SCALING UP THE RESPONSE TO MALARIA IN THE WHO EUROPEAN REGION

WORLD HEALTH ORGANIZATION
EUROPE

PROGRESS TOWARDS CURBING AN EPIDEMIC 2000–2004

SCALING UP THE RESPONSE TO MALARIA IN THE WHO EUROPEAN REGION

Progress towards curbing an epidemic 2000–2004

By Dr Mikhail Ejov

WORLD HEALTH ORGANIZATION
REGIONAL OFFICE FOR EUROPE

Copenhagen
2005

Keywords

MALARIA – prevention and control
NATIONAL HEALTH PROGRAMS
STRATEGIC PLANNING
PROGRAM DEVELOPMENT
EUROPE

Address requests about publications of the WHO Regional Office to:

- *by e-mail* publicationrequests@euro.who.int (for copies of publications)
  permissions@euro.who.int (for permission to reproduce them)
  pubrights@euro.who.int (for permission to translate them)
- *by post* Publications
  WHO Regional Office for Europe
  Scherfigsvej 8
  DK-2100 Copenhagen Ø, Denmark

CONTENT

ACKNOWLEDGEMENTS

The work carried out under the regional project, Roll Back Malaria, in the WHO European Region would not have been possible without the support of the national health authorities. Since it is impossible to mention them all individually, we would like to thank in this way all those who have been committed to and involved in malaria control and prevention in malaria-affected countries of the Region over the past five years.

We are indebted to all the national WHO staff and international experts recruited by the Roll Back Malaria programme of the WHO European Region who has contributed their time and expertise to make the project successful.

We would equally like to extend our special thanks to RBM/WHO headquarters for their technical and financial assistance as well as back up in the planning and implementation of RBM interventions in the European Region.

We wish to thank the RBM partners (USAID, CDC, ECHO, UNICEF, WFP, Eni, GAP, IFRC, MERLIN, ACTED, the World Bank, the Governments of Norway and Italy and others) for funding without which this project would not have been possible.

The continuous help provided by Karen Taksoe-Vester, Programme Assistant, Pernille Jorgensen, Technical Officer, and Karen Bradbury, Secretary, from RBM/WHO Regional Office for Europe is acknowledged with gratitude.

PREFACE

Malaria, together with HIV/AIDS and tuberculosis, is one of the major public health challenges undermining development in the poorest countries of the world. Approximately 40% of the world's population, in over 100 endemic countries, are at risk of malaria. The Roll Back Malaria partnership was launched in November 1998 to catalyse vigorous collaboration and to coordinate all efforts to halve the global burden of malaria by the year 2010. The RBM partnership, which was founded by four international agencies (WHO, UNICEF, UNDP and the World Bank), has grown rapidly in recent years.

In the 1990s the residual reservoir of malaria infection, aggravated by political and socio-economic situations, mass population migration, extensive development projects, and almost discontinued activities on malaria prevention and control constituted conditions favourable for malaria transmission in some countries of the WHO European Region. As a result, large-scale epidemics broke out in Central Asia, Turkey and the Trans-Caucasian countries.

The WHO Regional Office for Europe has committed itself to an intensive response to the burden of malaria and had by 1999 developed a regional strategy to Roll Back Malaria in affected countries of the European Region. The ultimate goal is to prevent mortality, reduce morbidity and minimize socio-economic losses provoked by the disease, through the progressive strengthening of capacities and capabilities of national health services and mobilizing community actions. As a result, all possible measures aimed at containing malaria epidemics and reducing the malaria burden are presently being taken by the countries confronting the resurgence of malaria, WHO and RBM partners.

The main purpose of this publication is to provide an update on progress made towards the achievement of the goal and objectives of the regional RBM programme and to serve as evidence for decision-making.

Dr F. Nafo-Traoré
Director
Roll Back Malaria
World Health Organization
Headquarters
Geneva

ABBREVIATIONS

ACTED	Agency for Technical Cooperation and Development
CAR	Central Asian Republics
CARE	The Cooperative for American Remittances to Europe (original name)
CDC	Centres for Disease Control
CISID	Computerized information system for infectious diseases
CQ	Chloroquine
DDT	Dichlorodiphenyltrichloroethane
DNA	Deoxyribonucleic acid
ECHO	The European Commission's Humanitarian Aid Office
Eni	Italian oil and natural gas company
G.B.A.O.	Gorno-Badakhshan autonomous region
G6PD	Glucose-6-phosphate dehydrogenase
GAP	The South-eastern Anatolia Project, Turkey
GFATM	Global Fund to Fight AIDS, TB and Malaria
GIS	Geographical Information System
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
IEC	Information, education, communication
IFRC	International Federation of Red Cross and Red Crescent Societies
ISNAR	The International Service for National Agricultural Research
JICA	Japan International Cooperation Agency
KAP	Knowledge, Attitude, Practice
NIS	Newly Independent States
MDA	Mass drug administration
MERLIN	Medical Emergency Relief International
PCR	Polymerase chain reaction
PQ	Primaquine
PYR	Pyrimethamine
RAPD	Random Amplification of Polymorphic DNA
RBM	Roll Back Malaria
S-P	Sulfadoxine-pyrimethamine
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WFP	World Food Programme
WHO	World Health Organization

INTRODUCTION

Despite vast investments and strenuous efforts, malaria was never eliminated within the southern frontiers of the former USSR and Turkey. Throughout the 1970s and 1980s, malaria outbreaks and epidemics were registered in Azerbaijan, Tajikistan and Turkey. Although the epidemics were contained, it proved impossible to achieve complete interruption of malaria transmission in those countries. The present malaria situation in the Region illustrates once again that the achievements of the malaria eradication programmes in the countries of Europe cannot be maintained indefinitely. Nowadays, we witness a massive return of malaria into areas of Central Asia and the Trans-Caucasian countries where it had previously been eliminated. WHO has committed itself to an intensive response to the burden of malaria and had by 1999 developed a regional strategy to Roll Back Malaria in affected countries of the Region. The strategy is presently being implemented on the ground. This report reviews the malaria situation in the WHO European Region, with particular emphasis on failures of the past eradication efforts, the reasons behind and the extent of the resurgence of malaria and the progress made towards curbing an epidemic over the past five years. Regional priorities, with the purpose of consolidating the results achieved, and of moving further from malaria control to elimination within affected countries of the Region have been also discussed.

HISTORICAL ASPECTS

By the beginning of the 1960s, malaria had been nearly eliminated in all countries of the European Region, with the exception of some areas in Azerbaijan, Tajikistan, and Turkey, where malaria transmission remained in residual foci.

Azerbaijan

As a result of a decrease in the attention paid to epidemiological surveillance and the expansion of agricultural irrigation, malaria had returned to the Shirvan area of the Kura-Araksin lowlands of Azerbaijan. By the beginning of the 1970s, *An. sacharovi*, the principal vector of malaria, had developed resistance to DDT, which had been deployed extensively both in the agricultural sector and for malaria control *(1)*. A combination of the above-mentioned factors led to an outbreak of *P. vivax* malaria, and by 1970, 23 districts and 4 towns of the republic had been affected. Malaria control interventions, with particular emphasis on mass inter-seasonal chemoprophylaxis with PQ and indoor residual spraying with DDT, made containment of the outbreak possible, and in the following years, a gradual reduction in the incidence of *P. vivax* malaria and the number of active foci of malaria was observed *(2)*. In 1978, 42 active foci (against 149 in 1974) were registered in the republic, with only two reporting more than 6 malaria cases. Despite a significant reduction in malaria incidence, transmission in the republic was not interrupted. Owing to intensive population migration, residual foci were re-activated, and from 1979, the republic faced a new rise in malaria incidence. In 1984, 744 malaria cases were reported. Taking into account the serious health threat presented by the new situation, the Ministry of Health of Azerbaijan undertook measures necessary to prevent a large-scale malaria epidemic. While at the first stage (1981–1982), all efforts were focused on containing ongoing large-scale epidemic, the second stage of activities (1983–1985) were aimed at the elimination of remaining foci and the building up of capacities for complete elimination of malaria. In contrast to preceding years, particular attention was paid to disease management activities and large-scale seasonal chemoprophylaxis *(3, 4)*. This was connected with the fact that amongst the population in endemic areas, high rates of G6PD deficiency (15–30%) were observed *(5)*. The entire population in all affected areas was covered by malaria control activities. These efforts by and large succeeded in bringing about a substantial reduction in malaria incidence, and reduced morbidity rates were observed in all malaria-affected districts of the republic *(6)*. Despite the reinforcement of malaria control interventions, the malaria situation in the republic remained uncertain. During the following years, sporadic cases of autochthonous malaria were reported on an annual basis.

Tajikistan

Malaria was nearly eliminated in Tajikistan in the mid-1960s, and by 1966, only 11 malaria cases due to local transmission were reported *(7)*. Since 1961, within epidemic-prone areas, only preventive activities were undertaken, whereas in areas of residual endemicity (the Pyanj river basin), a complex of interventions including indoor residual spraying with DDT, active

case detection, and radical treatment of malaria cases were carried out. The importation of malaria by infected mosquitoes from bordering territories of Afghanistan was presumed to be one of the main reasons for the area's residual endemicity. Many publications were devoted to the question of the flying range of mosquitoes and their abilities to cross water-barriers. By the beginning of the 1980s, it was established that malaria vectors (*An. pulcherimus* and *An. hyrcanus*) in southern Uzbekistan were easily capable of flying over the Amu-Darya River and back, a river of more than 750 m in width. This gave solid evidence of the water-barrier crossing abilities of local infected species *(8)*. From 1963–1980, 135 malaria cases were detected in 25 settlements in seven of eight border areas between Tajikistan and Afghanistan (with the exception of the Kumsangir district). Almost all these settlements were situated within 3 km of the floodplain areas of the Amu-Darya and Pyanj rivers, with Afghan settlements located just on the opposite side. Risk areas, as far as incoming infected mosquitoes were concerned, included Pyanj and all of the eastern part of its district, where many breeding sites existed along both sides of the border, with intense foci of malaria present on the Afghan side. At particularly high risk was the western part of the Parhar district, due to its many rice paddies and high vector densities. Within the Moscow district, the majority of high-risk areas included the mountainous stretches along the border, where mosquito crossings over a particularly narrow part of the Pyanj river were highly probable, with persistent foci located on the Afghan side. The situations in the Lenin and G.B.A.O. districts were not termed high risk, as vector densities there remained comparatively low along both sides of the border, and there were no malaria patients in the adjacent areas. The absence of malaria in the Kumsanghir district gave further proof of the hypothesis of malaria importation by infected mosquitoes from Afghanistan, as Afghan settlements across the border were more than 10 km away from the Pyanj river. On the other hand, there was little doubt about the persistence of local transmission, which was not effectively contained owing to the exophilic behaviour of *An. pulcherimus* and *An. hyrcanus* vectors, as well as to a lack of malaria surveillance. The latter was confirmed by local malaria outbreaks – 34 cases in Kalai-Humb district in 1971, and 90 cases in Kuliab in 1978. From 1979 to 1981, the number of malaria cases rose from 58 to 121. Almost all cases were detected in the same districts in which sporadic cases had been routinely registered and local outbreaks had taken place from 1963 to 1980 (Pyanj, Moscow, Parhar, Kuliab, Vosei districts and the town of Kuliab). Most probably, two factors were responsible for the dramatic increase in morbidity in 1981. Before 1979, all agricultural areas within districts engaged in cotton growing had been heavily sprayed with DDT, an action that undoubtedly curbed the growth of malaria vector densities, particularly on the part of the exophilic mosquito population. In 1979, DDT outdoor spraying for agricultural purposes was discontinued. Moreover, all malaria control interventions carried out by the Soviet antimalarial teams on the Afghan side bordering Tajikistan were terminated as well, leading to a drastic deterioration of the malaria situation. A peculiarity of the epidemic process in 1981 was the rapid spread of infection to 54 settlements, accompanied by comparatively low transmission rates. The highest number of malaria cases (105) was reported in the Pyanj district. The rise in morbidity witnessed in 1982–1983 also took its toll on the Parhar and Moscow districts. The course of the malaria situation in Tajikistan 1981–1983 vividly demonstrated the fact that the control approaches applied at that point of time were ineffective both in terms of the prevention of the occurrence

of new foci and the containment of the transmission in existing foci. In the absence of effective residual insecticides, disease management activities and chemoprophylaxis constituted the major part of complex efforts to quell the malaria outbreaks during these years. The use of malathion as an alternative insecticide for indoor residual spraying and mass seasonal chemoprophylaxis, in hand with the strengthening of disease management services, did result in a reduction in malaria incidence within the republic in the years to follow *(9,10,11)*. Despite large-scale antimalarial activities, however, malaria cases have remained within a range of 200–300 a year.

