WHO-EM/MAL/385/E

Regional malaria action plan 2016–2020

Towards a malaria-free Region

World Health Organization
Regional Office for the Eastern Mediterranean

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Contents

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 the plan were to: halve the malaria burden in 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. The strategy was updated following the World Health Organization (WHO) Regional Committee for the Eastern Mediterranean resolution EM/RC55/R.9 (2008), putting more emphasis on malaria elimination.

By 2010, Morocco and the United Arab Emirates were certified as malaria-free, and Iraq 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 and Saudi Arabia. Significant reduction of morbidity was also being recorded in several high-burden countries, such as Afghanistan, and in certain areas of Sudan and Yemen.

The regional action plan for malaria control and elimination 2016–2020 has been developed considering WHO Regional Committee for the Eastern Mediterranean Region resolution EM/RC55/R.9, global resolutions pertaining to malaria control and elimination, and other related regional strategies including integrated vector management and public health pesticides management frameworks. The goal, objectives, targets and approaches of the regional action plan are in line with the WHO Global Technical Strategy for Malaria 2016−2030 adopted by the Sixty-eighth World Health Assembly in May 2015 (WHA68.2).

1. Introduction

The World Health Organization (WHO) Global technical strategy for malaria 2016–2030 was developed through a comprehensive consultative process with all Member States. Seven regional consultations were conducted in 2014, including an Eastern Mediterranean Region consultation held in Casablanca, Morocco. The global strategy was adopted at the Sixty-eighth World Health Assembly in May 2015 (WHA68.2).

To implement the global technical strategy for malaria during 2016–2020, the Regional Office for the Eastern Mediterranean developed this action plan through a consultative process, first with an expert group in Cairo, Egypt in May 2015, and then with malaria programme managers in a regional meeting in Tehran, Islamic Republic of Iran in June 2015. The final action plan was presented at the Sixty-second pre-Regional Committee meeting and endorsed by Member States.

This action plan is intended for ministries of health, national malaria programme managers and other stakeholders in malaria control and elimination. The goal, objectives, targets and approaches of the plan are in line with the United Nations (UN) post-2015 Sustainable Development Goal 3 for heath, and its target for malaria: "By 2030, end the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases".

The action plan considers prior global emphasis on universal coverage with core malaria interventions, which still needs to be achieved. Recalling that in 2005, by resolution WHA58.2 on Malaria control, the World Health Assembly urged Member States to ensure that at least 80% of those at risk should have access to antimalarial interventions by 2010; and that, in 2007, by resolution WHA60.18, the Health Assembly resolved to establish a World Malaria Day. On the first such commemoration in 2008, the UN Secretary-General called for universal coverage with malaria control interventions.

In this action plan, malaria elimination is the utmost regional priority, keeping in mind that in 2008 the WHO Regional Committee for the Eastern Mediterranean adopted resolution EM/RC55/R.9 on Malaria elimination in the Eastern Mediterranean Region: vision, requirements and strategic outline urging Member States with endemic malaria to develop a national multiyear strategic plan to eliminate malaria in areas where it is feasible, and to scale up efforts to intensify malaria control in high and stable transmission areas. It urged Member States that have achieved or are close to malaria elimination to

maintain vigilance and strong surveillance systems to prevent re-establishment of malaria transmission; and to establish/strengthen functional collaborative mechanisms to support elimination in high-burden countries, including provision of financial and human resources.

In view of the diversity between countries in the Region, this action plan sets out specific objectives for three groups of countries. It identifies the main strategic approaches for implementation, monitoring and evaluation of malaria interventions, with time-bound targets and appropriate indicators for each approach. It also includes a detailed plan for the implementation of the strategy during 2016–2020.

2. Regional malaria situation

2.1 Regional overview

The WHO Eastern Mediterranean Region comprises 22 countries located in north Africa (Egypt, Libya, Morocco and 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 Arab Republic, United Arab Emirates and Yemen). South Sudan, which was previously part of the WHO Eastern Mediterranean Region, joined the WHO African Region in 2013.

Geographical diversity in the Region determines malaria variability in terms of endemicity, intensity of transmission and type of malaria. The malaria-endemic countries of the Region are situated in the three eco-epidemiological zones of malaria: Afrotropical, Oriental and Palaearctic. In Saudi Arabia, Yemen and the sub-Saharan countries of the Region (Djibouti, Somalia and Sudan), the predominant malaria species is *Plasmodium falciparum* and the main vector species are *Anopheles arabiensis* and *An. funestus*. In the other endemic countries, mainly Afghanistan, the Islamic Republic of Iran and Pakistan, both *P. falciparum* and *P. vivax* are transmitted and the main vector species are *An. culicifacies*, *An. stephensi*, *An. superpictus*, *An. sacharovi*, *An. maculipennis* and *An. Fluviatilis* (Table 1).

Currently, countries in the Region are in different phases of malaria control and elimination. Six countries are in the control phase (Afghanistan, Djibouti, Pakistan, Somalia, Sudan and Yemen). Two countries have low, geographically limited malaria transmission and are in the elimination phase (Islamic Republic of Iran and Saudi Arabia). The remaining countries are in the phase of prevention of reintroduction of malaria. The risk of malaria reintroduction as a result of importation still exists in these countries, some of which eliminated malaria a long time ago (Bahrain, Jordan, Kuwait, Lebanon, Libya, Palestine, Qatar and Tunisia) and others in the more recent past. Of the latter, two countries have achieved certification of elimination (Morocco and United Arab Emirates) while four countries are not yet certified (Egypt, Iraq, Oman and Syrian Arab Republic). In recent years, a number of countries (Egypt, Jordan and Oman) have reported introduced cases or limited outbreaks of indigenous cases.

Table 1. Malaria vectors in endemic countries

Country	Vector
Afghanistan	*An. stephensi*
	An. superpictus
	An. hyrcanus
	An. pulcherrimus
	An. culicifacies
	An. fluviatilis
Djibouti	*An. gambiae*
	An. arabiensis
Iran (Islamic Republic of)	*An. stephensi*
	An. culicifacies
	An. fluviatilis
Pakistan	*An. culicifacies*
	An. stephensi
Saudi Arabia	*An. arabiensis*
	An. sergentii
	An. stephensi
	An. fluviatilis
	An. multicolor
Sudan	*An. arabiensis*
	An. funestus
	An. gambiae
	An. nili
	An. pharoensis
Somalia	*An. arabiensis*
	An. funestus
Yemen	*An. arabiensis*
	An. culicifacies
	An. sergentii

Since the year 2000, geographic distribution of malaria in the Region has been shrinking consequent to malaria elimination in four countries (Morocco, Syria, Iraq and Oman), one island (Socotra in Yemen), and most areas of Saudi Arabia and Islamic Republic of Iran (excepting border districts with Yemen and Pakistan). Moreover, there has been a positive change in high-burden countries with areas of high transmission moving to moderate and low transmission. In recent years, however, there have also been situations where malaria transmission has increased, either due to climate change (e.g. in Punjab province, Pakistan after floods in 2010) or when weak national capacity to detect and respond to malaria cases led to an outbreak (e.g. in Djibouti in 2013–2015).

Ongoing political instability, civil crises and conflicts in several areas of the Region represent a great challenge to sustaining the gains achieved, including scaling up of interventions and moving towards elimination in Afghanistan and Yemen, and proper vigilance for prevention of reintroduction in Iraq and the Syrian Arab Republic. The Region has had prior experience of re-emergence of malaria following conflicts in Afghanistan, Iraq and Yemen.

2.2 Regional burden

Risk

Based on reported data in 2015, it is estimated that 44% of the population of the Eastern Mediterranean Region are living in areas at risk of local malaria transmission. The number and percentage of the estimated population at risk of malaria in endemic countries with local transmission are shown in Table 2.

Incidence

Three of the eight countries in the Region with ongoing transmission attained more than 75% reduction in malaria incidence rates in 2015 compared to 2000 (Afghanistan, Islamic Republic of Iran and Saudi Arabia). The number of microscopically confirmed cases has fluctuated from year to year in the other six countries (Djibouti, Pakistan, Somalia, Sudan and Yemen) and it is not possible to conclude whether malaria case incidence is increasing, decreasing or constant. In 2015, countries in the Region reported a total of 5 374 167 cases (Tables 3–5) of which 18.5% were parasitologically confirmed. Six countries accounted for more than 98% of confirmed cases: Sudan 60%, Pakistan 20%, Afghanistan 10%, Yemen 7% and Somalia 2%.

