the south and central zone of Somalia and southern Sudan. Malaria in pregnant women can result in maternal anaemia and death, miscarriage, stillbirth, low birth weight infants and neonatal death.

Geographical diversity in the Region determines malaria variability in terms of endemicity, intensity of transmission and type of malaria. In Saudi Arabia, Yemen and the sub-Saharan countries of the Region (Djibouti, Somalia and Sudan), *P. falciparum* is predominant. In the other endemic countries, mainly Afghanistan, Islamic Republic of Iran and Pakistan, both *P. falciparum* and *P. vivax* are transmitted.

With regard to malaria, countries of the Region pose strikingly dissimilar challenges that range from maintaining malaria-free status to controlling unstable and stable types of malaria, thus demanding different malaria control approaches. For this reason, they are categorized into different

groups. Nine countries have eliminated local malaria transmission: Bahrain, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Palestine, Qatar, Tunisia and United Arab Emirates. The risk of malaria reintroduction in these countries still exists. In four countries, malaria transmission has either recently been interrupted, as in Oman, Morocco and Syrian Arab Republic or it occurs in very limited residual foci, as in Egypt,. Three countries, the Islamic Republic of Iran, Iraq and Saudi Arabia, retain malaria endemicity in localized areas and are planning for or implementing the malaria elimination strategy. More than 95% of the malaria cases in the Region occur in six countries: Afghanistan, Djibouti, Pakistan, Somalia, Sudan and Yemen. Sudan alone accounts for almost 50% of the total regional cases.

2.2 Malaria control activities

The Roll Back Malaria programme was launched in the Eastern Mediterranean Region in 1999. Since then, it has been strengthened considerably. The regular and extrabudgetary funds available for the programme have grown from less than US$ 3 million in the biennium 1998–1999 to over US$ 11 million in 2004–2005. Most of the increase has been allocated to country activities, and the intercountry budget and activities have increased up to six-fold.

The regional malaria programme has worked to increase support for malaria control at national and regional levels through reorienting staff and strengthening human capacity to implement new malaria control approaches. In the countries with high malaria burden, additional WHO staff positions have been established for malaria control. Resource mobilization activities of the regional programme have increased considerably since 2002. Resources are also being made available from the Global Fund to fight AIDS, Tuberculosis and Malaria. The Regional Office provides support to countries in preparing submissions to donors such as the Global Fund, USAID, ECHO and AGFUND, and in implementation of approved projects. Total funding approved by the Global Fund for malaria projects in Afghanistan, Pakistan, Somalia, Sudan and Yemen amounts to US$ 75.5 million. As of May 2006, the total amount disbursed was US$36.2 million.

Capacity is being strengthened through a regional malaria training course established at the Regional Malaria Training Centre in Bandar Abbas, Islamic Republic of Iran. Since 2000, nine international courses on the

planning and management of malaria control programmes have been held, and a total of 169 professionals from 20 countries, mainly from the Region, have been trained. WHO supported the development and implementation of intercountry and national training courses on vector control management as well as national training courses on malaria vectors and malaria microscopy.

A great deal of attention is being given to advocacy by the regional programme. A website was launched in 2001 and is regularly updated. Several documents have also been produced. These include manuals on the use of larvivorous fish for mosquito control and integrated vector management. Guidelines have been developed on the elimination of residual foci of malaria, on the prevention of the re-establishment of malaria transmission and on quality assurance of malaria microscopy. In addition, several malaria publications have been translated into regional languages.

3. The regional malaria strategy 2006–2010

3.1 Goal and objectives

The goal of the regional malaria programme is to reduce the malaria burden to a level in which it is no longer a major cause of morbidity and mortality and a barrier to social and economic development

There are different levels of malaria control in the countries of the Region, and different objectives for each level of malaria control. The objective of the global Roll Back Malaria initiative is to reduce the malaria burden by half by 2010 compared with 2000. This objective is highly relevant to a few countries in the Region, namely Afghanistan, Djibouti, Pakistan, Somalia, Sudan and Yemen. In other countries of the Region, more ambitious objectives have been selected based on the prevailing malaria situation. These objectives include preventing re-establishment of malaria transmission in malaria-free countries and eliminating residual foci of malaria in countries with very limited malaria transmission.

The Eastern Mediterranean Region spans three different eco-epidemiological zones and includes countries with wide variation in socioeconomic development status. The diversity of environment influences the malaria situation and is a major determinant of success in malaria control between

and even within countries. To address these variations, the regional malaria programme has categorized the countries of the Region into three groups (based on information available in 2005). A specific strategic objective has been identified for each group.

Group 1: Countries which have eliminated malaria (A); and countries with very limited malaria transmission in residual foci (B)

Objective: To prevent re-establishment of malaria transmission in malaria-free countries and to eliminate residual foci of malaria in countries with very limited malaria transmission

This group is currently subdivided into countries in which malaria has been eliminated for more than three years (Group 1A: Bahrain, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Palestine, Qatar, Tunisia, United Arab Emirates), and countries in which only a few autochthonous cases were reported in limited residual foci during the past 3 years and the programme is strongly committed to eliminating the residual foci and to achieving malaria-free status (Group 1B: Egypt, Morocco, Oman and Syrian Arab Republic).

The main challenge for this group is to prevent re-establishment of local malaria transmission in the presence of continuous population movements from malaria-endemic countries. Other challenges include maintaining collaboration in border areas and maintaining awareness of malaria risk and the skills to diagnose and promptly treat the disease among the health staff of governmental and private health care facilities. It is equally important to maintain malaria awareness among members of the community, particularly among those individuals regularly travelling to malaria-endemic countries.

Malaria-free status will be maintained through a well-developed network of basic health services in all countries of the group. Free access to health services and selective screening for certain high risk populations in the high-risk areas will further contribute to the objective. To be able to cope with the potential threat of imported cases, personnel of governmental and private health care institutions will have to be trained and re-trained in diagnosis, clinical management and chemoprophylaxis of malaria. Staff of specialized services will be trained in malaria prevention through the use of targeted vector control and environmental management. Malaria surveillance as part

of the general surveillance system is based on reporting of malaria cases and deaths attributed to malaria by space and time. The malaria control programme will also incorporate information from relevant monitoring systems, such as those for insecticide resistance, entomological and meteorological monitoring, and population movement. Information based on priority indicators will enable the programme to evaluate progress regularly and to report to national authorities, WHO and other parties in a timely manner.