Turkey

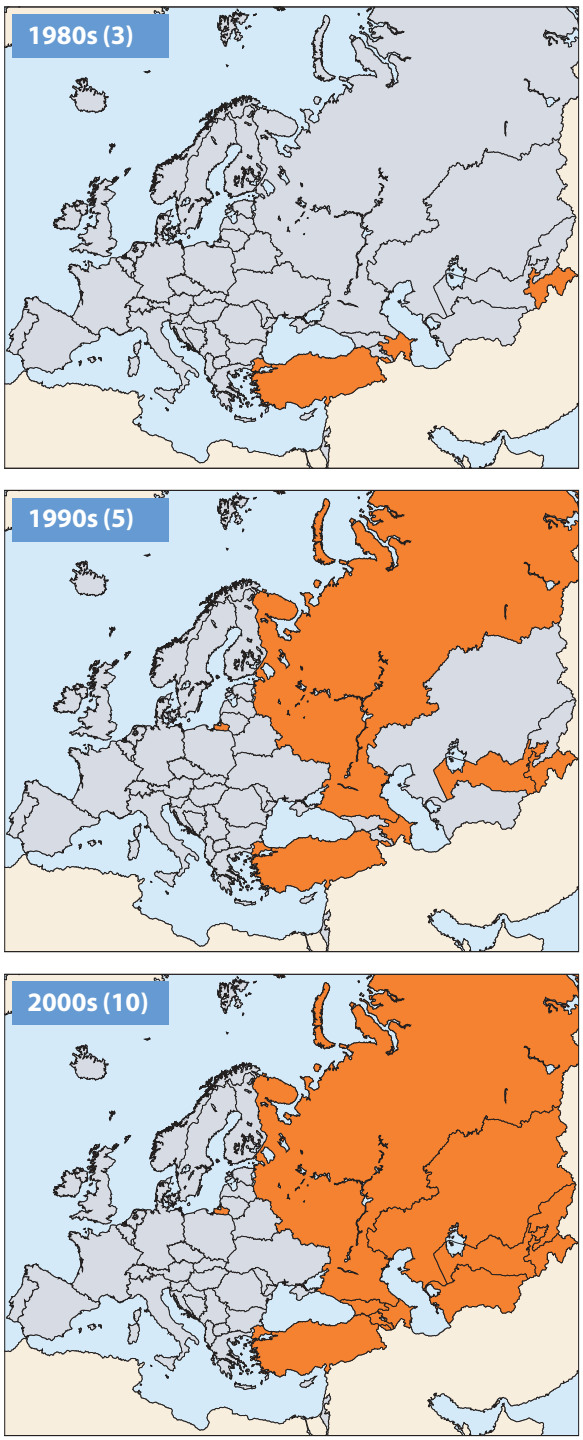
Following 1960, as a result of a large-scale malaria control programme initiated in the country, malaria morbidity rates were reduced and endemic areas decreased on an annual basis. Within the period between 1960–1974, just once, in 1964, did the number of malaria cases exceed 5000. In the mid 1970s, following the country's success in the field of malaria control, the malaria unit was re-organized, and both malaria control and surveillance fell into the hands of primary health care system personnel. This coincided with the commencement of the construction of dams and water power plants on the Chukurova plain, which led to the migration of workers from malaria-endemic districts of the country. Massive malaria importation, along with large-scale irrigation and high densities of malaria vectors, resulted in an explosive *P. vivax* malaria epidemic in the Adana, Icel and Hatay provinces in 1974. The disease was re-established in the European part of Turkey in 1974 *(12)*. In 1977, 115 512 malaria cases were registered in the country. Through large-scale malaria control interventions, including disease management activities, vector control interventions (indoor residual spraying and larvicidal activities based on the use of chemical insecticides and larvivorous fish), and finally, intensified malaria surveillance, the epidemic was contained in 1978 *(13)*. At the beginning of the 1980s, the Chukurova plain remained the most malaria-affected area of Turkey. This was caused by conditions favourable for malaria transmission, difficulties in conducting interventions for vector control due to the exophily of some local vectors, socio-behavioural attitudes on the part of local populations which had allowed for extended man-vector contact, and a mass influx of people from malaria endemic districts, particularly the south-eastern areas of Anatolia. Moreover, the heavy use of insecticides in the agricultural sector led to the development of *An. sacharovi* resistance to DDT in 1959 and to dieldrin in 1971 *(14, 15)*. The attitude on behalf of the population towards residual spraying with malathion was negative, although, in those years, it was still an effective insecticide *(16)*. All of the above-mentioned factors brought about a new rise in malaria morbidity from 1980–1986, affecting the Adana, Osmaniye, Sanliurfa, Mardin, Adiyaman and Icel provinces. In 1983, about 70 000 cases were reported in the country *(17)*. The application of a new residual insecticide, pirimiphos-methyl, along with the intensification of malaria surveillance, allowed for a significant reduction of malaria cases in 1984–1990 *(18)*. In 1990, the lowest malaria morbidity level to be seen over the past 15 years was reported in the country. The success which had been achieved did not last, however, and from 1991, there has been a gradual rise in malaria incidence. In 1993–1994, a large-scale epidemic spread to the GAP, a development project in southeast Anatolia, particularly within the Diyarbakir, Batman, Siirt, Sirnak and Mus provinces. In 1994, according to

statistical data, 84 345 malaria cases were officially reported, although evaluation was pointing to a much higher number (from 160 000 to 170 000). The large-scale control interventions carried out included indoor residual spraying with insecticides including ultra-low-capacity spraying with pyrethroids, intensified malaria surveillance, use of larvicides and growth regulators, Bti-based agents, and larvivorous fish. Special attention was given to health education amongst the population.

Although epidemics and outbreaks were contained, it proved impossible to achieve complete interruption of malaria transmission in the countries in question.

CURRENT TRENDS

Fig. 1; Number of Malaria-affected countries in the WHO European Region in the 1980s, 1990s and 2000s



Source: Roll Back Malaria, WHO Regional Office for Europe, 2004

The perception that Europe is free from malaria has changed rapidly over the past decades. Since the early 1980s and throughout the decades to follow, the number of countries affected by malaria has increased from 3 to 10 (Fig. 1). At the beginning of the 1990s, the residual reservoir of malaria infection, aggravated by political and socio-economic situations, mass population migration, extensive development projects, and almost discontinued activities on malaria prevention and control constituted conditions favourable for malaria transmission. As a result, large-scale epidemics broke out in Central Asia and the Trans-Caucasian countries (Tab. 1 and Fig. 2), and a total of 90 712 malaria cases were officially

COUNTRY	1990	1991	1992
Armenia	0	0	0
Azerbaijan	24	113	27
Belarus	0	0	0
Bulgaria	0	0	0
Georgia	0	0	0
Greece	0	0	0
Italy	0	0	0
Kazakhstan	0	0	1
Kyrgyzstan	0	0	0
Republic of Moldova	0	0	0
Russian Federation	7	0	0
Tajikistan	175	294	404
Turkey	8675	12213	18665
Turkmenistan	0	13	5
Uzbekistan	3	1	0
Total	**8884**	**12521**	**19102**

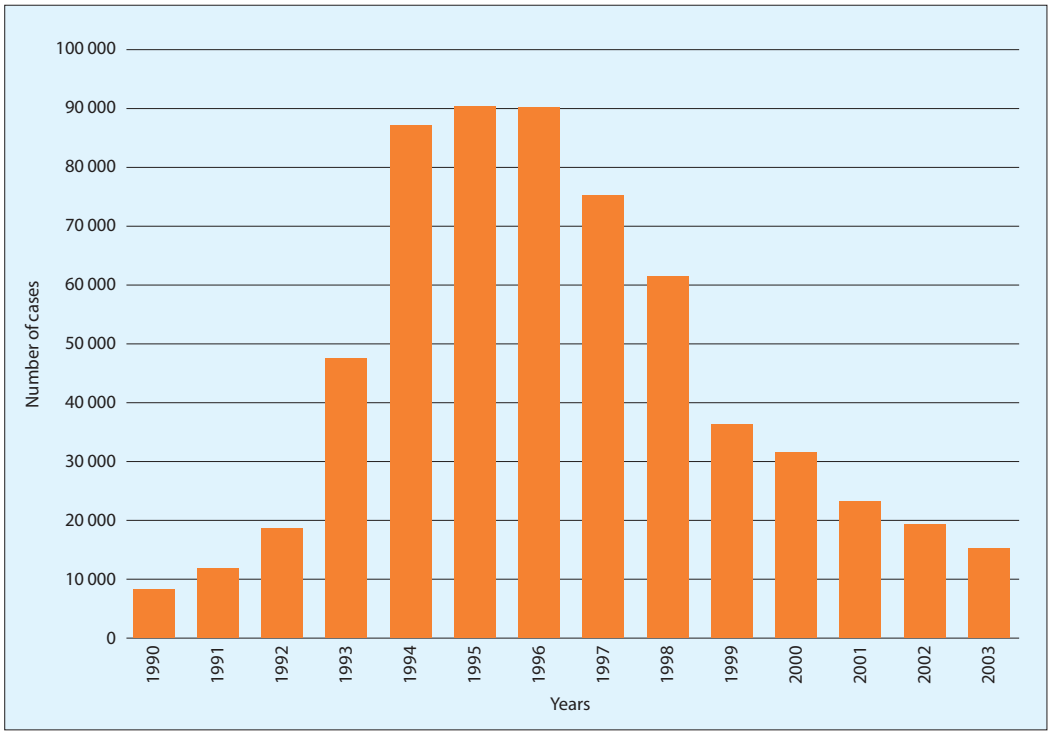


Figure 2; Reported number of autochthonous cases of malaria in all countries of the WHO European Region, 1990–2003