Table 2. Population at risk of malaria, by country, 2015

Country	UN estimated population	Total population at risk	High-risk population	Low-risk population	Malaria-free population
Afghanistan	30 551 676	23 314 782	7 704 178	15 610 604	7 236 894
Bahrain	1332 172	0	0	0	1 332 172
Djibouti	872 932	436 466	0	436 466	436 466
Egypt	82 056 377	0	0	0	82 056 377
Iran (Islamic Republic of)	77 447 170	750 998	0	750 998	76 696 172
Iraq	33 765 232	0	0	0	33 765 232
Jordan	7 273 799	0	0	0	7 273 799
Kuwait	3 368 575	0	0	0	3 368 575
Lebanon	4 821 970	0	0	0	4 821 970
Libya	6 201 523	0	0	0	6 201 523
Morocco	33 008 150	0	0	0	33 008 150
Palestine	5 006 611	0	0	0	5 006 611
Oman	3 632 444	0	0	0	3 632 444
Pakistan	183 188 847	178 172 755	42 648 339	131 766 702	5 016 092
Qatar	2 168 673	0	0	0	2 168 673
Saudi Arabia	28 828 872	39 758	0	39 758	28 789 114
Somalia	10 495 580	10 495 580	7 310 850	3 184 730	0
Sudan	37 964 305	37 964 305	32 990 981	4 973 324	0
Syrian Arab Republic	21 898 060	0	0	0	21 898 060
Tunisia	10 996 516	0	0	0	10 996 516
United Arab Emirates	9 346 127	0	0	0	9 346 127
Yemen	24 407 381	19 010 930	6 116 736	12 894 194	5 396 451
Total	618 632 992	270 185 574	96 771 084	169 656 776	348 447 418

Table 3. Reported malaria cases in malaria-free countries

Country	2005		2010		2015	
	Total reported cases	Local cases	Total reported cases	Local cases	Total reported cases	Local cases
Bahrain	71	0	90	0	87	0
Egypt	23	0	85	0	291	0
Iraq	47	44	7	0	2	0
Jordan	86	0	61	2	59	0
Kuwait	302	0	343	0	309	0
Lebanon	57	0	NA	NA	125	0
Libya	12	0	NA	NA	324	2
Morocco	100	0	218	0	510	0
Palestine	0	0	NA	NA	0	0
Oman	544	0	1 193	24	822	4
Qatar	168	0	440	0	445	0
Syrian Arab Republic	28	0	23	0	12	0
Tunisia	38	0	72	0	88	0
United Arab Emirates	1 544	0	3 264	0	3 685	0

Table 4. Reported malaria cases in countries at the stage of malaria-elimination

Country		2005	2010	2015
Iran (Islamic Republic of)	Total reported cases	18 966	3 031	797
	Local cases	14 396	1 847	187
	Local P. falciparum and mixed cases	1 555	191	10
Saudi Arabia	Total reported cases	1 059	1 941	2 620
	Local cases	204	29	83
	Local P. falciparum and mixed cases	NA	29	83

Table 5. Reported malaria cases in malaria in countries at the stage of burden reduction

Country	2005		2010		2015	
	Reported cases	Confirmed cases	Reported cases	Confirmed cases	Reported cases	Confirmed cases
Afghanistan	326 694	116 444	392 463	69 397	350 044	103 377
Djibouti	2 469	413	1 010	1 010	NA	NA
Pakistan	4 022 823	127 826	4 281 356	240 591	3 776 244	202 013
Somalia	28 404	12 516	24 553	24 553	39 169	20 953
Sudan	2 515 693	628 417	1 465 496	720 557	1 102 186	586 827
Yemen	200 560	44 150	198 963	106 697	96 348	68 938

Mortality

In 2015, the number of reported deaths due to malaria in the Region was 1010; more than 86% of these deaths were reported from Sudan (Table 6).

Table 6. Reported malaria deaths, 2015

Country	All ages
Afghanistan	49
Djibouti	NA
Egypt	4
Iran (Islamic Republic of)	1
Libya	1
Jordan	1
Morocco	4
Pakistan	34
Sudan	868
Yemen	12

WHO estimated that 3.8 million malaria cases (range 2.4–7.5 million) and 7300 malaria-related deaths (range 900–14 600) occurred in the Region in 2015. The estimated incidence of malaria cases decreased by 11% in 2015 compared with 2010. WHO estimated that with expansion of interventions between 2001 and 2013, around 27 million cases of malaria and 80 000 deaths due to malaria were averted.

Prevalence

Data from endemic countries reveal low malaria prevalence. A 2012 survey in Sudan using microscopy showed 2.3% of all ages had parasitaemia. All states had prevalence of less than 3%, except Blue Nile, Gedaref, South Darfur and West Darfur which had prevalence of 3.8%, 6.5%, 6.3% and 6.6%, respectively.

The first nationally representative malaria indicator survey in Djibouti in 2008–2009 showed that only 42 out of 6707 individuals (0.6%) examined for malaria parasite infection using rapid diagnostic tests were positive for the falciparum parasite.

A malaria indicator survey conducted in Yemen in 2013 showed prevalence of 1.5%. The Tihama area, which shoulders about 60% of the malaria burden, showed higher prevalence of 2.2%. Prevalence among individuals who reported a history of fever in the 2 weeks prior to the survey was 4% in the whole country and 6.3% in Tihama area. These figures demonstrate a marked reduction compared to data from school-based surveys conducted in Tihama in 2001 and 2008 which showed prevalence of 21.9% and 7.6%, respectively.

2.3 Coverage of key antimalarial interventions

Population coverage with antimalarial interventions has risen in the six countries of the Region with a high malaria burden (Afghanistan, Djibouti, Pakistan, Somalia, Sudan and Yemen) as a result of increased investment.

Prevention

By 2014, all malaria-endemic countries in the Region had adopted a policy of free-of-charge distribution of long-lasting insecticidal nets; seven countries distribute nets to all age groups. All countries at the control stage, except Pakistan, reported that distribution of long-lasting insecticidal nets to all age groups was through mass campaigns.

There has been a gradual increase in the number of long-lasting insecticidal nets distributed in the Region since 2004. Considering that the duration of a long-lasting insecticidal net is an average of 3 years and that one net will protect two persons, about 58 million people were protected in 2015 (Table 7).

The malaria indicator survey conducted in Sudan in 2012 showed that ownership of insecticide-treated nets (ITNs) was 62% in targeted states; however, only 22% of those with nets were using them. In Afghanistan in 2011, the percentage of households with at least one insecticide-treated net was 50% in targeted areas, and 60% of people were using them. The malaria indicator survey conducted in Yemen in 2013 showed that 40% of people in targeted areas had at least one insecticide-treated net, but only 15% of households were using them (Table 8).

Table 7. Long-lasting insecticidal nets distributed in malaria-endemic countries during 2013–2015

Country	2013	2014	2015
Afghanistan	359 622	4 325 552	58 830
Djibouti	25 700	25 000	0
Iran (Islamic Republic of)	169 084	70 360	91 845
Pakistan	2 238 300	1 519 947	1 822 015
Saudi Arabia	75 000	1 450 000	125 000
Somalia	525 000	413 000	291 085
Sudan	5 803 319	4 432 714	2 729 334
Yemen	1 405 837	3 75 899	847 946

Table 8. Household coverage and usage of insecticide-treated nets in high-burden countries

Country	Percentage of households with at least one ITN in targeted areas	Percentage of households with at least one ITN for every household member in targeted areas	Percentage sleeping under ITN in targeted areas	Percentage sleeping under ITN in targeted areas among those who have ITN	Source
Afghanistan	49.9	16.7	30.6	60.4	MIS 2011
Djibouti	18.0		13.0		MIS 2009
Pakistan	33.9		34.8		MIS 2013
Sudan	62.0	32.8	14.6	21.8	MIS 2012
Somalia	19.1	8.3	19.8		MIS 2014
Yemen	39.9	6.2	7.1	12.4	MIS 2013

ITN: insecticide-treated net

MIS: malaria indicator survey

All malaria-endemic countries are using one, or a combination of, larval source management interventions (Table 9).