Interruption of local malaria transmission and elimination of active foci of malaria will be implemented using a holistic approach. Essential prerequisites for success are: political commitment; well managed and effective health systems; a functioning health infrastructure; well designed and managed epidemiological and management information systems; adequate funding; careful planning based on an epidemiological approach; trained human resources; and good programme management capacity for operational and health systems research.

Countries that are ready to embark on a strategy of elimination of malaria foci have a long history of malaria control and usually a wealth of information on malaria. The problem is often how to retrieve and use information of high epidemiological significance and predictive value. Usually, if the programme is successful, the number of active foci decreases. At this point it becomes both feasible and mandatory to investigate each focus thoroughly. The information needed may be subdivided into general (physiography, meteorology, population) and malaria-specific (vectors, parasite, clinical cases) information.

Monitoring the status of foci, with precise identification of their functional status (active or non-active, new or residual), is a prerequisite for success in interruption of transmission and prevention of reintroduction of malaria.

The role of WHO is very important in the establishment of efficient and sustained cooperation between neighbouring countries through the exchange of relevant information, joint planning and implementation of anti-malaria activities in border areas.

Group 2: Countries with low malaria burden limited to certain areas and with effective malaria programmes

Objective: To eliminate malaria and prevent its reintroduction

This group currently comprises three countries, Iraq, Islamic Republic of Iran, and Saudi Arabia, with 23% of the regional population. These countries have achieved a steady decline in malaria over the past decade. The remaining malaria in these countries includes all epidemiological types of malaria (Palaearctic and Oriental types in the Islamic Republic of Iran and Iraq, and Afrotropical type in Saudi Arabia). The main characteristic for all these countries is that the malaria control programme is self-reliant, has strong political and financial support from the national authorities and is also well-supported by developed health systems at the central and peripheral levels. Certain epidemiological and socioeconomic factors, such as education, equity in resource allocation for marginalized populations and general development in social and economic infrastructure, also contribute favourably towards the objective of malaria elimination.

The major challenges to achieving the objectives and sustaining these achievements are competing priorities from other communicable and especially noncommunicable diseases, the need for cooperation with malaria-endemic countries in border areas and the complex emergency situation in Iraq.

The strategy of malaria elimination in the countries of Group 2 is a time-limited exercise to be carried out in a phased manner. The first phase will consist of activities aimed at strengthening the malaria control programme in terms of ensuring properly trained or re-trained personnel, with the necessary resources and logistics to provide a firm and sustainable foundation for the successful achievement of malaria elimination. During the second stage, implementation of selective anti-malaria interventions will be carried out in identified areas of the countries in cooperation with neighbouring countries in the border areas.

Group 3: Countries with moderate or high malaria burden, weak health systems and/or complex emergencies

Objective: To halve the malaria burden (incidence, severity and mortality) by the end of 2010

The countries of this group are currently Afghanistan, Djibouti, Pakistan, Somalia, Sudan and Yemen. They represent about 47% of the population of the Region and contribute to around 95% of malaria cases. These countries have areas that have high malaria transmission or are threatened by epidemics and complex emergency situations.

Malaria is considered to be one of the most important problems affecting the health of the population. Inadequacy, or in some instances lack, of human resources and capacity at the country level is one of the major constraints impeding development, implementation and sustainability of malaria control in the countries of this group. Management of the logistics system continues to be a major problem due to high operational costs. The security situation in some countries also continues to pose a challenge.

Lack of human resources and appropriate infrastructure are the main obstacles for implementation of comprehensive malaria control activities. Priority is being given to strengthening or rebuilding of a functional malaria control programme for country-wide implementation of malaria control activities.

The development of capacity for malaria control is considered part of national health system strengthening. Malaria control activities will be implemented in synergy with other major health programmes, particularly those for other vector-borne diseases, maternal and child health, IMCI, routine immunization, HIV/AIDS and tuberculosis.

3.2 Guiding principles

The regional malaria programme, supported by the global malaria programme and the Roll Back Malaria partnership, will continue to play a leading role in policy and strategy formulation, standard setting, capacity development, operational support and political and financial advocacy. The malaria status of countries of the Eastern Mediterranean Region has an

impact on those of neighbouring regions, i.e. Africa, Europe and South-East Asia, and vice versa. Thus, coordinated planning and organization of joint activities with other regions are needed. The success of this approach depends on activating close collaboration with and between Member States within and outside of the Region, and with development agencies, commercial organizations, professional associations, civil societies, research groups and the media.

"Going to scale" at country level will require strengthening coordination mechanisms with all partners, including nongovernmental organizations and the private sector, and developing a national strategic plan focused on results. Health system strengthening through a results-based management approach will provide the environment necessary for sustainable malaria control.

The epidemiology of malaria varies considerably, as it depends on ecology, the biology of the vectors, the parasites and the human hosts, socioeconomic factors and health system performance. However, irrespective of the prevailing malaria situation in any given country, controlling malaria invariably requires treatment of cases, prevention of the pathological consequences of the disease and prevention of infection. Accordingly, the main technical interventions adopted in the Region are based on the following principles: 1) prompt and effective treatment of malaria cases; 2) prevention of malaria by reducing exposure to infective mosquito bites; 3) prevention malaria through chemotherapeutic measures; and 4) prevention and control of malaria epidemics.

3.3 Strategic approaches

Strategic approach 1: Promote and facilitate access of populations at risk to reliable diagnosis and effective treatment of malaria

Prompt and effective treatment of malaria remains a key intervention in reducing the burden of disease and death from malaria. The challenges to providing adequate treatment are: widespread resistance to chloroquine and increasing resistance to other antimalarial medicines; wide availability of substandard and counterfeit antimalarial medicines; and weak health systems that are unable to deliver timely diagnosis and treatment, especially to remote and underserved populations.