Source: Roll Back Malaria, WHO Regional Office for Europe, 2004

1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
0	1	0	149	567	542	329	56	31	16	8
23	667	2840	13135	9911	5175	2311	1526	1054	505	480
0	0	0	0	0	0	1	0	0	0	0
0	0	11	7	0	0	0	-	0	0	0
0	0	0	3	0	14	35	244	437	473	308
0	0	0	0	0	0	1	2	0	0	0
0	0	0	0	2	0	0	0	0	0	0
0	1	0	1	0	4	1	7	2	0	0
0	0	0	1	0	5	0	7	15	2712	465
0	0	0	2	0	0	0	0	0	0	1
0	0	4	10	31	63	77	43	134	139	72
619	2411	6103	16651	29794	19351	13493	19064	11387	6160	5428
47206	84321	81754	60634	35376	36780	20908	11381	10758	10184	9182
1	1	0	3	4	115	10	18	5	15	6
0	0	0	0	0	0	7	46	9	11	33
47850	**87403**	**90712**	**90506**	**75685**	**62049**	**37173**	**32394**	**23832**	**20215**	**15983**

Table 1; Number of autochthonous malaria cases reported in countries of the WHO European Region, 1990–2003

reported in the Region in 1995. In the following years, Azerbaijan, Tajikistan and Turkey suffered explosive and extensive epidemics, while Armenia, Kyrgyzstan and Turkmenistan faced outbreaks on a smaller scale. From 1995–2003, the reported number of malaria cases in the Region declined from 90 712 to 15 983. Although this represents an overall decrease in the reported number of cases in comparison with 1995 figures, it is important to be realistic with respect to the actual figures of malaria in the Region. The magnitude of the malaria problem is thought to be much greater than that which statistics indicate and cannot be reliably assessed on the basis of official data available. This conclusion is based on the results of expert assessments and field surveys conducted in affected countries over the past years. Out of a total population in the Region of 873 457 500, it is estimated that between 35 and 40 million currently live in areas at varying degrees of risk of malaria (Tab. 2). In 2003 autochthonous malaria was reported in far more countries as compared to the pre-epidemic period (Tab.1 and Fig. 2). At present, malaria continues to pose a challenge in 8 out of the 52 member countries of the Region, namely Armenia, Azerbaijan, Georgia, Kyrgyzstan, Tajikistan, Turkey, Turkmenistan and Uzbekistan.

Table 2; Population at risk of malaria in malaria-affected countries, 2003

COUNTRY	TOTAL POPULATION	POPULATION AT RISK*	% OF POPULATION AT RISK	PARASITE SPECIES
Tajikistan	6 086 983	4 500 000	73.9	*P. vivax* & *P. falciparum*
Uzbekistan	24 880 545	5 600 000	22.5	*P. vivax* & *P. falciparum* (suspected)
Kyrgyzstan	4 920 847	2 500 000	50.8	*P. vivax* & *P. falciparum*
Turkmenistan	4 737 256	1 000 000	21.1	*P. vivax*
Georgia	5 262 050	2 000 000	38.0	*P. vivax*
Azerbaijan	8 041 278	5 500 000	68.4	*P. vivax*
Armenia	3 786 997	1 500 000	39.6	*P. vivax*
Turkey	66 667 997	15 000 000	22.5	*P. vivax*

*Estimations were made on the basis of expert assessments and field surveys

At present, Drs Zvantsov AB, Ejov MN, and Artemiev MM (*19*) list 19 Anopheles species: *An. atroparvus, An. barianensis, An. beklemishevi, An. claviger, An. hyrcanus, An. lindesayi, An. maculipennis, An. marteri sogdianus, An. martinius, An. melanoon, An. messeae, An. plumbeus, An. sacharovi, An. sinensis, An. subalpinus, An. multicolour, An. pulcherimus* and *An. superpictus* in the Newly Independent States. *An. messeae* represents the species with the most extensive habitat. It is a main potential vector of malaria in the majority areas of Russia, the Baltic Region, Belarus, Ukraine, and the northern parts of Kazakhstan and Kyrgyzstan. By 1977, densities of this species have reached the level of the 1940s (*20*). *An.* maculipennis resides in European Russia, in the Caucasian Region and in the foothills and mountains of Middle Asia. It is the main vector within the mountainous areas of the Trans-Caucasian region. *An.* atroparvus is a plain species. It is distributed to the west of the Riga-Astrakhan line. The northern border of the habitat of this species is found approximately along the straight line from Kaliningrad in the west to Astrakhan in the east. This species is also one of the main potential malaria vectors. *An. sacharovi* is a thermophilic species of the plains that often resides in saline reservoirs. It is prevalent in the plains of the Trans-Caucasian region and in Dagestan. This species represents the most southern and thermophilic species

of the *An. macullipennis* complex among all species of the European Region. It is the main malaria vector in Azerbaijan and Turkey, and extremely anthropophilic. *An. hyrcanus* resides south of 50° latitude, and serves as the principal malaria vector the mountains and foothills of Middle Asia, the Trans-Caucasian region, Turkey, Dagestan, to the south of Sochi and along the southern cost of the Crimea. *An. pulcherimus* is a plain species residing in Middle Asia and the south of Kazakhstan. The species is semi-exophilic, and it serves as the main malaria vector in the Middle Asian plains.

In European countries today only *An. labranchiae* and *An. superpictus* are still present in epidemiologically relevant densities. Scattered foci of *An. superpictus* have been reported recently in Italy and the species also exists in the Balkan Peninsula. Other potential malaria vectors belonging to the *An. macullipennis* complex, which are present in Europe, are *An. atroparvus* and *An. sacharovi. An. atroparvus* is widely distributed in the central and western countries of the Mediterranean basin, but the marked zoophily of this species does not make it an important malaria vector, unless under conditions of high density coupled with a low standard of living (*21*). *An. sacharovi*, the former main vector in the Balkans, is still abundant in many areas of the Lamia Plain and northern Greece, and possibly present in some areas of Italy at low densities. Zamburlini and Cargnus (*22*) surveyed the Upper Adriatic region of Italy and found that *An. macullipennis* and *An. messeae* were present, sometimes in considerable densities, along with *An. claviger*.

AUTOCHTHONOUS MALARIA

Central Asia

Malaria, nearly a forgotten disease in the Central Asian sub-region in the 1980s, could again become a major obstacle for developing countries of Central Asia, where at present nearly 14 million people, or more than 30% of the total population, live in areas at risk of malaria. The situation in Central Asia is illustrative of the rapid evolution of the malaria problem over the past ten years. In recent years, endemic malaria has returned to the area, and now it is well established in the southern part of Tajikistan, where the spleen and parasite index is above 10% in some localities. Epidemic situations, which produce a high incidence of clinical disease, have been reported in other parts of Tajikistan and neighbouring countries, including Kyrgyzstan and Turkmenistan. Sporadic cases of malaria are reported annually in Kazakhstan and Uzbekistan, and these countries remain highly receptive to a resumption of malaria transmission, which could lead to outbreak situations (Fig. 3 and 4).

The geographical distribution of malaria parasite species is far from uniform; it is clearly seen that *P. falciparum* malaria thrives in Tajikistan, where it is still focal, primarily affecting the most remote areas, and it is linked to rural populations. A shift from the more benign tertian malaria to malaria caused by *P. falciparum* as well as an increase therein have been observed originally among local populations returning from Afghanistan to the country, where curative and preventive health services have been disrupted. In 2004, the first autochthonous case of *P. falciparum* was reported in the Aravan district of the southern part of Kyrgyzstan bordering Uzbekistan. In other countries of Central Asia *P. falciparum* retains its imported character. In contrast to this, however, *P. vivax* is spreading rapidly, and by now this parasite species is widely distributed in Central Asia: from endemic setting in the southern part of

Tajikistan, and its epidemic type in the south-western part of Kyrgyzstan, to sporadic distribution in the southern part of Kazakhstan.

The number of malaria cases reported in TAJIKISTAN peaked in 1997, when nearly 30 000 cases were registered. The deterioration of the malaria situation in the country in the 1990s was linked to armed conflict, mass population movement across zones of intense transmission of malaria in Afghanistan, where malaria is endemic, and the disruption of public health care services and vector control activities. Noticeable changes in agricultural practices, particularly the increase in the cultivation of rice, have led to an increase in vector breeding grounds. Despite an 80% reduction in the reported cases since that time, the malaria situation remains serious in the country. The resumption of *P. falciparum* transmission and its spread across the country is a matter of particular concern. Moreover, the reappearance of endemic

Figure 3; Malaria strata in Central Asia

Source: Roll Back Malaria, WHO Regional Office for Europe, 2004

malaria in the southern part of Tajikistan and a steady increase in the incidence of malaria in the northern, western and central parts have been observed in recent years. A total of 5428 cases of malaria were reported in the country in 2003. Prevalence and PCR surveys recently conducted in the southern part of Tajikistan bordering Afghanistan have shown that the burden of malaria in the Khatlon Region (the most affected area of the WHO European Region), with its total population of nearly 2.2 million people, may be estimated at 100 000 to 150 000 malaria-infected carriers, with the proportion of *P. falciparum* malaria at more than 20%. The proportion of asymptomatic *P. vivax* and *P. falciparum* carriers is very high, reaching 80–90% of all malaria cases revealed. The total country estimate of symptomatic and asymptomatic cases of malaria may approach 200 000 to 250 000. Malaria vectors in Tajikistan include *An. superpictus*, *An. pulcherimus*, *An. macullipennis, An. hyrcanus* and *An. martinius*. The results of studies on vector resistance to insecticides (DDT, fenitrotion, cyfluthrin and deltamethrin) have shown that all vectors were susceptible to the above-mentioned insecticides.

However, taking into account the grave malaria situation in neighbouring Tajikistan and Afghanistan, along with the present day exacerbation of the situation in Kyrgyzstan, there is a very real threat that malaria may assume larger proportions in Uzbekistan. In this regard, the Ministry of Health of Uzbekistan initiated and carried out a number of activities aimed at the intensification of malaria surveillance. The number of imported malaria cases has continued to increase from 21 cases in 1994 to 80 cases in 2000. In 1999, due to a steady increase in imported malaria and the presence of conditions favourable for malaria transmission, the first autochthonous cases of malaria, 7 in all, were registered. A more than five-fold increase in the number of autochthonous malaria cases was witnessed during 1999–2000. In 2001–2003, 225 cases were registered, 53 of which were due to local transmission. All reported cases occurred in the Surkhandarinskaya region, which borders Tajikistan and Afghanistan. To intensify anti-malarial interventions in these border areas, malaria control services were reinforced and made operational. There are seven *Anopheles* species registered within the territory of Uzbekistan: *An. pulcherimus*, *An. superpictus*, *An. maculipennis, An. hyrcanus*, *An. martinius*, *An. claviger,* and *An. algeriensis*. The monitoring of vector susceptibility to insecticides has revealed that only *An. superpictus* populations in Fergana were resistant to malathion, fenitrothion, bendiokarb and propoxur. All other vectors remain susceptible to nearly all commonly used insecticides.