Indoor residual spraying is one of the main vector control interventions used in six malaria-endemic countries in the Region. Indoor residual spraying and long-lasting insecticidal nets are used together for malaria control in at least some areas in three countries. Data reported on indoor residual spraying operations are incomplete and of poor quality in many countries. The total reported number of people protected by indoor residual spraying in malaria-endemic countries was more than 5.5 million in 2015 (Fig. 1).

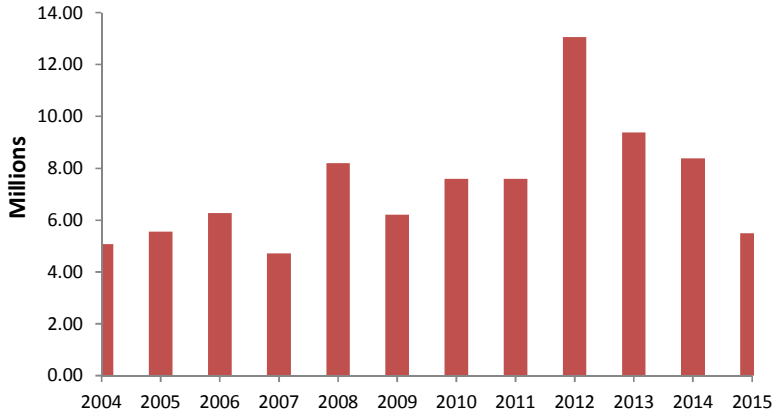

Fig. 1. Number of people protected by indoor residual spraying in malaria-endemic countries

Table 9. Type and location of larval source management in malaria-endemic countries

Country	Location	Larval source management type
Afghanistan	Imam Sahib district, Kunduz province	Larviciding using temephos as part of P. falciparum elimination.
Djibouti	Djibouti city	Environmental management i.e. covering of household water containers (jerry cans).
Iran (Islamic Republic of)	Sistan and Baluchistan, Hormozgan, Kerman and Fars provinces	From 2000 to 2011, various synthetic larvicides were used. From 2011, main product used is a formulation of Bacillus thuringiensis (Bioflash®) produced locally. Used in the following scenarios: cleared-up foci with population movement from endemic areas, new potential foci, new active foci, residual active foci.
Pakistan	Khyber-Pakhtunkhwa, Sindh and Punjab provinces	Larviciding.
Saudi Arabia	Not specified	Larviciding using insect growth regulators, temephos, Bacillus thuringiensis israelensis, pyrethroids.
Somalia	Bosaso	Larviciding in targeted breeding sites.
		Biological control using larvivorous fish in pilot berkets (20).
Sudan	Targeted states (Gezira, Gedaref)	Larviciding using temephos.
	Khartoum	Larviciding using temephos 50% EC.
		Environmental management (repair of broken water pipes, intermittent irrigation, filling and draining of rain water, etc.).
		Biological control using larvivorous fish (*Gambusia affinis*) in irrigated areas.
	6 states	Biological control using *G. affinis*.
Yemen	Socotra island, Tihama area	Larviciding using temephos selectively implemented in Socotra island. Previously (prior to 2007), breeding sites in the Tihama area, Aden city and other governorates were targeted by larviciding. Biological control using larvivorous fish (*Aphanius dispar*) implemented on small scale in Tihama and Socotra island during 2002–2003.

Diagnosis

Malaria diagnosis is free of charge in the public sector in all malaria-endemic countries. In 2015 Three endemic countries reported that rapid diagnostic tests are used at the community level. Access to diagnostic facilities for malaria is still limited. The health facility survey in Sudan in 2009 showed that only 43% of facilities had functional microscopy and 15.8% had rapid diagnostic tests. More than 6 million rapid diagnostic tests were delivered in 2015 in eight endemic countries, an increase of 45% compared with 2013. In 2015, based on surveillance reports from all countries of the Region, only 18% of cases were diagnosed by microscopy or rapid diagnostic test; the rest were treated on a clinical basis.

Treatment

Artemisinin-based combination therapies have been adopted as first-line treatment in all countries of the Region where falciparum malaria is endemic (Annex 1). In 2014, all endemic countries reported that artemisinin-based combination therapies are free of charge in the public sector for all age

groups. A 2012 survey in Sudan showed that 56.3% of fever cases among children aged under 5 years who were treated for malaria received artemisinin-based combination therapy. In some countries, however, many patients are still being treated with oral artemisinin-based monotherapies particularly in the private sector. Access to diagnostic testing is insufficient, resulting in unnecessary use of artemisinin-based combination therapy for patients without malaria. All malaria-endemic countries (except Djibouti and Saudi Arabia) are monitoring efficacy of antimalarial medicines. All endemic countries include primaquine in their national drug policy for radical treatment of vivax malaria. Primaquine is used for gametocidal treatment of *P. falciparum* cases in six countries

Guided by a pilot project in South Kordofan state, Sudan developed a national strategy for community-based management of malaria and other fevers using the services of trained volunteers. Afghanistan developed a national community-based strategy for malaria in late 2010, and began implementation in 2013. Intermittent preventive treatment of malaria during pregnancy is policy in south–central Somalia only; however, in recent years this policy has not been implemented due to the unavailability of sulfadoxine-pyrimethamine.

2.4 Available resources

Financial

The Regional Office for the Eastern Mediterranean supports countries in the preparation of submissions to donors, mainly the Global Fund, and in implementation of approved projects. During 2002–2014, the amount of resources approved by the Global Fund for malaria control and elimination in the Region was more than US$ 480 million (Table 10). For 2018–2020, the amount of grants approved for implementation of malaria interventions in Global Fund-supported countries is US$ 212 million.

In recent years, there has been a decrease in the reported share of domestic funding for malaria control and elimination. In 2015, 30% of allocated funds were from national resources in six high-burden countries. The reported annual available funds for 2011–2015 in the Region were US$ 105 million, which translates to US$ 0.40 per capita of the population at risk. The main external source is the Global Fund, providing more than 60% of funding during 2011-2015 in six high-burden countries (Fig. 2).

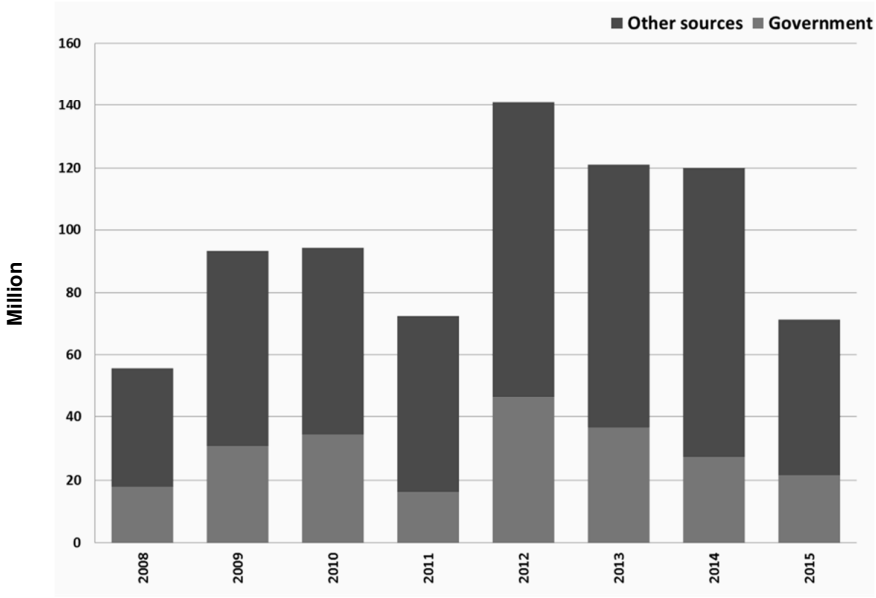

Fig. 2. Funds allocated to malaria in six high-burden endemic countries, 2008–2015

Table 10. Global Fund grant disbursements for malaria, 2002–2015

Country	Disbursements (in US$)
Afghanistan	80 816 559
Djibouti	2 645 387
Iran (Islamic Republic of)	23 439 281
Pakistan	62 205 068
Somalia	66 929 421
Sudan	216 103 822
Yemen	37 489 645
Total	489 629 183

Human and institutional networks and advisory groups

National capacities have been strengthened through regional training courses, namely: the international diploma course on malaria programme planning and management in Bandar Abbas, Islamic Republic of Iran; the international course on advanced malaria microscopy and quality assurance in Muscat, Oman; and the master's degree on medical entomology and vector control at Blue Nile National Institute for Communicable Diseases, Wad Madani, Sudan. The Regional Office has supported short training courses on case management, rapid diagnostic tests use, integrated vector management, malaria elimination and surveillance in collaboration with regional institutions including the United States Naval Medical Research Unit No. 3 (NAMRU-3) in Cairo, Egypt and Blue Nile National Institute for Communicable Diseases in Sudan. Several countries have established or

upgraded their national malaria centres (e.g. Kabul, Afghanistan; Jizan, Saudi Arabia; Sana'a and Hodeidah, Yemen; and Blue Nile and Sennar, Sudan).