Moving from monotherapy to WHO-recommended artemisinin-based combination therapy (ACT), demands a series of steps and preparations requiring guidelines, training, logistics, monitoring and financing policies to make the new medicines affordable to countries and people. All countries in the Region will, with the support of WHO, enact and reinforce legislation and regulations to ensure registration, importation, quality and availability of antimalarial medicines in public and private sector pharmacies, hospitals and peripheral health care facilities. Malaria control programme partners at country level should promote such regulations, and private practitioners should comply with national medicine policies.

Counterfeit antimalarial medicines that contain no antimalarial agents or have substandard formulations are increasingly available in many malaria endemic areas. It is the responsibility of national ministries of health and regulatory authorities to ensure the quality of antimalarial medicines provided through both the public and private sectors, through regulation, inspection and law enforcement. As a supportive mechanism, WHO, in collaboration with other United Nations agencies, has established an international mechanism to pre-qualify manufacturers of artemisinin compounds and ACTs.

Extensive measures are required to prevent and contain parasite resistance to antimalarial drugs. National drug regulatory authorities should withdraw marketing authorization of oral artemisinin monotherapy, and detect and remove substandard quality ACTs in the market to prevent emergence and spread of resistance to artemisinin and its derivatives. Mechanisms of law enforcement should be strengthened to seize antimalarial medicines of unknown quality that are illegally introduced in the market (especially in the informal private sector). Countries should share information with neighbouring countries and with the Regional Office when detecting counterfeits or antimalarial drugs of poor quality. There is a need to monitor parasite resistance and to evaluate utilization of antimalarial drugs in the public and private health systems.

To assist the countries to meet the challenge of drug resistance, the Regional Office will continue to support countries with local *Plasmodium falciparum* transmission, both technically and financially, through the establishment of sentinel sites as part of a surveillance system for continuous monitoring of

the first-line and second-line drugs as well as testing potential new malaria treatments.

The Regional Office will continue to support and coordinate with the Horn of Africa Network for Monitoring Antimalarial Treatment (HANMAT) which comprises six countries (Djibouti, Ethiopia, Eritrea, Somalia, Sudan and Yemen) and includes operational and research experts from several agencies. The purpose of the network is to provide a basis for rational and effective treatment policies in the Horn of Africa.

Lack of access to effective treatment in rural communities and remote areas remains a challenge, mainly in countries with intense malaria transmission, because of inadequacies in the health care system. In such settings, early and appropriate treatment of malaria is possible through the introduction or improvement of home management of malaria. This strategy aims to improve the practice of home and community-based malaria case management by training and providing medicines to mothers, caregivers at the home, village or community health workers and medicine vendors and shopkeepers. The efficacy of home management can be further enhanced through the use of pre-packaged medicines with treatment courses. With adequate guidance and support, this can be a life-saving intervention. Whenever suitable, artemisinin compound suppositories can be used in areas with high risk of malaria for pre-referral treatment of severe malaria and for people who cannot swallow.

Prompt and accurate diagnosis of malaria is the key to effective disease management and to the reduction of unnecessary use of antimalarial medicines. Parasitological diagnosis of malaria with microscopy or, where not available, RDTs, is recommended in all situations. The use of clinical diagnosis of malaria is recommended only for children under 5 years in hyper-endemic areas, suspected severe malaria where parasitological confirmation is not immediately available and cases of fever in established malaria epidemics where resources are limited. All efforts will be made to increase access to laboratory-based diagnosis, primarily microscopy. The latter has a low direct cost, is sensitive and capable of differentiating parasite species and determining parasite density, and can be used to diagnose other conditions. In malaria microscopy, the presence of both asexual stages and

gametocytes should be recorded. This will help to determine the timeliness and accuracy of diagnosis.

Rapid diagnostic tests should be deployed wherever diagnosis by reliable microscopy is not possible, for outbreak investigation, and possibly for surveys of parasite prevalence and self-diagnosis by travellers entering endemic areas. Where mono infection with *P. vivax* is common and microscopy is not available, there are two options: 1) using combination RDTs which contain pan-malaria antigens; and 2) using RDTs specific for falciparum malaria and treating negative cases with high clinical suspicions of malaria as vivax malaria. In areas where *P. vivax, P. malariae* or *P. ovale* occur almost always as a co-infection with *P. falciparum*, RDTs that detect only *P. falciparum* are sufficient. Serological methods will be used in certain areas of countries claiming malaria-free status for confirmation of interruption of local malaria transmission.

In malaria-endemic countries, existing laboratory services providing malaria microscopy should be strengthened. Where it is not possible to have microscopy, RDTs can be used effectively by trained health workers, including community health workers. Quality assurance of both microscopy and RDTs should be promoted at all levels of the health sector.

Targets

By the end of 2007, all countries will have an effective treatment policy including provision of effective, quality assured and safe antimalarial medicines

By the end of 2010, all countries will provide reliable malaria laboratory diagnosis

By the end of 2010 all malaria endemic countries will provide timely and effective treatment of uncomplicated and severe malaria provide to all populations at risk

Indicators

Number of endemic countries with a functional system for antimalarial drug resistance monitoring (in vivo and/or in vitro)

Number of targeted countries which have developed and implemented home and community-based management of malaria

Number of endemic countries that have developed polices and strategies to ensure private sector involvement/compliance in delivering quality treatment according to the national guidelines

Number of endemic countries that provide access to effective malaria treatment for at least 80% of the population at risk

Number of endemic countries that provide malaria laboratory diagnosis for at least 80% of the population at risk

Strategic approach 2: Promote and facilitate application of effective preventive measures against malaria for populations at risk

Recognizing the lack of capacity of weak health systems to deliver vector control interventions, and the need to strengthen these health systems, a regional strategic framework on integrated vector management (IVM) was developed. The strategy is based on principles of strengthening intersectoral and intrasectoral coordination, partnerships at all levels, decision-making criteria at the lowest level, synergy of sustainable and evidence-based interventions – addressing a number of vector-borne diseases where appropriate (malaria, Rift Valley fever, dengue fever, leishmaniasis etc.). Using the strategic framework, each country will prepare, adopt and implement a national plan of action for IVM based on a comprehensive vector control needs assessment.