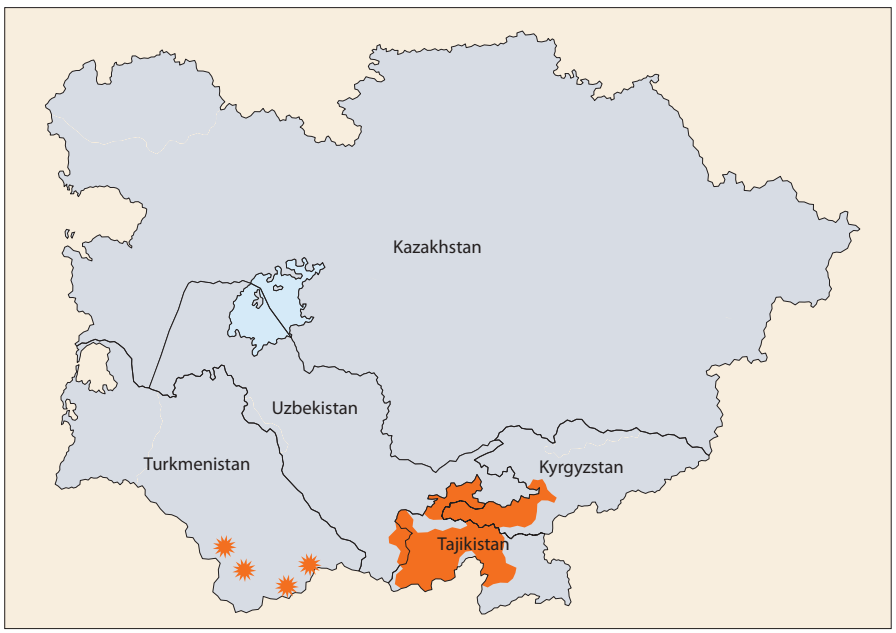


Figure 4; Areas with reported autochthonous cases of malaria , Central Asia, 2003

Source: Roll Back Malaria, WHO Regional Office for Europe, 2004

As a result of the importation of malaria by ex-military personnel upon their return from Afghanistan, autochthonous malaria was reported in Kyrgyzstan from 1986 onwards. In 1986–1987, 24 cases of autochthonous malaria were detected. In 1988, there were 21 cases due to local transmission, with 11 reported in the Batken district bordering Tajikistan and Uzbekistan. In the years to follow, only imported cases were reported in the country. In 1996, after a long break in local transmission, the first case of autochthonous malaria was registered

in the Panfilov district. From that point forward, there has been a rise in the number of cases due to local transmission. In 2001, 15 autochthonous cases of malaria were reported in the country. In 2002, the explosive resumption of malaria transmission produced an epidemic situation with an incidence much greater than that reported in the past years in Kyrgyzstan and a total of 2267 autochthonous *P. vivax* cases were reported in the south-western regions of the country, including Batken, Osh and Jalal-Abad. The explosive resumption of malaria transmission in Kyrgyzstan was a result of immigration of a number of infected people from Tajikistan into the Batken region where the *Anopheles* vector exists and conditions for malaria transmission were very favourable. In 2003, as a result of the application of epidemic control measures, there was a significant decrease in the reported number of malaria cases – 465. However, in 2004 the first autochthonous case of *P. falciparum* malaria was reported in the Aravan District of the southern part of Kyrgyzstan, in an area bordering Uzbekistan. Malaria vectors in the country include *An. pulcherimus*, *An. superpictus*, *An. hyrcanus*, *An. martinius*, *An. claviger* and *An. messeae*. Studies on vector resistance to different insecticides have revealed that all the above-mentioned species are susceptible to DDT, fenitrothion, cyfluthrin, deltamethrin, malathion, lamba-cyhalothrine and propoxur.

Although malaria was eliminated in Turkmenistan in 1960, sporadic cases were occasionally reported from the country. By 1998, the malaria situation had taken a drastic turn for the worse and 108 malaria cases were detected within the Gushgin etrap of Maryi veloyat. To prevent further spread of malaria throughout the etrap area, malaria programme personnel carried out seasonal chemoprophylaxis with chloroquine and indoor residual spraying. These interventions allowed for a significant decrease in malaria morbidity within the focus area. Presumably, local malaria transmission appeared as a result of malaria importation by mosquitoes flying in from bordering Afghanistan. Sporadic cases of autochthonous malaria are reported every year, and 44 cases of local malaria cases were registered in the country during 2000–2003. Malaria is becoming more widespread in Turkmenistan, spreading to other territories. Three principal malaria vectors are found in Turkmenistan: *An. superpictus*, *An. pulcherimus* and *An. maculipennis*. Monitoring of *An. superpictus* susceptibility to cyfluthrin, lamba-cyhalothrine, DDT and propoxur in Lebap, Maryi, Ahal, Dashogus and Balkan veloyats has revealed that all the above-named insecticides remained highly effective for indoor residual spraying.

In Kazakhstan an increase in the number of imported malaria cases was registered from 1990–1997, and the first malaria cases due to local transmission were reported in 1992. During 2000–2003, 9 cases of autochthonous malaria were registered within the area of southern Kazakhstan and Almaty where there have been no cases of autochthonous malaria in recent years. The ecological and climatic conditions within most regions of the country could lead to a resurgence of malaria transmission following its importation. The differences in eco-climatic settings, types of landscape, vector species distribution, and occupational and migration population patterns define the heterogeneity of malariogenic potential of the country. The highest risk of resumption of malaria transmission is in some parts of the Almaty, Jambyl, South-, West- and East-Kazakhstan regions, as well as in the cities of Almaty, Astana and Karaganda. *An. messeae*, the most common malaria vector in Kazakhstan, is found throughout most of the county. Studies of this vector's resistance to different insecticides have shown

that resistance to DDT was highest (up to 77%) in the western part and nearly absent in the eastern part of the country. Resistance to malathion, fenitrothion and synthetic pyrethroids was virtually absent in all areas under study.

Trans-Caucasian countries and Turkey

In the Trans-Caucasian countries and Turkey past and recent large-scale epidemics of *P. vivax* malaria have underlined the fact that all these countries are situated within epidemic-prone areas in which the explosive resumption of malaria transmission could follow the weakening or discontinuation of malaria control and preventive activities, and/or it may be greatly influenced by agricultural and development efforts. Despite a significant decrease in the reported number of malaria cases in the Trans-Caucasian countries and Turkey from 1995 to 2003, almost 25 million people, or about 30% of the total population, still live in areas at varying degrees of risk of malaria. The seriousness of the malaria situation in the south-eastern part of Turkey, a steep rise in the number of malaria cases in Georgia and insufficient resources available to tackle the malaria problem in Azerbaijan and Armenia, are major causes for concern within this sub-region (Fig. 5).

Figure 5;
Areas with reported autochthonous cases in the Trans-Caucasian countries and Turkey, 2003

Source: Roll Back Malaria, WHO Regional Office for Europe, 2004

In Turkey the malaria situation remains serious in terms of its impact on the health of the population and the socio-economic development. Within the country, over 15 million people, or 23% of the total population, reside in areas where malaria remains endemic. Moreover, a large proportion of the total population reside in areas where the risk of an explosive resumption of malaria transmission, leading to outbreak situations, remains high. Despite the fact that only 9182 cases were reported in 2003, it is generally accepted that the actual magnitude of the malaria problem in Turkey is considerably greater than that reported, especially in south-eastern Anatolia, where the incidence of malaria is the highest in the country. Endemic malaria with the parasite index of above 10% was found there. Most probably the reduction in malaria morbidity over the past years was not only a result of malaria control interventions, but also a consequence of changes in climatic and environmental conditions, including low rainfall over the last two years, which adversely affected malaria mosquito survival and their capacity to transmit malaria. Thus, despite the significant decrease in malaria morbidity over the past years, the malaria situation, as we have learned by experience, may be subject to sud-

den and very negative changes. In light of the country's overall malaria potential, it is vitally important to consider the intensification of malaria surveillance activities at the periphery, especially in south-eastern Anatolia, where the malaria situation remains serious. There are thirteen *Anopheles* species recorded in Turkey. *An. sacharovi* and *An. superpictus* are the principal malaria vectors, while *An. maculipennis, An. pulcherimus, An. algeriensis, An. claviger, An hyrcanus, An. marteri, An. multicolour, An. plumbeus* and *An. sergenti* may be considered secondary or possible vectors of malaria in the country.

In Georgia the malaria situation began to deteriorate in the mid 1990s as a result of a drastic reduction in the activities aimed at the prevention of malaria transmission and the intensification of population movements. The first three cases of local malaria transmission were detected in 1996 among residents of a district bordering Azerbaijan. In subsequent years the number of malaria cases continued to increase, reaching 473 in 2002. Between 1998 and 2002, the number of reported malaria cases increased by more than 30 fold. During this period the first cases of autochthonous malaria were reported in the western part of Georgia. In 2003 the country reported 308 autochthonous cases, a 34% reduction compared to the previous year. Conditions favourable for malaria transmission exist in an area covering nearly 52% of the country, and where 93% of the total population lives. At present, the highest risk of resurgence of malaria transmission and its spread concern the areas bordering Azerbaijan and Armenia in eastern Georgia, the Black Sea coastal areas, and the Kolhid lowlands in the western part of the country, where more than 68% of the total population resides and the transmission season may last more than 150 days. The main and secondary vectors there include *An. maculipennis*, *An. superpictus*, *An. sacharovi*, *An. hyrcanus, An. claviger* and *An. melanoon*. Other territories, which are home to 18% of the total population, face a malaria season from 90 to 120 days, and have a lower degree of risk of resurgence of malaria. The vectors there include *An. maculipennis, An. superpictus, An. claviger* and *An. plumbeus*.

In Armenia the malaria situation remained stable until 1994. In subsequent years a downgrading of malaria preventive services and a weakening of the malaria surveillance system resulted in a steady increase in the number of malaria cases, reaching 1156 by 1998. Over 98% of these cases were detected in the Masis district of the Ararat valley, an area bordering Turkey. In recent years, owing to epidemic control interventions, the number of autochthonous malaria cases has continued to decrease, dropping to 8 in 2003. Although numbers have been on the decline since then, the situation must be monitored closely, due to the existence of favourable conditions for malaria transmission. *An. maculipennis* serves as the main malaria vector in the country. In addition to *An. maculipennis*, other malaria vectors in the country include *An. sacharovi* and *An. claviger*. The appearance of *An. sacharovi* (the main vector in Transcaucasia) in the Ararat valley has created conditions more favourable for malaria transmission in the country. All *An. maculipennis* populations that were tested for resistance to cyfluthrin were found susceptible to this insecticide.

In Azerbaijan the malaria situation began to deteriorate rapidly after 1990, as a result of almost complete cessation of malaria preventive interventions and hydro-engineering and melioration activities as well as intense population movements. In 1996, the number of malaria cases reached 13 135, with the majority of these cases registered in the districts of the Kura-Araksin and Lenkoran lowlands, areas which were also highly malaria-endemic in the past.

In 1997, the situation was aggravated as a result of mudslides throughout the Kura-Araksin and Lenkoran lowlands when mosquito-breeding sites increased dramatically. The highest morbidity rates were reported in several districts of Azerbaijan bordering Iran, Georgia and the Russian Federation. Over the course of 1997–2003, as a result of large-scale epidemic control interventions, the malaria situation in the country continued to improve, with only 408 cases reported in 2003. Malaria vectors in Azerbaijan comprise *An. maculipennis* (the area of the Big and Small Caucasus*), An. sacharovi* (Kura-Araksin and Lenkoran lowlands) and *An. melanoon* (Lenkoran lowland).

INTRODUCED MALARIA

Today in most malaria-free industrialized countries the risk of sustained reintroduction of malaria transmission is minimal: either transmission has historically never occurred, or social-economic development is so advanced that cases of imported malaria can be identified and reintroduction of malaria can be eliminated in a timely manner. However, when importation of malaria coincides with socio-economic degradation and the disintegration of health and social services, the re-establishment of malaria transmission could take place.