Technical support and coordination

The Regional Office has developed technical and advocacy documents to support to malaria control and elimination efforts. 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 and on the prevention of re-establishment of malaria transmission. The Moroccan experience of malaria elimination has been documented and published. In addition, several malaria publications have been translated into regional languages.

Intercountry and interregional meetings – including meetings of national malaria programme managers, coordination meetings of the Horn of Africa Network for Monitoring Antimalarial Treatment (HANMAT) and Pakistan–Islamic Republic of Iran–Afghanistan Malaria Network (PIAM-Net) countries, and technical workshops – have been used as mechanisms for networking, coordination of malaria activities and provision of technical updates.

From 2009 to 2015, the Regional Office implemented a United Nations Environmental Programme-Global Environment Facility project on sustainable alternatives to DDT and strengthening of national vector control capabilities in eight countries. The project's resources have been instrumental in strengthening integrated vector management – not only in the project countries, but also in other countries of the Region.

The regional offices for Europe and the Eastern Mediterranean have supported periodic meetings between Afghanistan and Tajikistan, and Afghanistan and Turkmenistan, and the development of a memorandum of understanding for bilateral cooperation between the countries. WHO served as a member of the Gulf Cooperation Council technical committee for the Malaria-free Arabian Peninsula initiative and as the G5 coordination mechanism between Afghanistan, Islamic Republic of Iran, Iraq and Pakistan and WHO.

3. Challenges

- An increase in political commitment at higher levels and sustained financial support are required to achieve global and regional resolutions toward malaria elimination.
- For the delivery of malaria interventions, there is an urgent need to address key health system challenges, namely: weak leadership; limited programme management capacity; limited human capacity at district/lower levels, with high staff turnover and increasing health force migration; weak procurement and supply management systems; lack of, or weak, community-based programmes; and unregulated private sector.
- In countries at the control phase, malaria surveillance and monitoring and evaluation systems are weak. As malaria transmission decreases in most areas of endemic countries, timely surveillance of confirmed malaria cases becomes a major priority. In malaria-free countries, complacency and decreasing support to surveillance and vigilance may result in reintroduction of malaria as a result of importation. There is a strong need to establish comprehensive and timely surveillance systems – making use of new communication and mapping technologies – to cover public and private facilities, as well as the community.
- Capacities in entomological surveillance need to be strengthened to guide the selection and implementation of vector control interventions and assess their impact.
- There has been gradual expansion of parasitological diagnosis by microscopy or rapid diagnostic tests with quality management systems. However, limited access and poor quality of facilities for parasitological diagnosis still is a challenge in some high-burden countries (in 2014, only 29% of total reported cases were confirmed). Quality diagnostics and treatment services should be expanded into the private sector with strong supervision.
- Spread of resistance to antimalarial medicine is a major threat for countries with *P. falciparum* transmission. Oral artemisinin-based monotherapies, they are still available on the market and prescribed, especially by private providers in some countries. Weak national regulatory systems to enforce compliance with national treatment policies and prevent marketing of poor quality antimalarial medicines are a further challenge.
- There is an increase in coverage with long-lasting insecticidal nets; however, there is a gap between current coverage and the target of universal coverage. This gap can be attributed to insufficient funding from donors and inadequate financing from national budgets, as part of low

allocations for the health sector as a whole, as well as limited capacity in planning and implementation at country level. There are also disparities in the level of coverage of the intervention in different areas of some countries.

- In all countries targeted for long-lasting insecticidal nets, a significant gap exists between the level of coverage and the usage by household members.
- In many areas, the spread of insecticide resistance is coupled with weak capacities to routinely monitor its spread. Managing and mitigating the spread of insecticide resistance, where reported, requires introduction and rotational use of more expensive insecticides and thus programmes are incapacitated from making timely and effective decisions. National plans for management of insecticide resistance have not yet been developed and/or implemented in most of the high-priority countries.
- In most countries, national capacity to manage public health pesticides throughout their life-cycle is inadequate which is further compounded under decentralized health systems.
- Limited intersectoral collaboration requires establishing a functional multisectoral approach, especially with agriculture, water, education, energy, development agencies, military and tourism, supported by appropriate policies and legislation.
- In many areas, considerable and increasing population movement (legal and illegal) due to political problems, civil unrest and conflict poses an increasing risk of reintroduction of malaria to malaria-free countries. Strengthening emergency preparedness capacity is needed to prevent and control outbreaks, with appropriate contingency plans for vector control, case management and logistics.
- Lack of sustainable contingency plans to tackle climate change and natural disasters is additional challenge for malaria control.

4. Regional vision, goal and objectives for malaria control and elimination

4.1 Vision

All countries in the WHO Eastern Mediterranean Region are malaria-free.

4.2 Mission

Regional and country programmes work as a team with all partners and relevant sectors to implement sound, innovative, evidence-based and cost-effective interventions and approaches for control, elimination and prevention of reintroduction of malaria.

4.3 Goal

By 2030, to interrupt malaria transmission in areas where it is feasible and reduce the burden by more than 90% in areas where elimination is not immediately possible, so that malaria is no longer a public health problem or a barrier to social and economic development.

4.4 Objectives

1. By the end of 2020, reduce the incidence of malaria by more than 40% compared to 2015.
2. By the end of 2020, reduce malaria mortality rates by more than 75% compared to 2015.
3. By the end of 2020, prepare 50% of endemic districts for pre-elimination (incidence of less than 1 case per 1000).
4. By the end of 2020, interrupt malaria transmission in 25% of endemic districts with incidence of less than 1 case per 1000.
5. By the end of 2020, eliminate falciparum malaria from two countries (Islamic Republic of Iran and Saudi Arabia) in the Region.
6. Prevent re-establishment of malaria transmission in countries/areas that have eliminated malaria.

4.5 Regional stratification

The WHO 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 countries of the Region into three groups. Specific strategic objectives have been identified for each group.

Group 1. Countries with a high malaria burden

The countries in this group are currently Afghanistan, Djibouti, Pakistan, Somalia, Sudan and Yemen. They represent about 44% of the population of the Region. These countries have areas that are at high risk of malaria transmission or are threatened by epidemics and/or complex emergency situations. Afghanistan reported reduction in confirmed malaria cases of more than 50% between 2000 and 2010. Djibouti, Pakistan, Somalia, Sudan and Yemen have not reported consistent decreases in the number of cases. However, significant reduction of cases has been recorded in certain geographic areas such as Khartoum (Sudan) and Socotra island (Yemen), the latter being almost malaria-free with no local cases since 2006.

Inadequacy or lack of human resources and capacity at country level is a major constraint impeding development, implementation and sustainability of malaria control in this group of countries. Management of logistics systems continues to be a major issue due to high operational costs. The security situation also continues to pose a challenge in some countries. Priority is given to strengthening the capacity of malaria control programmes, especially at lower levels, for country-wide implementation of malaria control interventions. Ensuring universal access to effective diagnostic and treatment services for testing, treating and tracking of every case, and rational use of cost-effective prevention measures, should be emphasized in all areas with malaria risk.

There are 845 malaria-endemic districts in these countries. Through emphasis on strengthening malaria surveillance, parasitological confirmation of all cases, appropriate vector control interventions and enhancing programme management, this action plan aims to reduce malaria incidence to less than 1 case per 1000 by 2020 in 50% of endemic districts in preparation for moving toward elimination.