Preventing malaria by reducing exposure to infective mosquito bites will be achieved by the use of various vector control measures. The basis for selection of the most appropriate and cost-effective vector control measures will be malariogenic stratification of the country concerned. Each stratum will be characterized in terms of the beginning, peak(s) and end of malaria transmission, thus allowing for the establishment of date(s) for operations as

well as the frequency of application of a particular intervention. Quality application of insecticides or tools and their supervision needs to be strengthened, together with including entomological surveillance for insecticide resistance and vector species composition, biting and resting behaviour in sentinel sites.

In the case of bednet implementation, the current approach is to target one LLIN per two persons or one LLIN per sleeping place, free of charge in all the rural areas affected by malaria. Where resources are limited, it is recommended to target vulnerable groups of people (pregnant women, children under the age of five and displaced populations) in malaria high-risk areas and then expand as resources become available. Attempts should also be made to link distribution of LLINs with other public health programmes, in particular with immunization, antenatal care and maternal and child health services and services provided by nongovernmental organizations.

It is also expected that the use of IRS and LLINs will have an impact on other vector-borne diseases in areas where the distribution, biting, and resting behaviour of the vectors overlap with those of malaria.

In areas of high *P. falciparum* transmission, immunity levels tend to be high in adults, and women during pregnancy may have asymptomatic infections. In these areas, malaria infections in pregnant women produce maternal anaemia and placental parasitaemia, which can lead to low birth weight and neonatal mortality, particularly during first and second pregnancies. To prevent the consequences of malaria in pregnancy in areas of high malaria transmission, two interventions are recommended for delivery through antenatal care programmes: the use of insecticide-treated mosquito nets (ITNs); and intermittent preventive treatment (IPT) with sulfadoxine–pyrimethamine (SP) in areas where SP is efficacious. At present no data are available on the efficacy and safety of alternatives to SP for intermittent preventive treatment.

Targets

By the end of 2007, all countries will have adopted an integrated vector management strategy

By the end of 2007, all countries will have strengthened capacity to plan, implement, evaluate and monitor vector control interventions

By the end of 2010, all countries will have implemented appropriate vector control measures, especially IRS and ITNs, and will have established entomological surveillance systems

By the end of 2007, all endemic countries will have implemented WHO-recommended strategies for prevention of malaria and anaemia among pregnant women, infants and other vulnerable groups in targeted areas

Indicators

Number of countries that have developed a national IVM strategy

Number of countries with updated vector mapping

Number of endemic countries reporting at least 80% coverage of selected IRS and ITNs/LLINs in targeted areas

Number of countries implementing WHO guidelines and recommendations on judicious use of insecticides for vector control

Number of targeted countries implementing the WHO-recommended strategy for malaria prevention during pregnancy

Strategic approach 3: Support prevention and control of malaria in epidemic situations, complex emergency and urban settings

Malaria epidemics are quite frequent in countries of the Region. The regional strategy aims at the prevention or reduction of the impact of epidemics by early detection and timely response with the implementation of effective malaria control measures. The maximum benefit occurs when measures are implemented at the very early stages. This will require the development of a cost-effective surveillance system that includes forecasting, early warning and detection that would lead to either the very early recognition of epidemics and immediate implementation of control measures or the

implementation of preventive control measures before the epidemics starts. Therefore, the national authorities in epidemic-prone countries will develop, with the assistance from WHO, a national contingency plan for malaria epidemic preparedness and response. This plan will incorporate the following objectives:

- Identification the epidemic-prone areas and the population at risk to allow the prediction and detection of epidemics, development of plans for emergency preparedness and response;
- Wherever feasible, forecast and prevent malaria epidemics by vector control measures;
- Establish a surveillance system to detect the early appearance of the epidemic and to control it by effective rapid case management and, where possible, vector control.

Many malaria epidemics are detected too late for vector control interventions to be implemented cost-effectively. However, in many instances, monitoring weather factors (rainfall, river level, temperature and humidity) may raise the alert up to six weeks before the incidence of clinical malaria cases increases above the local malaria epidemic threshold.

Excessive rainfall is usually associated with epidemics in arid and semi-arid areas in the Region where the limiting factor for malaria transmission is the absence of breeding sites. The combination of increased rainfall and higher temperatures are indicators for malaria epidemics in highland and desert-fringe areas. To assist countries in the identification of epidemic-prone areas and populations at risk, the Regional Office will continue to provide the technical support for mapping epidemic-prone areas, including using geographic information systems (GIS) technology. The Regional Office will consider all possible national and international opportunities for using remote sensing technology for forecasting and early warning of malaria epidemics. Currently, the famine early warning system network provides timely and regular meteorological and vegetation information which can be used to enrich field information for prevention and control of malaria epidemics.

The medicines used to treat malaria in epidemics should be highly efficacious, safe and offer good patient compliance. Complete treatment

should be given in all circumstances. ACTs are the best available drugs for the treatment of uncomplicated malaria in *P. falciparum* and mixed *P. falciparum and P. vivax* epidemics. Chloroquine will remain the drug of choice in vivax-only epidemics.

Intramuscular artemether injection will be the drug of choice for the management of severe disease during epidemics because quinine use is impractical in most epidemic situations. Where artemether injection is unavailable, an artesunate suppository is recommended for emergency use in the periphery, when severely ill patients are unable to swallow oral medication. The Regional Office will support countries in updating their treatment guidelines for epidemic situations and in securing access to the appropriate medicines.

Mass treatment of fever cases with ACT to reduce mortality is recommended once malaria has been established as the cause of the epidemic.

While the main priority in malaria epidemics is the prompt and effective diagnosis and treatment of malaria, the role of vector control is also very important. Countries will be supported to plan, target and timely implement vector control operations in malaria epidemics with the aim of reducing the risk of transmission and saving lives. Assistance also will be provided to create (if unavailable or inadequate) a national infrastructure of well-trained personnel, adequate supplies and equipment, preparedness planning, supervision and evaluation.