Two cases of autochthonous *P. falciparum* malaria were reported in Germany with evidence of local transmission by indigenous *Anopheles plumbeus*. The cases occurred within one week in the paediatric ward of a hospital in Duisburg in the summer of 1997. Neither patient had any travel history to malaria-endemic areas and had never received blood transfusion. A 6-year-old girl from Angola with *P. falciparum* infection was present at the same time for treatment. As no clinical signs of malaria were evident, priority was given to abscess treatment. Specific antimalarial therapy was not given until 22 August; hence the Angolan child remained parasite-positive for about 6 weeks. The first autochthonous case, a 4-year-old girl, was originally hospitalized from 13 to 28 August for treatment of pyelonephritis. A few days after discharge, she developed a fever and was re-hospitalised on 3 September with suspected urosepsis. The diagnosis of *P. falciparum* malaria as revealed by microscopic examination of blood smears was made 6 days after re-admission. The second case was a 22-year-old female with cystic fibrosis suffering from pneumonia. She was hospitalised from 15 August to 10 September, and developed malaria symptoms on 10 September. *P. falciparum* malaria was confirmed parasitologically. To investigate whether a local Anopheles species might indeed be responsible for these cases, a series of entomological surveys in the surroundings of the Duisburg hospital were performed. A flooded hole in an old beech tree was discovered containing larvae and pupae with characteristics typical for those of *An. plumbeus* in a small forest only 700 m from the hospital. The species of *An. plumbeus* was confirmed by morphological characteristics of adult mosquitoes reared in the laboratory from collected pupae, leaving no doubt that the potential *P. falciparum* vector *An. plumbeus* is breeding in the vicinity of the Duisburg hospital. The rare indigenous mosquito species, which preferentially breeds in water-filled holes of old breech trees, is susceptible to *P. falciparum* in experimental infections (*23*).

In 1997 a very peculiar case of *P. vivax* malaria was diagnosed in a rural area of Tuscany, Italy, where indigenous *An. labranchiae* mosquitoes have recently re-colonised a vast agricultural development zone. On 7 August a 62-year-old woman with high fever was admitted to the Internal Medicine Unit of the Grosseto Hospital. She and her family members had no

history of travel outside the country nor of blood transfusion, and the nearest international airport (Pisa) was over 150 km away. By chance, on 13 August, a physician requested a parasitological blood examination, which revealed a heavy *P. vivax* parasitaemia. A detailed epidemiological investigation suggested that she had probably been infected through the bite of *An. labranchiae* that was carrying *P. vivax* acquired from a person (a gametocyte carrier) from the Indian sub-continent who lived on a farm 500 metres from the patient's house. Adult resting mosquitoes were collected from day resting sites. This was the first introduced case of malaria since the elimination of malaria in Italy in 1970 (*24*).

In March 2001 a 75-year-old woman was admitted to the Hospital de Principe de Asturias in Madrid, Spain, with a history of intermittent fever for one week and no obvious infection. On day seven of fever, the presence of rings inside the patient's erythrocytes was revealed. A rapid antigen detection test was done; the test returned negative results for *P. falciparum* and *P. vivax*. The sample was later identified as *P. ovale* through microscopy and molecular studies (PCR) at a reference malaria laboratory (*25*). Treatment with chloroquine followed by primaquine eliminated the infection successfully and the patient recovered. The patient had never travelled outside Spain and had had no previous contact with people who had lived in or visited a country with endemic malaria. She had never received any blood transfusions or blood derivatives. Because of obesity, she had been confined to her home since January 2000 except for two visits to the hospital. She resided in an urban area close to two rivers (less than 1 km distance), and 4 km and 18 km away from two international airports, within the radius of other previously reported airport malaria cases (*26*). The parasite may also have been transmitted by local mosquitoes. In Spain a possible vector for local infection is *An. atroparvus*, since this species has shown receptivity to *P. vivax* (*27*) and possibly could be receptive to *P. ovale* as well. Recent entomological surveys conducted in previously malarious areas of Spain have shown high densities of *An. atroparvus*, which are similar to those observed during the period when malaria was endemic (*28, 29, 30*).

Two cases of *P. vivax* malaria imported from Greece were reported in Germany in 2000. Two German tourists were diagnosed with *P. vivax* malaria in Germany, 10 days after their holiday in a tourist resort in Halkidiki, Greece. *P. vivax* malaria was diagnosed in an American citizen residing at the same hotel. This patient was hospitalized at the Infectious Disease Hospital in Thessaloniki, where *P. vivax* malaria was diagnosed. It was the 6th malaria episode reported by the patient. The recent episodes of malaria began at the end of June with high fever and he was self-treated. The symptoms reappeared three weeks after and the patient was finally hospitalised on 25 July. He reported a recent 3 years sojourn in Mozambique where he developed malaria 6 times (*31*). The most likely explanation is that the carrier with *P. vivax* gametocytes infected the local Anopheles mosquito vectors (*32*).

For the first time after malaria elimination in 1965, 11 introduced cases of malaria were reported in 1995 in four settlements in the region of the town of Sandanski situated in southwestern Bulgaria. The patients had never travelled abroad. The epidemiological investigations revealed that the source of infection of the local mosquito populations (*An. maculipennis*) were immigrants from Africa who stayed in the Struma river valley for several weeks. In the next year (1996), seven additional cases of *P. vivax* malaria were diagnosed in inhabitants of the same settlements, probably due to infection with a strain characterized by a long incuba-

tion period. All the patients were duly diagnosed, hospitalised and radically treated with chloroquine and primaquine. An analysis of the present entomological situation has shown a high density of Anopheles population – *An. maculipennis* and *An. superpictus* in various regions of the country (*33*).

Throughout the 1980s, introduced malaria cases were reported in the Orenburg, Pavlodar, Tyumen, Chelyabinsk, Omsk, Tomsk, Gorky, and other regions of THE RUSSIAN FEDERATION. This was in large part due to the continuous importation of malaria from Afghanistan. Between 1981 and 1990, 7690 cases of *P. vivax* and 70 cases of *P. falciparum* malaria were imported into the country. Despite the massive importation, mostly into rural areas, the number of introduced cases of malaria reached 60 only (*34*). From the beginning of the 1990s, the malaria situation in the country was further aggravated. Throughout 1995 to 1998, the number of imported and autochthonous malaria cases continued to rise, reaching 1018 and 63 respectively. Between 2000 and 2003, 388 autochthonous cases, including introduced malaria, were detected in the country (*35*). In recent years, autochthonous malaria cases have been reported in many regions and territories of the Russian Federation. In view of the ongoing massive importation of malaria from Tajikistan and Azerbaijan, it is ever crucial to pay special attention to epidemiological surveillance of all imported and autochthonous cases (*36*).

IMPORTED MALARIA

Imported malaria is becoming a growing medical and health issue in many countries where the disease had been successfully eliminated. A brief glance at travel statistics shows the spectacular growth in tourism worldwide. For example, in Africa, which is the main global reservoir of malaria, there were 17 875 000 international tourist arrivals in 1993 compared to 750 000 in 1960; an average annual growth rate of 10.1% (*37*). The serum of travellers returning from sub-Saharan Africa showed a high prevalence of antibodies against the circumsporozoite antigen of *P. falciparum* (6–49%, depending on the type of travel), which indicates a high rate of malaria infection (*38*). However, only a small proportion of travellers to malaria-endemic areas will actually develop the clinical infection. This situation poses a double hazard: first, to the individuals who acquire malaria because the disease may remain undiagnosed or be incorrectly diagnosed, resulting in high case-fatality rates; and second, to the communities that these individuals may come into contact with on their return to malaria free areas, because active malaria vectors and favourable environmental conditions could result in local transmission of malaria (*39*). In numerical terms, the morbidity and mortality of imported malaria is low when compared with similar parameters in endemic areas. However, the costs and public health resources required to manage imported malarial diseases are considerable, consuming funds that could be better utilized for control efforts in endemic countries (*40*).

In THE WHO EUROPEAN REGION most of the malaria cases are imported into the western part of Europe, especially into countries of the European Union. Since the early 1970s there has been a ten-fold increase in the number of imported cases, from about 1500 in 1972 to more than 15 000 in 2000. The largest numbers of imported cases have been recorded in continental France, the United Kingdom, Germany and Italy. Together these countries account for almost 75% of all imported cases of malaria in the WHO European Region (*41*). At present, between 10 000 and 12 000 cases of imported malaria are notified in the European Union each year, but

significant underreporting is assumed (*42*). Almost all the cases are acquired while visiting endemic areas (*43*). The ratio between *P. falciparum* malaria and other plasmodium species changed significantly during 1971–1999. From the 1970s until the early 1980s the proportion of cases with *P. falciparum* malaria constituted less than 30% in average. By 1984, however, the ratio of imported cases of *P. falciparum* infection compared with other plasmodia has begun to increase reaching almost 80% at present. Between 1990 and 2003, almost 900 people died from imported *P. falciparum* malaria in the WHO European Region. The number of deaths due to malaria increased concurrently with the steep rise in the number of imported cases of *P. falciparum* malaria at the beginning of the 1980s (*41*).

The number of malaria cases imported into France is about 5000 per year, of which vivax infections represent less than 12% (*44, 45*). The great majority of imported *P. vivax* cases (80%) are acquired in Asia, South America, Indian Ocean Islands and East Africa, and some cases are regularly observed in patients returning from central or western Africa (*46*).

Malaria is one of the most commonly imported infectious diseases in Germany. The number of imported cases increased sharply during the past twenty years totalling 1021 cases in 1996. The highest numbers were observed in Berlin (121) and Hamburg (93). In Hamburg, over 60% of the cases were non-German residents returning from international travel. *P. falciparum* accounted for 67% of all imported malaria cases reported in 1996. Cases imported into Germany originated mostly from Africa (76% in 1996) and Asia (14% in 1996). The disease had been acquired in the following countries: Ghana (136 cases in 1996), Kenya (135 cases in 1996), Nigeria (64 cases in 1996), Cameroon (50 cases in 1996) and India (43 cases in 1996). There were no obvious changes in the number of malaria cases imported from Turkey, which is of special interest because of the extensive relationship between the two countries. From 1993 to 1996, a total of 60 cases of malaria imported from Turkey were reported (*47*).

Virtually all malaria infections seen in the United Kingdom in recent years have been contracted overseas and imported into the country, apart from two cases in 1976 due to imported infected mosquitoes and occasional cases of congenital or of transfusion malaria. In 1996, 2500 cases of malaria were reported, the largest number since records began to be kept in this way 25 years ago. The peak was due to a combination of the steadily rising number of *P. falciparu*m infections with one of the cyclical peaks of *P. vivax* malaria that occur every five to eight years. A comparison of malaria reports between the last two decades shows a doubling of *P. falciparum* cases from a mean of 504 cases each year in 1977–1986 to a mean of 1086 cases each year in 1987–1996 while there was a 23% fall in all the other malarial infections combined, from 1177 to 904 each year (*48*). In 1996, 51.3% of the cases were due to *P. falciparum* and a further 1.3% were *P. falciparum* in mixed species infections. *P. vivax* accounted for 40.6%, *P. ovale* for 5.4%, and *P. malariae* for 1.4%. 96% of all cases of *P. falciparum*, 98% of cases of *P. ovale* and all cases due to *P. malariae* were contracted in Africa (mostly from western Africa), whereas 92% of the *P. vivax* cases were contracted in countries of the Indian sub-continent. Malaria in the United Kingdom is becoming an increasing problem for people of ethnic minorities. Currently 38% of the imported cases are found in people of African ethnic origin and 35% of South Asian ethnic origin, whereas only 14% appear to be of either Caucasian origin or British nationality. Deaths occur in travellers of all ethnic origins, but

people of European origin appear to be at particular risk of dying from malaria. The incidence of malaria cases seen in the United Kingdom shows annual cycles, but the patterns differ for *P. falciparum* and *P. vivax* malaria. *P. vivax* cases follow a regular curve that peaks in mid-summer. This reflects transmission in the Indian sub-continent. Cases of *P. falciparum* show two peaks – the main one following summer holiday travel and a second peak in January following Christmas holidays in Africa. The interval between returning to the United Kingdom and falling ill varies with parasite species. Over 90% of the *P. falciparum* infections are diagnosed within the first month. In contrast, less than a third of *P. vivax* infections are manifest in the first month, a similar proportion in the next five months, and another similar proportion in the subsequent six months. The remainder (7.4%) of *P. vivax* cases are first diagnosed over a year after returning to the United Kingdom (*49*).