Group 2. Countries/districts with low malaria transmission targeting malaria elimination

This group currently comprises two countries, Islamic Republic of Iran and Saudi Arabia, which account for 17% of the population of the Region. These countries have achieved a steady decline in malaria incidence over the past decade. The malaria control programmes in these countries are self-reliant, have strong political and financial support from national authorities, and are well-supported by developed health systems at central and peripheral levels. Certain epidemiological and socioeconomic factors (such as education, equity in resource allocation for marginalized populations, and well-developed social and economic infrastructures) also contribute favourably towards the objective of malaria elimination.

The Islamic Republic of Iran reported a low of 187 local cases in 2015, with significant reduction of *P. falciparum* and mixed cases (only 10 cases). With planned intensification of elimination efforts it is expected that falciparum malaria will be eliminated in the country in the very near future.

Saudi Arabia reported only 83 local cases in 2015, compared to 4736 in the year 2000. Saudi Arabia is very close to elimination, but faces several challenges in the last mile. Addressing these challenges will require a very strong disease and entomological surveillance system to implement focal vector control interventions, and effective border coordination with Yemen.

Based on available data in 2015, there were 252 districts in six high-burden countries with incidence of less than 1 confirmed malaria case per 1000 population. The malaria programmes will be reoriented toward pre-elimination in the first 2 years of this action plan through greater emphasis on strengthening disease surveillance and confirmation of all malaria cases, with the aim of interruption of local malaria transmission in 25% of these districts by the end of 2020.

The major challenges to achieving the objectives and sustaining achievements include: competing priorities from other communicable and noncommunicable diseases; huge population movement from malaria-endemic countries; and the need for coordination of malaria activities between neighbouring countries, especially across border areas. Sustaining political and financial commitment at national and subnational levels, and from donors, will be a challenge to initiating a district approach to elimination in six high-burden countries.

Group 3. Countries/areas that have eliminated malaria

This group comprises countries in which malaria was eliminated a long time ago (Bahrain, Jordan, Kuwait, Lebanon, Libya, Palestine, Qatar and Tunisia), and those which achieved certification of elimination in the past decade (Morocco in 2010 and United Arab Emirates in 2007). It also includes countries that have interrupted local transmission for more than 3 years within the past decade, but where elimination is not yet certified (Egypt, Iraq, Oman and Syrian Arab Republic) (Table 11). In all these countries, a few local cases may occur as a result of importation; however, the malaria programmes are capable of proper response to prevent re-establishment of local transmission.

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

Table 11. Interruption of local malaria transmission in malaria-free countries, by year

Country	Year of interruption of local malaria transmission	Remarks
Bahrain	1979	
Egypt	1998	2014, 22 local cases reported from Aswan region
Iraq	2009	
Jordan	1970	2 introduced cases reported in 2010
Kuwait	1979	
Lebanon	1963	
Libya	1973	Local cases reported in 1999, 2000 and 2003
Morocco	2005	Certified as malaria-free in 2010
Oman	2004	Local cases reported in 2007, 2008 and 2010–2015 (introduced cases)
Palestine	~1965	
Qatar	1970	
Syrian Arab Republic	2005	Programme review in 2010
Tunisia	1979	
United Arab Emirates	1998	Certified as malaria-free in 2007

5. Strategic approaches

The regional action plan is built on three pillars with two supporting elements, as highlighted in the Global Technical Strategy 2016–2020.

Pillar 1. Ensure universal access to malaria prevention, diagnosis and treatment

a) Promote and facilitate application of effective preventive measures against malaria for populations at risk

Malaria prevention through reducing population exposure to infective mosquito bites will be achieved by the use of vector control measures. The basis for selection of the most appropriate and cost-effective vector control measures is 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 establishment of date(s) for operations as well as frequency of application of a particular intervention.

Quality application of insecticides or tools and their supervision need to be strengthened, together with entomological surveillance for insecticide resistance and vector species composition, biting and resting behaviour in sentinel sites.

Indoor residual spraying

Indoor residual spraying is indicated as a means of rapidly reducing malaria transmission in all phases, from malaria control to elimination, to respond to outbreaks/resurgences. As long as there are structures with sprayable surfaces, communities cooperate, and vectors are susceptible to the intended chemical, indoor residual spraying may be useful in the following settings: to control malaria during humanitarian emergencies (displaced populations, refugee settings, etc.); to prevent transmission in epidemic-prone areas; to interrupt transmission in residual foci; and to manage and mitigate resistance in areas where coverage with long-lasting insecticidal nets is high and vectors are resistant to pyrethroids. The effectiveness of indoor residual spraying is highly dependent on the quality of the spraying operation: at least 80% of premises in target communities must be properly sprayed. Indoor residual spraying is usually effective for 3–6 months, and occasionally up to 9 months, depending on the insecticide used, the type of surface sprayed and the

seasonality of transmission. Implementation of indoor residual spraying relies on the availability of operational national vector control services with adequate human, financial and logistical resources including skilled spray teams, storage and transport facilities, and spraying equipment.

Indoor residual spraying must be based on accurate entomological and epidemiological information (with special reference to the feeding and resting behaviour of vectors, biting rhythm and intensity of transmission, and incidence and prevalence of malaria). The number, nature and location of premises to be sprayed, as well as access, must be determined through geographical reconnaissance. The procurement decision must take into account all relevant data on insecticide resistance, within and near to the target area, and be consistent with national insecticide resistance management policies.

Long-lasting insecticidal nets

Long-lasting insecticidal nets are indicated in a wide range of transmission conditions where long-term protection is needed, including: areas with a relatively long season of malaria transmission or perennial transmission, such that more than one indoor residual spraying cycle would be required; areas where indoor residual spraying cannot be used and only personal protection can be achieved (e.g. among nomadic populations); and areas where indoor residual spraying may face problems of acceptability, feasibility and accessibility.

The current recommended approach targets one net per two persons or one net per sleeping place, free of charge in all targeted areas, with the aim of reaching universal coverage. Where resources are limited, it is recommended to prioritize high-risk areas or populations and then expand coverage as resources become available. Normally, a combination of campaigns and continuous distribution channels to sustain coverage should be adopted. Attempts should also be made to link distribution of long-lasting insecticidal nets with other public health programmes, in particular antenatal care and immunization programmes. Implementation of long-lasting insecticidal nets strategy relies on availability of effective procurement and distribution systems through the public and/or private sectors and presence of an effective awareness/communication strategy.

WHO-approved long-lasting insecticidal nets should be used. The insecticide on nets should last for 3 years, however recent data show that the physical lifespan of a net is extremely variable; therefore, there is a need for continuous monitoring of durability and distribution of nets to cover the gaps. Due attention should be given to the time required for procurement, storage and transport of nets.

Larviciding and source reduction

Implementation of chemical larviciding (e.g. temephos), biological control methods (e.g. *Bacillus thuringiensis israelensis*) and/or source reduction by environmental management methods depends on the specificity and accessibility of mosquito breeding sites. The contribution of such interventions to malaria control is limited and can only be considered complimentary, yet they are important maintenance measures during post-elimination for reducing receptivity in selected areas. In general, anti-larval measures are likely to be cost-effective for malaria control only in settings where vector breeding sites are few, fixed and easy to find such as urban areas, and in breeding sites that are man-made and homogenous. Selection of areas for larval control should be guided by evidence; targeted breeding sites/areas should then be mapped using a geographic information system (GIS) and divided into operational units.

Entomological surveillance, monitoring and evaluation

Specialized teams are required for entomological monitoring and evaluation in all phases of malaria control and elimination. The entomological skills needed for such work must be maintained, and be built or rebuilt where skills are lacking. Entomological laboratories and rearing facilities need to be established and equipped at different levels of administration. Periodic entomological monitoring for key indicators is needed i.e. updates on vector species, distribution, age, resting and feeding behaviours, vector abundance and sporozoite prevalence. Monitoring must also include insecticide resistance testing in multiple sentinel sites, as well as data on the residual efficacy of interventions (such as indoor residual spraying and long-lasting insecticidal nets) using known susceptible strains of mosquitoes. Reliable information on other factors (e.g. altitude, climate) also needs to be collected. Such information should be synthesized at national level and utilized to update vector distribution maps and vector susceptibility, and inform local and national decision-makers.