All efforts will be made to implement anti-vector measures in epidemic situations in the most cost-effective manner through implementing vector control activities at the very beginning of an epidemic aiming at high coverage (more than 85%) in terms of targeted villages, households, rooms, cattle sheds and people.

Vector control operations will also be carried out as a preventive anti-epidemic measure under certain situations, such as a resurgence of malaria in controlled areas or a gradual build-up of transmission over the years in targeted communities at risk of epidemics.

IRS will be the method of choice for vector control in malaria epidemics. The deployment of nets (preferably LLINs) targeting 100% coverage of

affected populations will only be implemented in the following situations: a) in places where ITNs/LLINs are readily available and experienced staff are in place to deploy them to quickly reach high coverage level; b) in refugee camps together with other personal protection measures; c) in emergencies with scattered displaced populations where IRS is impracticable.

Targets

By the end of 2007, all epidemic-prone countries will have implemented weekly malaria surveillance with appropriate epidemic thresholds in at least 80% of epidemic-prone areas/districts

By the end of 2010, selected epidemic-prone countries will have implemented a suitable malaria early warning system in selected epidemic-prone areas/districts

By the end of 2010, all epidemic-prone countries will have implemented a national contingency plan for malaria epidemic preparedness and response

Indicators

Number of countries with a national malaria epidemic preparedness and response plan including having a contingency stock of needed supplies and equipment

Number of countries with a functional early detection system including weekly malaria surveillance with appropriate epidemic thresholds in at least 80% of epidemic-prone areas/districts

Strategic approach 4: Support countries to strengthen the capacity of malaria control programmes at national and district level in partnership with all relevant agencies

Improvement of national institutional capacity for planning and management of malaria control is a crucial strategy for sustainable malaria control programmes. To address this vital strategy, WHO will support countries to develop their malaria control programme, as part of the health care delivery system, in three interrelated domains: infrastructure and facilities; human resources; and information. WHO will also support the establishment of

efficient mechanisms for procurement and distribution of medicines, reagents, insecticides and other essential commodities.

Malaria remains the main cause of morbidity and mortality in Group 3 countries due to lack of human resources and limited coordination among partners. To support partners working in these countries, WHO will ensure continuous technical support at country level by WHO field staff to assist in planning, implementation, monitoring and evaluation of malaria control activities.

Human resource management at all levels is essential to all malaria programmes in the Region and is a key feature of the regional strategy. The Regional Office will support countries to carry out needs assessments in human resource development and provision of enabling working environments. The Regional Office, in collaboration with countries, will develop and implement a mechanism for retaining trained human resources in the service for which they were trained.

The Regional Office will collaborate with countries to identify, and if necessary upgrade, national centres for malaria training and research.

The Regional Office will continue to support, financially and technically, the activities of the Regional Malaria Training Centre in Bandar Abbas, Islamic Republic of Iran and the Blue Nile Training and Research Institute in Sudan. The Regional Office will identify new centres of excellence in different fields of malaria control and will support networking of regional centres with other international centres. In the area of vector control, the Regional Office will explore the possibility of establishing a Master's degree programme in entomology and vector control, in accordance with Regional Committee resolution EM/RC52/R.6 (2005) on integrated vector management.

Partnership is the key factor for success of the malaria control/elimination strategy. Partnerships have been increased in all countries of the Region with a high malaria burden. New partners include governmental sectors other than the Ministry of Health, national and international nongovernmental organizations, the private sector, mass media, bilateral and multilateral agencies, and funding institutions including the Global Fund to Fight AIDS, Tuberculosis, and Malaria. Efforts will be made to promote further

partnerships in all countries of the Region with a malaria problem, particularly in those with a high burden of the disease.

WHO, governments and partners at country level will continue to promote greater intersectoral collaboration among all relevant sectors. Collaboration with the private sector will be further expanded and promoted through all possible means.

The role of the community is very important to the control of malaria within the Region. The promotion of health awareness through mass media and the mobilization of community action to reduce man–vector contact are key activities. Partnerships with nongovernmental organizations can effectively extend advocacy and health education activities.

The Regional Office will continue to collaborate and coordinate in all aspects of malaria control and elimination with other WHO Regional Offices, particularly those for Europe and Africa.

Targets

By the end of 2007, all countries will have improved national institutional capacity for planning and management of malaria control

By the end of 2010, all endemic countries will have strengthened human capacity for planning, implementation, monitoring and evaluation of malaria control/elimination at all levels

By the end of 2007, all endemic countries will have scaled up community-based services for malaria prevention and treatment

By the end of 2007, countries will have developed national advocacy and IEC strategies according to local socio-cultural environment

Indicators

Number of targeted countries with WHO field staff

Number of countries with functional national malaria training and research centres

Number of regional training courses and intercountry workshops (planning and management, malaria laboratory diagnosis, case management, epidemics control, vector control and monitoring and evaluation)

Number of countries with developed community-based systems for deploying packages for malaria control

Number of regional activities for promoting advocacy, partnership, coordination and resource mobilization

Number of approved proposals submitted to the Global Fund and other donors

Strategic approach 5: Support expansion and maintenance of malaria-free areas and malaria elimination, wherever feasible

A malaria-free area is defined as an area where there is no local malaria transmission (Box 1) and thus no indigenous cases occur. The only cases that may occur are those imported. At present, nine countries of the Region are already free from malaria. In the remaining countries, malaria endemicity varies considerably. Target areas for elimination include residual foci of transmission, as well as larger, more populous endemic areas where achieving disease-free status is feasible.

Box 1. Definitions of malaria elimination and malaria-free status

The WHO informal consultation on malaria elimination, held in Tunis 24–25 February 2006, defined malaria elimination and malaria-free status as follows.

- Malaria elimination is ***the interruption of local transmission by mosquitoes***, and covers by definition all plasmodium species that infect humans.
- The defining criterion for ongoing local malaria transmission by mosquitoes is the occurrence of ***cluster(s) of 3 or more cases of malaria infection that can be traced with a high likelihood to one source of mosquito-transmitted infection within the territory***. A country/area can be considered malaria-free when there have been no such clustered cases due to local malaria transmission by mosquitoes for three consecutive years.