In 1970 the World Health Organization officially declared Italy malaria free. A surveillance system was established to prevent a possible return of malaria transmission and to monitor the epidemiology of imported cases. Until 1985 less than 100 cases of imported malaria were reported every year (*50*). Since then this figure has increased constantly, reaching a peak of 973 cases in 1998 (*51*). During 1989–1998, a total of 6871 malaria cases were officially confirmed, and 6852 (99.7%) patients were infected while visiting malarious countries. During 1999–2000, a total of 2060 cases of malaria were confirmed in the country. 93% of all imported cases were patients infected in Africa, 4% in Asia, 3% in Latin America, and less than 1% in Papua New Guinea. *P. falciparum* accounted for the highest number of cases (84%), followed by *P. vivax* (8%), *P. ovale* (5%) and *P. malariae* (2%). Mixed infections accounted for less than 1% (*52*).

In parallel to what is occurring in the rest of Europe there is an increase in imported malaria in Spain: during 1994–1995 an average of 225 cases per year were declared (81% acquired in Africa) of which 42.4% occurred in Madrid. The annual incidence rate of malaria among travellers to Spain from sub-Saharan Africa could be estimated at 0.38% – 120 cases in 31 000 Spanish travellers visiting this zone each year (*28*).

THE REGIONAL ROLL BACK MALARIA STRATEGY

Amongst all health priorities of the countries in the WHO European Region, the control of infectious diseases, including malaria, is one of the highest. The WHO Regional Office for Europe has committed itself to an intensive response to the burden of malaria, and had by 1999 developed a regional strategy to Roll Back Malaria in affected countries of the European Region *(53)*. Its ultimate goal is to prevent mortality, reduce morbidity and minimize socio-economic losses provoked by the disease, through the progressive strengthening of capacities and capabilities of national health services and mobilizing community actions. The specific objectives of the regional RBM programme in the short and medium terms (2004–2009) are as follows:

- prevention of deaths caused by malaria;
- interruption of the transmission of *P. falciparum* malaria and its elimination in countries of Central Asia;
- containment and prevention of malaria outbreaks and epidemics;
- further reduction of the incidence and prevalence of malaria; and
- prevention of the re-establishment of malaria transmission and maintenance of the malaria-free status in areas and countries where it has been eliminated.

Sustaining regional programme activities beyond 2009 could reduce the impact of malaria to levels low enough to no longer represent a public health problem and, finally, eliminate the disease in malaria-affected countries of the Region.

In the WHO European Region, Roll Back Malaria focuses on addressing malaria-related issues through expansion and intensification of country-level Roll Back Malaria partnership actions; enhancing national capacities for decision-making; investing in human development and capacity building; improving capacities for early diagnosis and prompt/radical treatment of malaria; strengthening capacities for early detection, containment and prevention of outbreaks/epidemics; promoting cost-effective and sustainable preventive measures, including vector control; strengthening surveillance and operational research capabilities; ensuring community mobilization, and enhancing inter-sectoral collaborative actions *(54)*.

STRATEGY IMPLEMENTATION

GOVERNMENT AND PARTNER RESPONSE

The international and political attention that has been mobilized in recent years in malaria-affected countries of the Region is presently translated into real commitments and actions. Armenia, Azerbaijan, Georgia, Kyrgyzstan, Tajikistan, Turkmenistan, Turkey and Uzbekistan, supported by WHO and RBM partners (United States Agency for International Development (USAID), Centres for Disease Control (CDC), the European Commission's Humanitarian Aid Office (ECHO), the South-eastern Anatolia Project (GAP), UNICEF, the World Food Programme (WFP), the Italian oil and natural gas company (Eni), the International Federation of Red Cross and Red Crescent Societies (IFRC), Medical Emergency Relief International (MERLIN), Agency for Technical Cooperation and Development (ACTED), the World Bank and others), have managed to get their country RBM partnership movements off the ground. During 1999–2003, regional and national-level RBM partnership inception meetings took place in Uzbekistan, Tajikistan, Azerbaijan, Turkey, Armenia, Georgia and Kyrgyzstan. As a result, the leaders of the majority of countries confronting the resurgence of malaria and partners have committed themselves to taking all possible measures aimed at containing malaria epidemics and reducing the malaria burden *(56, 57)*.

REGIONAL RESOLUTION ON MALARIA

The malaria issue was on the agenda of the 52nd Session of the Regional Committee for Europe, which took place at the WHO Regional Office for Europe in Copenhagen, Denmark from 16 to 19 September 2002. The regional resolution "Scaling up the response to malaria in the European Region of WHO" urged Member States:

1. to ensure that concern and action to control malaria are high on the health and development agenda throughout affected countries of the Region;
2. to match their political commitments to the actual magnitude of the malaria problem in each country;
3. to ensure implementation of national malaria programmes in accordance with the regional RBM strategy, placing emphasis on the needs of populations at risk, evidence-based actions, and on more efficient use of existing tools, as well as on a firm move towards an integrated approach to malaria prevention and control within the context of health sector development; and
4. to establish, sustain and intensify actions in partnership at country level through the mobilization of external resources.

All Member States endorsed this resolution (*55*).

On 11 January 2000, a Roll Back Malaria Partnership Meeting was held in Dushanbe, Tajikistan. The objectives of the meeting were to review technical and operational modalities on dealing with malaria and to evaluate the results achieved by the National Programme of Tropical Disease Control in Tajikistan during 1997–1999; to develop a joint plan of action for the National Programme of Tropical Disease Control, including malaria control; to promote RBM country partnership actions; and to prepare a national RBM strategy for implementing cost-effective, technically sound and sustainable malaria control meas-

ures adapted to the country's conditions and responding to local needs. As an outcome of the meeting, a RBM Project Proposal of actions to be implemented in 2000–2001 was drafted. The purpose of such a document was to elicit financial support from both existing and potential donors (*58*).

On 22 March 2000, a Roll Back Malaria Partnership Meeting, organized by the WHO European Office in collaboration with the Ministry of Health of Turkey, was held in Ankara, Turkey. The purpose of this meeting was to draw up and present a RBM project proposal for implementation in Turkey during the period between 2000 and 2002. More than 180 government officials and representatives from national and international institutions, organizations and agencies as well as private companies, participated in the meeting.

On 7 December 2000, the WHO Regional Office for Europe organized an emergency Roll Back Malaria Partnership Meeting in Tbilisi, Georgia. This meeting was held in order to elicit the financial assistance necessary for containing the epidemic of malaria in the country and as a reaction to the inadequate response and insufficient financial assistance from partners/donors to cope with the malaria problem following the first WHO mission to build the Partnership for Roll Back Malaria in Georgia (November 1999). As a result of the inadequacy of measures taken the incidence of malaria had increased substantially, and the threat of malaria assuming epidemic proportions in the country was an issue to be addressed urgently. Representatives and officials participating in the meeting included those from WHO, UNDP, ECHO, USAID, UNICEF, the European Commission, GTZ Medical Project, the Embassies of France and Germany, JICA, IFRC, Save the Children, the Ministry of Labour, Health and Social Affairs, the National Centre for Diseases Control, the Parliament of Children and Youth of Georgia, the Institute of Parasitology and Tropical Medicine of Georgia, and many others. As an outcome of this meeting, a conceptual paper to serve as the basis for a Roll Back Malaria project proposal for Georgia was drafted and submitted to the Ministry of Health which distributed the project proposal to partners and potential donors.

In order to discuss the positive experience accumulated over the past years in containing malaria epidemics in Armenia and Azerbaijan, the aggravation of the malaria situation in Georgia and cross-border issues for countries of the Caucasian Region and Turkey, another Inter-Country Roll Back Malaria Partnership Meeting took place in Georgia in November 2001. Officials from Armenia, Azerbaijan, Georgia and Turkey, as well as representatives of various existing and potential RBM partners (USAID, WFP, UNDP, IFRC, MERLIN, GTZ, UNICEF, GAP, CARE and others) participated in the meeting. It was recommended to establish an inter-country working group in order to draw up a RBM project proposal for the Caucasian countries and Turkey, and to streamline approaches and mechanisms for more effective RBM partnership actions at sub-regional and country levels. All participants concurred that the steps necessary to expand and accelerate RBM efforts in solving common malaria-related problems in their respective countries should be taken, with particular emphasis placed on border areas. It was strongly emphasized that the RBM Programme of the WHO Regional Office for Europe should serve as the entity responsible for providing leadership in relation to the coordination of activities between the many acting and potential partners.

Member states affected by malaria were called upon again to ensure that concern and action to malaria control remain high on the health and development agenda. A Sub-Regional

Roll Back Malaria Partnership Meeting funded by USAID/CAR and organized by the WHO Regional Office for Europe and CDC/CAR was held in Bishkek, Kyrgyzstan from 18 to 20 March 2003. More than 150 health officials from Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan were present. Representatives from USAID/HQ and USAID/CAR, CDC/HQ and CDC/CAR, the WHO Regional Office for Europe and Kyrgyzstan, MERLIN, ACTED, the Malaria Institute/Afghanistan and other parties attended the meeting. The meeting presented a unique opportunity for participating countries, the donor community, key partners and WHO to gather together in order to promote RBM partnership action and consolidate additional support for rolling back malaria in countries of Central Asia.

A scaling up of Roll Back Malaria interventions in Central Asia followed an epidemic of malaria that occurred in the southwest region of Kyrgyzstan. In response to the epidemic, a project entitled "Roll Back Malaria in Central Asia" gained the financial support of the United States Agency for International Development (USAID). The grant, which amounts to USD 1 million, supports malaria control activities in Central Asia with particular emphasis on Kyrgyzstan and Tajikistan. A sub-regional strategy, in which baseline surveys are conducted, priority-specific constraints are identified, practical modalities for the regular cross-border exchange of information related to malaria are developed, populations at particular risk are identified and project interventions are tailored to specific countries' situations and needs, is being actively promoted through activities carried out by the Roll Back Malaria field offices funded by WHO and USAID and based in Osh, Kyrgyzstan and Dushanbe, Tajikistan. WHO provides overall technical guidance and strategic coordination of project activities in Central Asia with partners concerned. Other strategic partners within the Central Asian region – CDC, MERLIN, ACTED and UNICEF have been called upon to provide financial support and technical assistance in the establishment of sustainable malaria control and prevention programmes within the sub-region (*59, 60*).

Tajikistan shows strong political commitment to Roll Back Malaria, and national authorities work closely with the WHO Regional Office for Europe in areas of disease management, vector control, training, surveillance, operational research, health education and community participation. Roll Back Malaria activities were carried out in cooperation with the Ministry of Health and with the support of WHO, USAID, CDC, ECHO, the Governments of Norway and Italy, MERLIN, ACTED, UNICEF, WFP and other partners. During 2001–2004, a WHO Roll Back Malaria Field Office was functional in Tajikistan. The outcomes of the work done were as follows:

1. the extent of the malaria problem was evaluated;
2. surveillance mechanisms were reinforced;
3. operational research capabilities were strengthened;
4. programme management at all levels was improved; and
5. country-level RBM partnership action was scaled up.