Insecticide resistance monitoring and management

All malaria vector control programmes must have an insecticide resistance management plan, as part of national strategic plans for malaria and in line with the Global plan for insecticide resistance management in malaria vectors. Insecticide resistance management activities must be implemented pre-emptively and cannot be delayed until resistance has appeared.

For indoor residual spraying, the minimum resistance management policy is to alternate between insecticide classes with different modes of action in rotation. Where coverage with long-lasting insecticidal nets is high, indoor residual

spraying using non-pyrethroid insecticides is the recommended resistance management strategy. Resistance monitoring must be conducted at least once a year in several locations that are targeted by vector control activities. Wherever possible, insecticide resistance should be tracked not only with conventional bioassays, but also by molecular genotyping methods and biochemical assays.

Pesticide management

In line with the Sixty-third World Health Assembly resolution WHA63.26 on Improvement of health through sound management of obsolete pesticides and other obsolete chemicals in May 2010 and Regional Committee resolution EM/RC58/R.10 on managing the use of public health pesticides, the Regional Office will support countries to establish/strengthen capacity to regulate pesticides throughout their life-cycle and work closely with all stakeholders in line with the regional framework for action on the sound management of public health pesticides.

Quality of vector control products and uptake of new vector control tools

Numerous potential tools and approaches are under development for overcoming the specific challenges of vector resistance and residual transmission. Countries should therefore ensure that registration of new and existing control tools is harmonized. In addition, countries should continue to implement operational research to improve access, ownership and usage of long-lasting insecticidal nets and quality and uptake of indoor residual spraying, including components of behavioural change communication. Quality assurance of existing and new vector control products and equipment is crucial for sustained efficacy and safety. As regional and national capacities to conduct quality control assessments are currently limited, countries must invest in building sufficient expertise and the necessary facilities.

Implement malaria vector control in the context of integrated vector management

Recognizing the weak capacity of health systems to deliver vector control interventions, a regional strategic framework on integrated vector management has been developed, updated and adopted by Member States. The integrated vector management strategy is based on principles of strengthening intersectoral and intrasectoral coordination, partnership at all levels, decision-making criteria at the lowest level, and synergy of sustainable and evidence-based interventions, to address a number of vector-borne diseases as appropriate (malaria, Rift Valley fever, dengue, leishmaniasis, etc.). Using the strategic framework, each country should prepare, adopt and implement a national plan of action for integrated vector management based on a comprehensive vector control needs assessment.

Targets

- By the end of 2020, all malaria-endemic countries will have a functional vector control unit to plan, implement, evaluate and monitor vector control interventions, and have established entomological surveillance systems and updated mapping of vector distribution with susceptibility profile.
- By the end of 2020, all countries will have harmonized their pesticide registration for the rapid uptake of new and existing vector control tools for malaria control and elimination.
- By the end of 2020, at least 80% of household members in targeted areas will be using insecticide-treated nets.
- By the end of 2020, all areas targeted for (in need of) indoor residual spraying will have implemented quality indoor residual spraying in at least 80% of targeted structures
- By the end of 2020, all areas targeted for (in need of) larval source management will have implemented quality larval source management in at least 80% of breading places.
- By the end of 2020, relevant non-health sectors in all malaria-endemic countries will have implemented identified environmental management interventions in targeted areas.

b) Promote and facilitate universal access of populations at risk to quality-assured diagnosis and effective treatment of malaria

Prompt parasitological confirmation is recommended in all patients suspected of malaria before treatment, regardless of malaria transmission intensity. This requires universal access to quality microscopy or rapid diagnostic tests for parasitological confirmation in public and private health facilities and at community level.

In malaria-endemic countries, existing laboratory services providing malaria microscopy should be strengthened. Where microscopy is not possible, rapid diagnostic tests should be used by trained health workers including community health workers.

At present, WHO considers quality-assured microscopy the gold standard for patient management. Microscopy 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 in falciparum malaria should be recorded. This will help to determine the timeliness and accuracy of diagnosis.

Rapid diagnostic tests can be used effectively by trained health workers, including community health workers. They can be deployed wherever diagnosis by reliable microscopy is not possible for outbreak investigation, surveys of parasite prevalence, and self-diagnosis by travellers to endemic areas. In areas where transmission of *P. falciparum*, *P. vivax* or other species occur, the use of rapid diagnostic tests containing *P. falciparum*/*P. vivax* or pan-malarial antigens is recommended. Countries should procure malaria rapid diagnostic tests that have been assessed by WHO's product testing programme, and all procured lots should be tested according to WHO-recommended procurement criteria.

Appropriate trainings for different levels of health workers and physicians, as well as legislation, should be in place to enforce compliance with the results of rapid diagnostic tests for treatment decisions. This will prevent unnecessary treatment of non-malarial fever cases with antimalarial medicine.

In countries/areas in the final stage of malaria elimination, if rapid diagnostic tests are used for diagnosis and prompt treatment then microscopy slides should also be taken for parasitological confirmation in a quality-assured laboratory. In very low transmission and elimination settings, polymerase chain reaction (PCR) or other nucleic acid amplification techniques that are more sensitive can play a role in screening of asymptomatic persons and surveys for identification of low-density infections. In areas in an advanced phase of elimination, such techniques can also be used for further confirmation of diagnosis as well as genotyping. Serological methods may be used for assessing interruption of local malaria transmission in some areas.

Quality assurance of microscopy should be promoted at all levels of the health sector. Countries should ensure good quality management systems for malaria diagnosis in the public sector, and also with private sector involvement. The fundamental components of a quality assurance system are: standard operating procedures and job aids; supervision visits; slide proficiency testing; validation of routine blood slide results (cross-checking); accreditation of microscopists; certification of reference laboratories; and monitoring of the quality management system.

Integration is crucial; national malaria control programmes should promote access to diagnostic testing, as far as possible, as part of the integrated management of febrile illnesses, with integrated supervision activities and strong collaboration with the general laboratory services and national reference laboratory.

Prompt and effective treatment of malaria remains a key intervention in reducing malaria morbidity and mortality. The challenges to providing adequate treatment include: treatment of fever cases as malaria without

parasitological confirmation; increasing resistance to antimalarial medicines, including emerging resistance to artemisinin-based combination therapies; availability of substandard and counterfeit antimalarial medicines; poor compliance with national treatment policies; strong and unregulated private sector; and weak health systems unable to provide reliable surveillance information and deliver timely diagnosis/treatment, especially to remote and underserved populations.

Some countries in the Region have reinforced their 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. In countries that are still facing challenges, all malaria control programme partners and relevant sectors should promote such regulations and implement measures to enforce compliance with national treatment policies.

Counterfeit antimalarial medicines are available in some malaria-endemic areas. It is the responsibility of ministries of health and national regulatory authorities to ensure the quality of antimalarial medicines provided through both the public and private sectors, through regulation, inspection and law enforcement. National drug regulatory authorities should withdraw marketing authorization of oral artemisinin-based monotherapies, and detect and remove substandard artemisinin-based combination therapies from 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 on the market (especially in the informal private sector). Countries should share information with neighbouring countries and with the Regional Office when detecting counterfeit or antimalarial drugs of poor quality.

In rural communities and remote areas, mainly in countries with a higher malaria burden, lack of access to effective treatment remains a challenge due to inadequacies in the health care system. In such settings, early and appropriate treatment is possible through the introduction and improvement of integrated community case management of malaria. This strategy aims to improve the practice of case management at the community level by training and providing rapid diagnostics and medicines to trained community health workers. The efficacy of this strategy can be further enhanced through the use of pre-packaged medicines, treatment courses and appropriate rapid diagnostic tests.

The recommended pre-referral treatment options for children under 6 years of age, in descending order of preference, are: intramuscular artesunate; rectal artesunate; intramuscular artemether; and intramuscular quinine. The recommended pre-referral treatment options for older children and adults, in

descending order of preference, are: intramuscular injections of artesunate; artemether; and quinine.

All positive falciparum cases should be treated with highly effective medicines, currently artemisinin-based combination therapies. In areas with local transmission, a single dose of 0.25 mg/kg of primaquine base should be given on the first day of treatment, in addition to an artemisinin-based combination therapy, to all patients with parasitologically confirmed *P. falciparum* malaria except pregnant women, infants aged under 6 months, and women breastfeeding infants aged under 6 months. Uncomplicated malaria cases usually do not need to be hospitalized; however, treatment should be supervised by a health worker.