During the WHO Malaria Eradication Campaign, a malaria focus was considered to be "a defined and circumscribed locality situated in a currently or formerly malarious areas and containing the continuous or intermittent epidemiological factors necessary for malaria transmission" (WHO 1963). Malaria foci can be defined ecologically as a system consisting of an abiotic part (territory) interacting with the populations of the parasite, vectors and hosts that support its existence.

Elimination of malaria transmission requires inputs and cooperation from all health sectors such as public works services, meteorological organizations, agriculture, education and military. As the detection of every malaria case is crucial at this stage, ensuring the full cooperation of the private health sector is critical. Even in integrated health services, a specialized anti-malaria component should exist. Its role is to plan, guide, and monitor strategy implementation and to perform evaluation and interpretation of results. In contrast, most of the work in the field is to be done by the general health services. This includes case detection, clinical and parasitological diagnosis, provision of treatment, patient counselling, health education and reporting. Every health worker at primary health care level needs to be well trained on how to recognize potential cases of malaria on clinical grounds and where to refer cases for diagnosis and treatment. Control of malaria vectors should be part of a specialized integrated vector control component of the public health services.

The purpose of antimalarial measures at the stage of elimination of foci is to:

- Achieve the sustainable interruption of malaria transmission
- Deplete the reservoir of infection
- Prevent the re-establishment of malaria from the same area, from the same country or from abroad.

The action to interrupt transmission should be quick, energetic, and of time-limited duration. In contrast, prevention of reintroduction of malaria is a long-term policy that would require continuous investment of funds and personnel, although on a smaller scale than before the interruption of transmission. For interruption of malaria transmission, a two-pronged action is required aimed at disease management including prevention of infection of mosquitoes and disease prevention through vector control.

Case detection should be enhanced in residual active foci. This can be done either through establishing/strengthening either passive case detection facilities or through active case detection for people who are living in accessible conditions. Active detection should emphasize quality rather than quantity of blood slides collected. Quality active case detection implies visits to every house at the time when most members of the household are at home. Every effort should be made to visit the houses that were missed or locked, and all possible attempts should be made to contact people who were absent during the visit. This may necessitate revisiting the village. A mechanism, such as a database, should exist to match people who were contacted through the passive system with the lists for active case detection.

The principle of total coverage should be applied to case detection. All the inhabited houses need to be visited, even if their population is said to be covered by autonomous health services, such as railways, large industry etc. Good rapport should be established with the military medical services, especially if military camps are located in the area. Military personnel should be subjected to case detection in a synchronized manner based on the same policy. The same applies to prisons and similar institutions. Special emphasis should be placed on the smallest and most remote villages and groups of houses.

The indication for a blood examination is any febrile disease (history of fever or presentation with fever) with no other obvious explanation. Slides should preferably be examined on the spot (passive centres and mobile teams) or promptly dispatched to a laboratory for rapid examination. In areas or conditions where microscopic diagnosis is not available, falciparum-specific RDTs should be used for diagnosis of suspected cases, as a supplement to microscopy, to avoid treatment delay. Blood donors should be screened for malaria parasites.

Early detection and prompt treatment of imported cases will be carried out at the time of entry in the country/territory, by providing easy and free access to public health services.

All positive falciparum cases should be treated with highly effective medicines, currently ACTs. Uncomplicated malaria cases usually do not need to be hospitalized. However, the treatment should be supervised by a health worker. Radical treatment of vivax malaria is usually by a

combination of chloroquine for 3 days and primaquine for 14 days. Primaquine may produce haemolysis in patients with G6PD deficiency. Whereas this haemolysis is self-limiting if the drug is stopped, it may be dangerous if the treatment is continued. Therefore, health workers observing the treatment should enquire whether the colour of urine remains normal. The treatment with primaquine may be delayed if this is advantageous from the operational point of view.

In malaria-free countries of the Region as well as in the countries aiming at malaria elimination, the prevention of re-establishment of malaria transmission through introduction of cases is of paramount importance. Therefore, the use of chemoprophylaxis is recommended for nationals travelling abroad to malaria endemic countries. The selection of drug for prophylaxis will depend on the country visited. Advice on malaria risk and prevention of mosquito bites will also be provided.

Indoor residual spraying is the most effective method that selectively eliminates endophilic mosquitoes feeding on potential parasite carriers, without affecting much the exophilic part of the mosquito population. It has, however its limitations such as resistance of the human population, concern on adverse ecological impact, elevated cost, resistance to insecticides. Indoor residual spraying application is almost impossible in big cities which increase the role of larval control in urban malaria, which is facilitated by the fact that breeding places suitable for anophelines are limited.

Larval control is indicated in specific conditions when breeding places are well-defined and limited in size, particularly in arid and semi-arid areas. This intervention is expensive because of the need for repeated applications during the malaria transmission season. It requires the use of insecticides that are not toxic for non-target organisms and vegetation, such as the chemical temephos (Abate) or biological agent such as *B. thuringiensis*. Distribution of larvivorous fish may be a good additional measure in subtropical and tropical environments where fish such as Gambusia, tilapia, and other mosquito predators are part of the local ecosystems.

The use of LLINs with high population coverage (as opposed to their use for personal protection), effectively decreases the number of infective mosquito bites and diminishes malaria morbidity and mortality, and all consequences of malaria burden.

A more long lasting effect may be obtained through environmental projects (drainage, clearing of drains, flushing, drying out). However, many breeding places are of economic, recreational or aesthetic value and cannot be eliminated disposed of easily. By reducing breeding places, environmental control effectively decreases the vector population, but does not play a decisive role in interruption of transmission.

Malaria surveillance, monitoring and evaluation will be carried out by specialized and general health services. This includes: a) collection of information, its analysis and reporting; b) epidemiological investigation of imported and locally transmitted malaria cases and malaria foci in case of the breakdown of preventive system; and c) assessment of coverage and quality of malaria preventive measures through monitoring process.

All malaria cases should be epidemiologically investigated. Family members and neighbours should be checked by blood examination and all cases should be followed up for at least 28 days. In malaria-free countries and countries aiming at malaria elimination, malaria should be a compulsory notifiable disease. Malaria foci should be reclassified at the end of each transmission season. Entomological investigation is needed which will include a search for adult anopheline mosquitoes and their identification.