Within the framework of a sub-regional malaria control project funded by USAID/CAR and executed by the WHO Regional Office for Europe, Tajikistan is a major beneficiary and receives technical assistance, training for malaria specialists, support in disease management and prevention as well as other forms of assistance.

Uzbekistan demonstrates strong political commitment to the Roll Back Malaria movement. At present, particular attention is paid to malaria surveillance. Epidemiological investigations of all reported cases of malaria are carried out systematically, and all malaria cases are correctly treated. Furthermore, biological means of vector control, including the use of larvae-consuming Gambusia fish, are being used in selected areas of the country. The strengthening of institutional capacities also remains a RBM country priority. A national malaria surveillance programme for 2002–2004 was drawn up in collaboration with the WHO Regional Office for Europe and is presently being implemented. The programme focuses on disease management and prevention, as well as epidemic preparedness and control. In 2002–2004 RBM activities supported by the Ministry of Health, the WHO Regional Office for Europe, USAID/CAR, CDC/CAR and MERLIN included strengthening of malaria surveillance, training of general and specialized health personnel, disease management and prevention and health education. Within the framework of a sub-regional malaria control project, Uzbekistan receives assistance in coordinating and synchronizing malaria control and preventive activities within its border areas.

Kyrgyzstan shows strong political commitment to controlling the malaria situation. In March 2003 a Regional Partnership Meeting funded by USAID/CAR and organized in collaboration with the WHO Regional Office for Europe and CDC/CAR was held in Bishkek. Health officials from Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan participated in the meeting. In response to the malaria epidemic in 2002, the WHO Regional Office for Europe opened a malaria field office in Osh, Batken Province, one of the three regions most affected by malaria. The WHO Regional Office for Europe has assisted the country in the procurement of drugs, insecticides, and microscopes, and it has supported vector control activities, including indoor residual spraying and biological control. Malaria surveillance and operational studies, including drug efficacy monitoring, have also been conducted from the Osh field office. Kyrgyzstan is a major beneficiary assistance within the framework of a sub-regional malaria control project funded by USAID/CAR and executed by the WHO Regional Office for Europe.

At present, RBM-related activities in Turkmenistan include disease management and prevention, training, surveillance, epidemic control and community involvement. The Ministry of Health, WHO and USAID provide support for this.

Turkey demonstrates strong political commitment to the RBM movement. Malaria control activities carried out from 2000 have included capacity building, disease management and prevention, operational research including drug efficacy monitoring trials, malaria surveillance, health education and community participation. At present the Ministry of Health and other governmental entities, the WHO Regional Office for Europe, UNICEF and the administration of the Southeast Anatolia Project collaborate on malaria control and prevention, particularly in the region of Southeast Anatolia.

Political commitment to the principles of Roll Back Malaria continues to grow in Georgia. In light of the heightened risk of malaria, WHO has increased its efforts towards containing outbreaks and their spread across the territory of the country. The RBM country-level movement is presently supported by the Ministry of Health and the WHO Regional Office for Europe. Interventions carried out include disease management and prevention, training, surveillance, epidemic control and operational research.

Armenia demonstrates strong political commitment to Roll Back Malaria. Malaria control activities carried out at present emphasize the training of medical and laboratory staff at all levels in the diagnosis and treatment of malaria, epidemic preparedness and control, surveillance, health education, community mobilization and intersectoral collaboration. RBM-related interventions were supported by the Ministry of Health, other governmental entities, the WHO Regional Office for Europe, UNICEF, the International Federation of Red Cross and Red Crescent Societies, and the World Food Programme. In 2003, Armenia redefined and adjusted the present malaria control strategy, objectives and approaches, bearing in mind the results achieved to date, the actual extent of the problem and potential threats in the country. A multi-sectoral approach brought together representatives from the Ministries of Health, Defence, National Security, Internal Affairs, and Agriculture, who all contributed to a comprehensive plan for malaria control and elimination.

Azerbaijan demonstrates strong political commitment to the Roll back Malaria regional movement. Malaria control activities carried out at present focus on integrated vector control measures (indoor residual spraying, environmental management, biological means of control), disease management, training, surveillance, public health education and community mobilization. Intersectoral collaboration between the Ministry of Health and other entities is essential to the consolidation of the progress made to date. Agriculture and irrigation in particular are two major issues that must be addressed to minimize vector breeding grounds. At present, RBM activities are supported by the Ministry of Health, WHO and UNICEF.

The elements of strong political will to tackle the disease at national levels, intensive support from WHO (both headquarters and the Regional Office for Europe), a high level of advocacy for action against malaria, and a broad Roll Back Malaria partnership, along with considerable financial assistance and particular focus on the malaria situations and countries' needs, have brought a substantial reduction in the number of malaria cases in the European Region over the past five years (2000–2004).

TECHNICAL GUIDANCE AND COORDINATION

The coordination of malaria control interventions, both among the Member States of the European Region themselves and the bordering countries that belong to the WHO Regional Office for the Mediterranean, has been particularly emphasized in recent years. These issues were discussed at length during a Regional Meeting of National Malaria Programme Managers from the WHO European and Mediterranean Regions, which took place in May–June 2000 in Baku, Azerbaijan *(61)*.

A Regional Meeting on Vector Biology and Control was held in May 2001 in Almaty, Kazakhstan. The objectives of the meeting were to review the current status of knowledge in the area of vector biology and control, to identify *Anopheles* species and their role and distribution in different eco-epidemiological zones of the WHO European Region. Furthermore the meeting aimed at reviewing available information on mosquito susceptibility to insecticides in the Region, and discussing existing methods and technologies for vector control – residual spraying with insecticides, biological control measures, insect growth regulators, the use of larvivorous fish, and genetic control methods and their applicability in view of different eco-epidemiological settings, economic considerations and environmental

concerns in the WHO European Region. Countries participating in the meeting included Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan, Turkey, Turkmenistan and Uzbekistan, with representatives of research institutions (Kazakhstan, The Russian Federation and Turkmenistan), the private sector (Kazakhstan), WHO staff members (WHO European Office and WHO/Kazakhstan) and observers from the Centre of Biological Control in Israel. It was recommended that WHO and malaria-affected countries should continue to work together in the planning, implementation and evaluation of vector control operations, capacity building aimed at improving knowledge and developing skills and competence in the field of medical entomology, and operational entomological research, including monitoring of resistance and irritability of local malaria vectors to insecticides *(62)*.

Taking into account the deterioration of the malaria situation in border areas of Kyrgyzstan, Tajikistan and Uzbekistan, the WHO Regional Office for Europe, in collaboration with the respective Ministries of Health, initiated and conducted a Trilateral Meeting on Malaria Control in Border Areas, which took place in Tajikistan in June 2001. The European Commission's Humanitarian Aid Office (ECHO) and Medical Emergency Relief International (MERLIN) also attended the meeting. The rationale for organizing a meeting on this topic was that it represents an issue of ever-increasing importance throughout the countries of Central Asia and Kazakhstan. The problem of border malaria is particularly acute in Kyrgyzstan, Tajikistan and Uzbekistan, all of which have already undertaken substantial efforts towards the control of malaria in their border areas. One of the major determinants of the continuing outbreaks and epidemics of malaria witnessed across Central Asia was the lack of coordination and information exchange between countries. The WHO Regional Office for Europe has taken the lead in the initiative to improve cooperation and exchange of data among these countries. The meeting was convened to review the current malaria situations in the respective countries, to identify problems and constraints encountered, to outline a direction and strategy for increased coordination of malaria control in border areas, and to discuss the modalities for a more systematic exchange of information on the malaria situation and its control/prevention, particularly in border areas. As an outcome of the meeting, it was recommended to develop and implement mechanisms for the exchange of information, to draw up standard reporting formats, to apply measures for the immediate notification of emergency situations, to develop and synchronize malaria action plans. Efforts undertaken by WHO in this regard includes assisting in working out a common strategy, taking measures to elicit financial support from potential donors, and organizing inter-country meetings to bring together key decision makers from the region *(63)*.

In July 2001 a WHO Roll Back Malaria Field Office was established in the Khatlon Region of Tajikistan. The Khatlon Region (bordering Afghanistan), with a total population of over 2 million, accounts for over 60% of the total number of malaria cases reported annually in the country. Perhaps even more alarmingly, this border region faces a growing problem with *P. falciparum* malaria. The field office was created to obtain a clearer picture of the extent of the malaria problem within the region, particularly in regards to *P. falciparum*, to reinforce surveillance mechanisms, to strengthen research capacities, to update the knowledge and practical skills of local personnel engaged in malaria control, and to improve the coor-

dination of RBM partnership actions at the peripheral level. In response of the malaria epidemic in 2002, the WHO Regional Office for Europe opened another Roll Back Malaria Field Office in March 2003 in Osh, one of the three regions most affected by malaria in the southern part of Kyrgyzstan. Within the project areas, base-line surveys were conducted, epidemiological data was collected and analysed, disease management, vector control and malaria surveillance activities were supported, public awareness measures were undertaken, and operational research, including drug efficacy monitoring was conducted. International and locally recruited project staff oversaw the project activities in both countries. The establishment of these field offices represent a truly collaborative effort between WHO, the respective Ministries of Health and numerous RBM partners – USAID/CAR, CDC/CAR, MERLIN and ACTED. Both offices will continue to be functional in 2005.

A Meeting on Epidemiological Surveillance of Malaria in Countries of Central and Eastern Europe and Selected Newly Independent States was held in Sofia, Bulgaria from 24 to 26 June 2002. Participants included representatives from 18 countries (Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, the former Yugoslav Republic of Macedonia, Germany, Greece, Hungary, Moldova, Poland, the Slovak Republic, Romania, the Russian Federation, Ukraine and Yugoslavia) and WHO senior and technical staff (WHO European Office, WHO Mediterranean Office and WHO/Bulgaria). The participants exchanged experiences on malaria surveillance and prevention and outlined a strategy for the prevention of the re-introduction of malaria and other vector-borne diseases in their countries, with particular emphasis on strengthening malaria surveillance mechanisms at country and inter-country levels *(64)*.

In Central Asia, an Inter-Country Malaria Technical Meeting with the financial and technical support of USAID/CAR, the WHO Regional Office for Europe and CDC/CAR was organized in Almaty, Kazakhstan in February 2004 at which Ministry level officials from Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan reaffirmed their commitments towards implementing malaria control and preventive measures based on well-defined national and regional priorities. Participants shared their opinions and views on the development of a practical guide for malaria control and its planning. National malaria control guidelines are being revised with assistance from the WHO Regional Office for Europe and CDC/CAR in accordance with the present malaria control objectives, situations and needs of the particular country.

A series of RBM Technical and Partnership Meetings discussing cross-border malaria issues were held in Bishkek and Osh, Kyrgyzstan, Tashkent and Andijan, Uzbekistan, and Khodjent and Dushanbe, Tajikistan in 2003 and 2004 to ensure that this process remains on track.

Taking into account the seriousness of the malaria situation in border areas of Turkey, Syria and Iraq, the WHO Regional Offices for Europe and the Mediterranean, in collaboration with the respective Ministers of Health, conducted a Trilateral Meeting on Malaria and its Control in Border Areas. At the meeting, which took place in Aleppo, Syrian Arab Republic from 20 to 22 April 2004, the current malaria situation was reviewed and problems/constraints identified. It was recommended to work out a joint plan of action to Roll Back Malaria in border areas of these countries, to exchange relevant information, to organize joint

training courses, and to support the countries in developing their proposals, including an inter-country one, to be submitted to the Global Fund to Fight AIDS, TB and Malaria (GFTAM) *(65)*.