To prevent relapse, malaria cases due to *P. vivax* or *P. ovale* in children and adults (except pregnant women, infants aged under 6 months, women breastfeeding infants aged under 6 months, women breastfeeding older infants unless they are known not to be G6PD deficient, and people with G6PD deficiency) should be treated with a 14-day course of primaquine in all transmission settings. To prevent relapse in people with G6PD deficiency, it is recommended to give primaquine base at 0.75 mg/kg body weight once a week for 8 weeks, with close medical supervision for potential primaquine-induced haemolysis. When G6PD status is unknown and G6PD testing is not available, a decision to prescribe primaquine must be based on an assessment of the risks and benefits of adding primaquine.

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; and intermittent preventive treatment of malaria during pregnancy with sulfadoxine–pyrimethamine in areas where sulfadoxine–pyrimethamine is efficacious. In the Region, intermittent preventive treatment during pregnancy is currently adopted only in the south–central Somalia. Use of mass drug administration and seasonal malaria chemoprevention should be studied and piloted wherever epidemiologically suitable. All countries should have appropriate medicines for chemoprophylaxis, health information and prevention tools for travellers to malaria-endemic areas.

Extensive measures are required to prevent and contain parasite resistance to antimalarial medicines. There is a need to monitor parasite resistance and to evaluate utilization of antimalarial drugs in public and private health systems. To assist countries to meet the challenge of drug resistance, the Regional Office will continue to support countries with local malaria transmission, both technically and financially, through the establishment of sentinel sites as part of a surveillance system for continuous monitoring of first-line and second-line drugs, as well as testing potential new malaria treatments.

The Regional Office will continue to support and coordinate with HANMAT, which comprises eight countries (Djibouti, Ethiopia, Eritrea, Saudi Arabia, Somalia, Sudan, South Sudan and Yemen) and PIAM-Net, which includes three countries (Afghanistan, Islamic Republic of Iran and Pakistan), as well as with operational and research experts from several agencies. The purpose of these networks is to provide a basis for rational and effective treatment policies in member countries.

All malaria-endemic countries should have policy, legislation and enforcement strategies to prevent marketing and use of counterfeit antimalarial medicines. Regional networks will be a suitable forum for information sharing and coordination among countries.

Malaria-free countries should ensure enough stock of antimalarial medicines to be provided free of charge to all imported cases, irrespective of nationality.

Targets

- By the end of 2020, all malaria-endemic countries will have established quality management systems for parasitological diagnosis of malaria in coordination with national public health laboratory.
- By the end of 2020, at least 90% of reported suspected malaria cases will be confirmed by parasitological diagnosis.
- By the end of 2020, at least 90% of cases will receive first-line antimalarial treatment according to national treatment policies.

Pillar 2. Accelerate efforts towards elimination and attainment of malaria-free status

A malaria-free area is defined as an area where there is no ongoing local transmission by mosquitoes and thus no indigenous malaria infection occurs. Imported cases will continue to occur.

In the Eastern Mediterranean Region, as of the end 2015, 14 countries are free from malaria. In the remaining eight 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. Currently, two countries are targeting nationwide elimination: Saudi Arabia, which has been implementing malaria elimination following in-depth assessment in 2003 and strategy development in 2004; and the Islamic Republic of Iran, which developed a pre-elimination strategy following assessment in 2004, then developed a national malaria elimination strategy in 2010, and updated the strategy in 2015.

During the WHO Global Malaria Eradication Campaign, a malaria focus was considered to be "a defined and circumscribed locality situated in a currently or formerly malarious area and containing the continuous or intermittent epidemiological factors necessary for malaria transmission" (WHO, 1963). Interruption of local malaria transmission and elimination of active foci should be implemented using a comprehensive multisectoral approach. Elimination of malaria transmission requires inputs and cooperation from all health sectors, as well as other sectors such as meteorology, agriculture, education, development 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 antimalaria 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 malaria cases on clinical grounds and where to refer cases for diagnosis and treatment. Control of malaria vectors should be part of a specialized integrated vector management component of public health services.

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

- achieve sustainable interruption of malaria transmission;
- deplete the reservoir of infection;
- prevent re-establishment of malaria from the same area, from the same country or from abroad.

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

The principle of total coverage should be applied to case detection. All inhabited houses need to be visited, even if their population is covered by autonomous health services such as railways, large industry, etc. Special emphasis should be placed on the smallest and most remote villages, nomadic groups and migrant populations. 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 sent to a laboratory for rapid examination. In areas or conditions where microscopy is not available, rapid diagnostic tests should be used for diagnosis of suspected cases to avoid treatment delay. Blood donors should be screened for malaria parasites.

Malaria surveillance, monitoring and evaluation will be carried out by both 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 the case of breakdown of preventive systems; and c) assessment of coverage and quality of malaria preventive measures through a monitoring process.

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

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. 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 active foci and locally transmitted malaria cases linked in space and time, should be monitored carefully to evaluate the impact of malaria elimination interventions.

To embark on a strategy of elimination of malaria foci, it is 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.

In malaria-free countries of the Region as well as in countries aiming at elimination, the prevention of re-establishment of malaria transmission through importation of cases is of paramount importance. Therefore,

preventative measures (including chemoprophylaxis) are recommended for travellers going to malaria-endemic countries or endemic areas within a country. 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 in line with updated WHO recommendations for international travel and health.

WHO and partners should continue their collaboration to support malaria-endemic countries at national or subnational level for embarking on pre-elimination and elimination through a district approach, where feasible, with more attention on the local epidemiological situation at district level. Countries will be supported in their efforts to verify interruption of transmission and preparation for certification, as needed. Support of cross-border coordination is crucial for malaria elimination and will be continued.

Targets

- By the end of 2017, strategy for malaria elimination through a district approach developed for all malaria-endemic countries.
- By the end of 2017, updated strategy for prevention of reintroduction of malaria developed for all malaria-free countries.

Pillar 3. Transform malaria surveillance into a core intervention

Malaria surveillance is the backbone of the regional action plan, for all malaria settings from the control phase to prevention of reintroduction. Surveillance is needed for priority-setting, policy- and decision-making, planning, implementation, and monitoring and evaluation purposes. It is crucial for the early detection and control of malaria epidemics.

Monitoring and evaluation are essential activities at all levels of the malaria control programme, both to identify the appropriate mix of 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 long-lasting insecticidal nets, coverage of key interventions for malaria prevention and management, and trends in malaria morbidity and mortality.

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 diseases and programmes.

Ensuring the completeness and reliability of data collected by the health information system is the main challenge for monitoring and evaluation in all countries, especially endemic countries. The Regional Office will support priority countries to establish a comprehensive malaria data management system at national and subnational level. The Regional Office will provide technical support to well-designed and appropriate prevalence and coverage surveys for measuring outcome indicators and estimating impact, and health facility surveys for measuring output and process indicators.

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

Development and implementation of applications and methodologies using new technologies, such as District Health Information System 2 (DHIS 2) and mobile telephones, will be supported through coordination with partners and other WHO departments.

a) Support prediction, prevention and control of malaria in epidemic and humanitarian emergency situations

The risk of a malaria epidemic is increasing as a result of ongoing socioeconomic, demographic, political and climate changes. The regional action plan aims at prevention, or reduction of impact, of malaria in epidemic and humanitarian emergency situations through prediction, prevention, early detection and timely response by effective control measures in collaboration and coordination with relevant national authorities, other UN agencies (e.g. UNHCR, IOM), nongovernmental organizations, other WHO departments and WHO collaborating centres (e.g. International Research Institute for Climate and Society).

Maximum benefit is achieved when malaria control measures are implemented at the very early stages of an epidemic situation. This requires the development of an effective surveillance system that includes forecasting, early warning and detection for either very early recognition of epidemics and immediate implementation of control measures or implementation of preventive control measures before an epidemic starts. National authorities in epidemic-prone countries should develop a national contingency plan for malaria epidemic preparedness and response. This plan should incorporate the following objectives:

- identifying epidemic-prone areas and populations at risk to allow prediction and detection of epidemics, and developing emergency preparedness and response plans;

- wherever feasible, forecasting malaria epidemics and preventing them through vector control measures;
- establishing a surveillance system to detect the early appearance of an epidemic and control it by effective rapid case management and, where possible, vector control.