Distribution of malaria foci, particularly new potential and new active foci, and locally transmitted malaria cases in space and time should be monitored carefully for evaluation of impact of interventions for malaria elimination.

Targets

By the end of 2007, countries in the Region where interruption of malaria transmission is feasible will have developed and implemented a malaria elimination strategy

By the end of 2010, countries that have eliminated malaria will have maintained malaria-free status; the malaria-free status will be validated or certified, if needed

Indicators

Number of countries that have developed and implemented a strategic plan for malaria elimination

Number of countries with an updated strategy for prevention of reintroduction of malaria to malaria-free areas

Number of malaria-free countries with established border coordination mechanisms with neighbouring endemic countries

Strategic approach 6: Strengthen malaria surveillance, monitoring and evaluation, systems and operational research

Strengthening the surveillance system, as a cross-cutting strategy, is crucial for producing results in disease control programmes. The surveillance system is needed for priority setting, policy- and decision-making and for planning, implementation, monitoring and evaluation purposes. It is also a good tool for early detection and control of malaria epidemics, which is important not only for epidemic-prone areas, but also for countries free of malaria transmission and for those countries that have adopted the goal of malaria elimination.

Special priority will be given to establishing and strengthening sentinel surveillance systems for monitoring resistance of malaria parasites to antimalarial drugs, resistance of malaria vectors to various insecticides and malaria mortality and for epidemic detection.

Design and use of a simple GIS application at national and district level, as a tool for collecting, analysing and disseminating surveillance information with a spatial dimension, will be strongly encouraged.

In malaria-endemic countries with weak or non-functioning health systems, all possible mechanisms will be considered to strengthen the malaria surveillance system to provide the information necessary for planning and management of control activities. Efforts will also be made to integrate the malaria surveillance system with surveillance systems of other disease and programmes.

Monitoring and evaluation are essential activities at all levels of the malaria control programme, both to identify the appropriate mix of malaria control interventions and to assess the effectiveness of programme activities over time. Malaria control programmes should monitor the availability and distribution of important malaria control services and commodities such as antimalarial medicines and LLINs, coverage of key interventions for malaria prevention and management and trends in malaria morbidity and mortality.

Completeness and reliability of the data collected by the health information system is the main challenge for monitoring and evaluation in all countries, especially in endemic countries. Well-designed prevalence and coverage surveys for measuring outcome indicators and estimating impact, and health facility surveys for measuring output and process indicators, are in many settings the only ways to collect reliable information.

Operational research will continue to be supported through the EMRO/TDR Small Grants Scheme. The Regional Office, after consultation with countries, will select a research theme for each round of the Small Grants Scheme to direct funds for generating necessary evidence. This will enable the countries to update their national strategies to address new needs of malaria control and elimination programmes. The Regional Office will investigate and use all possible means to disseminate, share and use the results. The Regional Office will support national malaria control programmes in establishing a mechanism for priority-setting and training their staff on research methodology.

The main research topics that will be supported by the regional malaria programme are as follows.

- Health and economic burden of malaria
- Integration of malaria control programme in public health services

- Integration of malaria control measures with other programmes such as routine immunization and IMCI
- Role of private sector in malaria diagnosis, treatment, prevention and reporting
- Community involvement in prevention, diagnosis and treatment of malaria
- New cost-effective methodologies for establishing quality assurance of malaria laboratory diagnosis
- Role and field application of various RDTs in confirming malaria diagnosis in different epidemiological situations
- Drug efficiency and effectiveness
- Prevention of relapse in vivax malaria; vivax malaria and pregnancy
- Usage of conventional and newly developed vector control measures on different eco-epidemiological situations
- Vector ecology and vector mapping
- Effectiveness of intermittent preventive therapy in adults and infants
- Malaria epidemic thresholds in different eco-epidemiological situations and establishment of malaria early warning systems

Targets

By the end of 2007, all countries will have developed and implemented a malaria monitoring and evaluation plan

By the end of 2010, all countries will have strengthened their integrated malaria surveillance system

By the end of 2010, all countries will have the capacity to define priorities for, design and conduct malaria operational research projects

Indicators

Number of countries that have implemented the malaria monitoring and evaluation plan at national and subnational levels

Number countries reporting regularly on malaria burden

Number of countries reporting on coverage of malaria control interventions

Biannual regional report on malaria burden and coverage of malaria control interventions published

Number of malaria operational research studies implemented

4. The role of WHO and partners

4.1 WHO

With regard to disease control, WHO's scope of work consists of providing normative and technical support, coordination, surveillance and monitoring and evaluation. WHO's specific mandate is to advise Member States on the selection of control tools and to define policies, strategies and technical guidelines. Coordination links up with normative work, with international disease surveillance and with the close cooperation with governments. At country level, WHO supports governments through its country offices while promoting and facilitating coordination internationally.

Historically, WHO has collaborated in many health activities at the country level, especially those related to disease control and health systems development. The focus of WHO cooperation in each country is determined by joint planning with all relevant partners. The primary types of support for malaria control are in the form of surveillance, quality assurance, regulation and evaluation, integration, capacity building, quality and timely application of IRS and LLINs, and management information systems.

In the field of surveillance and information systems, WHO takes responsibility for providing regular updates on the global health situation, and especially on progress in reducing the malaria burden towards the agreed goals.

The role of WHO in addressing the need for strengthening health systems is clearly becoming stronger. In each country, the government provides stewardship for a recurring cycle of defining problems, identifying causes, developing options, deciding on the required action, implementing and evaluating. Malaria control interventions must fit in with and be supported by the essential public health services of the government and be delivered through private and public health and non-health channels. More specifically, WHO will strive to maximize the contribution of malaria control efforts to strengthening health systems. WHO will also ensure that the general health policies of financing and decentralization are respected and supported and that the needs for developing and maintaining the

necessary national institutional capacity and public health workforce are addressed.