While the main priority in malaria epidemics is prompt and effective diagnosis and treatment of malaria, the role of vector control is also very important. 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 6 weeks before the incidence of clinical malaria cases increases above the local epidemic threshold, and appropriate interventions can be initiated.

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

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

Choice of intervention (indoor residual spraying and/or long-lasting insecticidal nets) depends on the availability of needed logistics, capacity and epidemiological situation. The deployment of nets will only be implemented in the following situations: a) in places where insecticide-treated nets/long-lasting insecticidal nets are readily available and experienced staff are in place to deploy them to quickly reach high coverage levels; b) in refugee camps and industrial projects housing temporary workers, together with other personal protection measures; c) in emergency situations with scattered displaced populations, where indoor residual spraying cannot not be implemented.

Targets

- By the end of 2017, all endemic and malaria-free countries will have updated malaria monitoring and evaluation plan according to their updated strategy.
- By the end of 2017, all endemic countries will have implemented weekly malaria surveillance with appropriate epidemic thresholds in at least 80% of epidemic-prone areas/districts.

- By the end of 2017, all epidemic-prone countries will have implemented a national contingency plan for malaria epidemic preparedness and response.
- By the end of 2017, all malaria cases and foci in countries at elimination stage are investigated, classified and registered in the national database.
- By the end of 2020, all malaria cases and foci in districts at elimination stage are investigated, classified and registered in the national database.
- By the end of 2020, malaria will be a compulsory notifiable disease in all countries of the Region.

Supporting element 1. Harnessing innovation and expanding research

The Regional Office will use the available networking mechanisms, namely HANMAT and PIAM-Net, to facilitate the uptake of new tools as per WHO recommendations.

Noting the importance of operational research to enable countries to accelerate progress toward elimination, the Regional Office will develop a mechanism to support countries to identify malaria research priorities, develop proposals and undertake the needed research. National malaria programmes should collaborate with local and international partners and institutions to identify priorities, develop proposals, raise resources from national and/or external sources, and implement research priorities. Multicounty studies will be supported and implemented to address common problems and for assessment of new technologies such as quality diagnostic techniques, genetics, medical geography, mapping, molecular techniques for species identification and insecticide resistance mechanisms, in collaboration with relevant international agencies (e.g. the United States Centers for Disease Control and Prevention, NAMRU-3, Kenya Medical Research Institute (KEMRI), London School of Hygiene & Tropical Medicine, and Liverpool School of Tropical Medicine).

The Regional Office will explore and use all possible means to ensure a peer review mechanism by an independent body. A functional mechanism to disseminate, share and use the results of research is crucial. National malaria control/elimination programmes will be supported to establish a mechanism for priority-setting and training staff on research methodology, in collaboration with relevant partners.

Targets

- By the end of 2020, all malaria-endemic countries will have defined priorities for operational research projects; each year, at least one research project for each main area of intervention will be supported (financially or technically).

Supporting element 2. Strengthening the enabling environment

a) Support countries to strengthen the capacity of malaria control programmes at national and district level as part of health system strengthening approach

Improvement of national capacities for planning and management of malaria control, as part of health systems strengthening, is a crucial approach. Countries will be supported, in coordination with partners, to make sure that resources available for malaria control and elimination are invested to strengthen the health system to ensure sustainable acceleration toward malaria elimination. To address this vital strategy, countries will be supported to develop their malaria control programme, as an integral part of the health care delivery system, in three interrelated domains: infrastructure and facilities; human resources; and information.

The regional malaria programme will increasingly emphasize developing human resources and seeking cooperation with other WHO health programmes and strategies such as pandemic and epidemic diseases, International Health Regulations (2005), Expanded Programme on Immunization, maternal and child health, integrated community case management, laboratory services, and health management information systems. The regional malaria programme will also strengthen its cooperation with other UN agencies, nongovernmental organizations and technical and implementing partners.

The Regional Office, in coordination with other stakeholders, will support the establishment of efficient mechanisms for procurement, distribution and quality control of medicines, reagents, insecticides and other essential commodities.

The Regional Office will collaborate with countries to identify, and if necessary upgrade, national centres for malaria training including: the Regional Malaria Training Centre, Bandar Abbas, Islamic Republic of Iran; the Blue Nile National Institute for Communicable Diseases, Wad Medani, Sudan; the malaria microscopy training centre, Muscat, Oman; the malaria training centre in Jizan, Saudi Arabia; and the Health Services Academy, Islamabad, Pakistan. The Regional Office will identify new centres for cooperation in different fields of malaria control and elimination, and will support networking of regional centres with other centres outside the Region.

Targets

- By the end of 2020, all endemic countries will have trained and adequate human capacity for planning, implementation, monitoring and evaluation of malaria control/elimination at national level and 80% of subnational level (districts).

b) Strengthening partnership and intersectoral coordination

Partnership is a key factor for the success of malaria control/elimination strategy. Partnerships have been increasing in all countries of the Region with a high malaria burden. Partners include government sectors (other than ministries of health), national and international nongovernmental organizations, the private sector, mass media, bilateral and multilateral agencies, and funding institutions including the Global Fund. Efforts will be made to promote further partnerships, especially with the development sector and industry, in all countries with a malaria problem particularly those with a high burden of disease.

The Regional Office will explore and implement mechanisms for developing high-level political commitment to support the regional vision for malaria elimination. Countries will be supported in their efforts to ensure sustained political commitment and to strengthen capacity for resource mobilization by development of an evidence-based malaria elimination investment plan, including innovative financing mechanisms, as part of their advocacy strategy for acceleration toward malaria elimination.

Promotion of health awareness and increased community participation in all stages of planning, implementation of interventions (such as integrated community case management), vector control measures, and monitoring and evaluation are crucial to reach the goal of malaria elimination in the Region.

Countries will be supported to strengthen collaboration between the malaria programme and the private sector by development and implementation of the public–private partnerships strategy.

The Regional Office will use all available mechanisms and subregional initiatives (such as HANMAT, PIAM-Net, and other subregional networks) for more effective border coordination for information sharing, joint implementation and evaluation. The Regional Office will continue to collaborate and coordinate with other WHO regional offices, mainly the Africa and Europe offices, in all aspects of malaria control and elimination with special focus on certain countries that border Eastern Mediterranean countries (Tajikistan, Turkmenistan, Turkey, Algeria, Ethiopia, Eritrea and South Sudan).

Targets

- By the end of 2017, endemic countries will have developed a national advocacy strategy for malaria elimination and prevention of reintroduction according to local sociocultural environment.

- By the end of 2017, all endemic countries will have a malaria elimination investment plan with approved allocation of at least 60% of needs from national resources.
- By the end of 2017, all endemic countries will have developed a public–private partnership strategy.

Annex 1. Estimated cost for implementation of the regional work plan 2016–2020

	Countries (US$)	Regional Office (US$)	Total 2016–2017 (US$)	Total 2018–2020 (US$)	Total 2016–2020 (US$)
Pillar 1. Ensure universal access to malaria prevention, diagnosis and treatment	1 910 000	955 000	2 865 000	3 681 750	6 546 750
Pillar 2. Accelerate efforts towards elimination and attainment of malaria-free status	1 140 000	390 000	1 470 000	1 727 500	3 197 500
Pillar 3. Transform malaria surveillance into a core intervention	480 000	610 000	1 090 000	1 257 000	2 347 000
Supporting element 1. Harnessing innovation and expanding research	380 000	370 000	750 000	1 022 500	1 772 500
Supporting element 2. Strengthening the enabling environment	2 830 000	2 997 000	5 827 000	9 122 550	14 949 550
Total	6 740 000	5 322 000	12 002 000	16 811 300	28 813 300

In May 2015 the Sixty-eighth World Health Assembly adopted the WHO Global technical strategy for malaria 2016–2030. The Regional malaria action plan 2016–2020 was developed by the WHO Regional Office for the Eastern Mediterranean in consultation with Member States and partners to guide the implementation of the global strategy in countries of the Region up to 2020. It is aimed at ministries of health, national malaria programme managers and other stakeholders in malaria control and elimination.

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