The malaria programme will increasingly emphasize developing human resources and seeking cooperation with other WHO health programmes and strategies such as EPI and IMCI, antenatal care services, laboratory services and health management information systems, and with technical partners for strategies that will strengthen health systems. WHO will also strengthen its cooperation with other United Nations agencies, nongovernmental organizations and other technical and implementation partners.

4.2 Governments

Governments should define long-term national malaria strategies capable of taking current issues into account and predicting and preventing emerging problems. They should involve all socioeconomic sectors and promote a high level of advocacy in order to create awareness of the impact and magnitude of malaria problem. There is a need for development of mechanisms to ensure intersectoral and intrasectoral coordination, public–private partnership, cross-border coordination and community participation. It is important that sufficient funds are allocated for control or elimination of malaria, as well as for maintenance of achieved malaria eradication status. This starts with the mobilization of local financial and human resources. It is equally important that a carefully constructed, comprehensive national strategic plan be developed with clear-cut objectives and targets and a set of essential indicators for evaluation.

4.3 Communities

Community partnership is an important component of any attempt to control malaria. The community should be involved in the mobilization of local resources and the planning of anti-malaria activities especially health promotion, malaria awareness and providing environmental management. One approach is through community organizations such as local development associations.

4.4 Multilateral and bilateral agencies

These agencies can help to enhance multisectoral collaboration, facilitate resource mobilization and explore innovative mechanisms for supportive action. Through community-based and local actions for improving health, they can effectively contribute to reducing the burden of malaria. These agencies can, in a synergistic manner, share information, maintain momentum, sustain efforts and inputs and monitor progress. The challenge for these agencies is to give more attention to malaria and environmental issues.

4.5 Nongovernmental organizations and the private sector

Nongovernmental organizations can be very helpful in social mobilization and the implementation of community programmes for malaria control. They are well suited for this role through their close associations with people and their problems. Partnerships between the public and private sectors are important vehicles for achieving public health goals. Foundations, trusts, research and academic institutions and the media all have a role to play in rolling back malaria.

5. Estimated budget

A. Estimated cost of implementation of national malaria control strategies in highly endemic countries (2006–2010)

Country	Estimated total cost (2006–2010)	Estimated gap (2006–2010)
Afghanistan	45 300 000	17 300 000
Djibouti	9 808 000	3 594 000
Pakistan	40 000 000	25 000 000
Somalia	29 023 940	27 200 000
Sudan (north)	167 019 000	116 913 300
Sudan (south)	103 130 000	103 130 000
Yemen	52 842 243	25 698 376

B. Estimated cost of implementation of the regional malaria strategy

Year	Estimated budget (million US$)
2006–2007	15
2008–2009	19
2010	11
Total	45

Annex 1. Population at risk of malaria in the Eastern Mediterranean Region, 2004

Country	Total population (000)[1]	Population at sporadic transmission risk (000)	Population at continuous transmission risk (000)	Total population at risk (000)	% population at risk
Afghanistan	22 998	4 997	7 763	12 760	55
Bahrain	708	0	0	0	0
Djibouti	817	0	300	300	37
Egypt	69 323	4 000	0	4 000	6
Iran, Islamic Republic of	66 775	10 169	3 433	13 602	20
Iraq	26 503	8 383	4 434	12 817	48
Jordan	5 617	0	0	0	0
Kuwait	2 645	0	0	0	0
Lebanon	4 370	0	0	0	0
Libyan Arab Jamahiriya	5 843	0	0	0	0
Morocco	30 509	541	0	541	2
Oman	2 651	0	0	0	0
Pakistan	151 816	47 063	100 199	147 262	97
Palestine	3 827	0	0	0	0
Qatar	656	0	0	0	0
Saudi Arabia	22 608	1 227	1 151	2 378	11
Somalia	8 298	2 800	4 500	7 300	88
Sudan	34 512	22 000	12 000	34 000	99
Syrian Arab Republic	18 200	253	0	253	1
Tunisia	9 911	0	0	0	0
United Arab Emirates	4 210	0	0	0	0
Yemen	21 003	NA	NA	12 602	60
Total[2]	513 800	101 433	133 780	247 814	48

[1] WHO 2004

[2] Of the total population at risk, 24 million are risk for vivax malaria only

Annex 2a. Reported malaria cases in countries in Groups 1 and 2

Countries	Cases in 2003		Cases in 2004		Cases in 2005		Species transmitted locally
	Total	Autochth-onous	Total	Autochth-onous	Total	Autochth-onous	
Bahrain	87	0	85	0	71	0	nil
Egypt	45	0	43	0	23	0	nil
Iran, Islamic Republic of	23 562	17 060	1 3821	7602	18 966	14 396	P. vivax> P. falciparum
Iraq	347	most	155	150	47	44	P. vivax
Jordan	163	0	173	0	86	0	nil
Kuwait	229	0	290	0	302	0	nil
Lebanon	58	0	68	0	57	0	nil
Libyan Arab Jamahiriya	47	0	15	0	12	0	nil
Morocco	73	4	56	1	100	0	nil
Oman	740	6c	615	0	544	0	nil
Palestine	1	0	0	0	0	0	nil
Qatar	93	0	72	0	168	0	nil
Saudi Arabia	1 724	700	1 232	308	1 059	204	P. falciparum > P. vivax
Syrian Arab Republic	24	2	13	1	28	0	nil
Tunisia	75	0	39	0	38	0	nil
United Arab Emirates	1 796	0	1 612	0	1 544	0	nil

Annex 2b. Reported and estimated malaria cases in countries in Group 3

Country	Year	Total cases reported	Cases confirmed	Cases estimated*	Species transmitted
Afghanistan	2005	281 888	66 798	1 500 000	P. vivax > P. falciparum
Djibouti	2005	2 590	413	60 000	P. falciparum > P. vivax
Pakistan	2005	4 022 823	127 825	1 600 000	P. vivax > P. falciparum
Somalia	2005	28 529	12 516	1 300 000	P. falciparum > P. vivax
Sudan	2005	1 988 132	706 768	5 000 000	P. falciparum > P. vivax
Yemen	2005	200 560	44 150	900 000	P. falciparum > P. vivax