During 2003–2004, the WHO Regional Office for Europe provided technical assistance to malaria affected countries of the Region with the drawing up of project proposals for the GFTAM. The Global Fund has given Georgia a grant of more than USD 800 000 to support the country's national response to malaria over three years (2004–2006). With a Global Fund grant of more than USD 2.5 million over five years (2004–2008), Uzbekistan will strengthen malaria control and prevention in the country. The WHO Regional Office for Europe is presently providing technical back-up to Georgia and Uzbekistan in order to strengthen capacities to plan and implement the approved Global Fund projects. In 2003–2004 the WHO Regional Office for Europe assisted potential grant recipients such as Armenia, Azerbaijan, Kyrgyzstan, Tajikistan and Turkey in the drawing up of malaria project proposals to be submitted to the GFATM.

Roll Back Malaria interventions are continuously monitored and evaluated through dialogue with national malaria counterparts, local WHO RBM focal points (Armenia, Azerbaijan, Kyrgyzstan, Tajikistan) and missions of WHO RBM programme staff and experts.

A Regional Meeting of National Malaria Programme Managers from the WHO European Region is scheduled to take place in September–October 2005 in Bishkek, Kyrgyzstan.

CAPACITY BUILDING

Within the WHO European Region, special attention is paid to training of managerial and technical staff. Over the past five years, two International Training Courses on Malaria and its Planning have taken place in Samarkand, Uzbekistan in October 2000 and Moscow, the Russian Federation in September–October 2002. Specialists from Armenia, Azerbaijan, Belarus, Bulgaria, Georgia, Kazakhstan, Kyrgyzstan, Moldova, The Russian Federation, Sudan, Tajikistan, Turkmenistan, Uzbekistan, and Vietnam have been trained in the field of malaria and its control. The World Health Organization, the Central Institute for Postgraduate Medical Training, and the Martsinovsky Institute of Medical Parasitology and Tropical Medicine organized these courses jointly, and they provided participants with updated knowledge and skills in malaria epidemiology, malaria control and planning, management and evaluation of malaria control activities.

From 4 to 13 June 2001, a Regional Study Tour on Malaria with the participation of technical staff from Georgia, Kazakhstan, Kyrgyzstan and Tajikistan was conducted by WHO in Tajikistan. The main objective of the study tour was to update knowledge and improve technical skills of staff engaged in malaria control. The tour also contained a well-organized field course the purpose of which was to introduce participants to the means by which disease management and preventive activities may be carried out under field conditions. The idea of conducting a study tour in one of the Region's most problematic areas in terms of malaria found great support from all participants. It was proposed to continue this initiative within the Region and to organize such practical exercises on a regular basis. In order to explore new situations and exchange experiences related to malaria and its control, short-term indi-

vidual visits by national malaria counterparts from Armenia, Georgia, Kyrgyzstan, Tajikistan to other affected countries of the Region were undertaken in 2001–2004.

A two-month Intensive Course of English for professionals engaged in malaria control and prevention within the countries of Armenia, Azerbaijan, Georgia, Kyrgyzstan, the Russian Federation, Tajikistan and Uzbekistan was organized in Moscow, the Russian Federation in March–April 2002.

In March–April 2004, an Inter-Country Training Workshop on Vector Biology and Integrated Vector Control was held in Dushanbe, Tajikistan. Participants included country representatives from Tajikistan, Uzbekistan, Kyrgyzstan and Kazakhstan, ACTED (Tajikistan and Afghanistan), WHO staff members (WHO European Office and WHO/Tajikistan) as well as experts from the Martsinovsky Institute of Medical Parasitology and Tropical Medicine and the Vavilov Institute of General Genetics, the Russian Federation. The workshop included an in-depth discussion on the issues of biology, taxonomy, ecology and genetics of malaria vectors. The most modern approaches and various options for vector control, including residual spraying with insecticides, biological control, insect growth regulators, larvivorous fish, genetic control methods, and impregnated mosquito nets were also thoroughly discussed.

A number of national training workshops on disease management, vector control and malaria surveillance for various categories of health personnel and entomological service staff have been carried out at country level (Tajikistan, Turkey, Turkmenistan, Uzbekistan, Kyrgyzstan, Georgia, Armenia, Azerbaijan, Bulgaria) over the past five years. Health professionals from Armenia, Uzbekistan, Tajikistan, Russian Federation and Turkey have undergone malaria-related training abroad (Switzerland, Iran, and Sweden).

Another Inter-Country Training Workshop on Malaria Surveillance is scheduled to take place in Bishkek, Kyrgyzstan in May 2005.

IDENTIFYING EPIDEMIOLOGICAL PATTERNS AND DEFINING OBJECTIVES

Malaria is a complex disease and its distribution varies to a great extent from place to place, and is governed by a variety of factors related to vectors, parasites and human populations under different geographical, ecological and socio-economic conditions. Past experience in the field of malaria control and eradication has underlined the focal nature of this disease and the desperate need for constant adjustment of malaria programmes to epidemiological and ecological patterns, which may change over time, and to the technologies and resources available. It should always be considered in the broad context of socio-economic changes.

Stratification is a very useful tool to reveal the uneven distribution of malaria and its determinants in a given territory and to subdivide malarious areas into strata with similar characteristics. The main advantage of malaria stratification is to provide a means of ensuring the adequacy of the malaria control interventions to the actual situation in a particular area. In order to simplify and better understand a complex problem and to facilitate the formulation of solutions the planning of malaria control is based on the stratification of the malaria problem in some countries of the Region.

In all affected countries of the Region malaria shows a marked focal distribution and a mixture of new and persistent malaria situations and problems. The identification of epidemio-

logical malaria settings in the Region is essential for establishing objectives and determining the most feasible national strategies and approaches, which are tailored to specific conditions and needs. At present, five types of malaria settings are identified within malaria-affected areas of Central Asia, the Trans-Caucasus and Turkey (Tab. 3 and 4). Qualitative and quantitative characteristics of malaria transmission as epidemiological indicators have been used to stratify malaria situations in the Region *(54)*. Several countries or certain parts of a country may belong to the same setting or, on the contrary, there could be different malaria settings within one country. Each setting has its own specific objectives and strategy to achieve the objectives. The gains obtained by a malaria elimination campaign in the past are still sustained in vast areas of the Region where its consolidation and maintenance phases are being applied. However, the large-scale resurgence of malaria transmission necessitated a reversion to the attack phase in other territories of the Region. Malaria control programmes are being implemented in some areas of Azerbaijan, Tajikistan and Turkey where malaria transmission was never interrupted.

STRENGTHENING DISEASE MANAGEMENT CAPACITIES

To detect malaria cases, blood slides are taken from fever-like and clinically suspected malaria cases by:

1. active case detection (ACD), which consists of screening for malaria cases through mobile malaria teams/clinics or home visits by malaria or general health staff, particularly in active malaria foci; and
2. passive case detection (PCD), which consists of screening for malaria cases at a health facility.

Some countries conduct fever and mass blood surveys to determine the extent of the malaria problem. Blood slides collected are examined at the laboratories and all laboratory confirmed cases of malaria are treated in health facilities. The organization of laboratory and curative services dealing with malaria varies from country to country. In addition, every country maintains reference laboratories at the central and sometimes at the second administrative levels. In all malaria settings, notably in the consolidation and attack phases of malaria elimination programmes, epidemiological investigation of malaria cases and their classification, with particular emphasis on *P. falciparum* malaria, are presently recommended. Malaria patients are mostly treated on an in-patient basis in settings where there is no risk of malaria or a minimal one. In areas where malaria is widespread preference is given to treatment of patients on an out-patient basis, and only patients with life-threatening disease conditions are admitted to the hospitals.

In the European Region where malaria is unstable and there is no significant immunity, the objective of malaria treatment is to obtain a parasitological and radical cure, but in settings where malaria is widespread the course of radical treatment, which lasts for 14 days, may be postponed and administered under supervision after the transmission season. In areas where autochthonous cases of *P. falciparum* are reported, it is required to supplement schizontocidal treatment of *P. falciparum* malaria with a gametocytocidal drug, usually PQ in a single dose. All parasitologically confirmed cases of *P. vivax* and *P. falciparum* malaria are treated with antimalarial drugs in accordance with national policies and guidelines for malaria treatment.

EPIDEMIOLOGICAL SETTING	GEOGRAPHICAL AREA	TYPE OF PROGRAMME AND ITS OBJECTIVES
• There is no malaria transmission • There is importation of malaria	• The entire territory of Kazakhstan • The entire territory of Kyrgyzstan except the south-western part • The entire territory of Uzbekistan except some areas bordering Tajikistan and Kyrgyzstan • The entire territory of Turkmenistan except some areas bordering Afghanistan and most likely Uzbekistan	***The maintenance phase of the malaria elimination programme:*** • To maintain the results achieved • To prevent re-introduction of malaria transmission • To prevent severe and complicated imported *P. falciparum* cases and mortality due to malaria
• *P. vivax* transmission is limited in space • Incidence of *P. vivax* is low (less than 50 per 100 000 population) • There is risk of outbreaks • There is importation of malaria	• Some areas of Uzbekistan bordering Tajikistan and Kyrgyzstan • Some areas of Turkmenistan bordering Afghanistan and most likely Uzbekistan	***The consolidation phase of the malaria elimination programme:*** • To interrupt transmission of *P. vivax* in the near future • To prevent re-introduction of malaria transmission on a large-scale basis
• *P. vivax* transmission is widespread • Incidence of *P. vivax* is moderate (from 50 to 300 per 100 000 population) • Outbreaks of *P. vivax* take place • There is importation of malaria	• Most districts in northern and western parts of Tajikistan • Some districts in central and southern parts of Tajikistan • Most districts in south-western part of Kyrgyzstan	***The attack phase of the malaria elimination programme:*** • To reduce the incidence of *P. vivax* in the near future • To interrupt transmission of *P. vivax* in the foreseeable future • To prevent re-introduction of *P. falciparum* transmission
• *P. vivax* transmission is widespread • Incidence of *P. vivax* is high (more than 300 per 100 000 population) • *P. falciparum* transmission is limited in space • Outbreaks of *P. vivax* and *P. falciparum* take place • Endemic malaria is present	• Most districts in central and southern parts of Tajikistan, particularly those bordering Afghanistan	***Malaria control programme :*** • To prevent severe and complicated *P. falciparum* and mortality due to malaria • To reduce the incidence of *P. vivax* in the near future • To interrupt transmission of *P. falciparum* in the near future • To reduce number of active foci of *P. vivax* in the foreseeable future
• There is imported malaria only	Mountain and arid areas	***Programme in originally non-malarious (non-receptive) areas:*** • To prevent severe and complicated imported *P. falciparum* malaria and mortality due to malaria

Table 3; Epidemiological settings, type of malaria programme and its objectives in Central Asia and Kazakhstan

Table 4; Epidemiological settings, type of malaria programme and its objectives in the Trans-Caucasian countries and Turkey

EPIDEMIOLOGICAL SETTING	GEOGRAPHICAL AREA	TYPE OF PROGRAMME AND ITS OBJECTIVES
• There is no malaria transmission • There is importation of malaria	• The entire territory of Armenia except some areas bordering Turkey and Azerbaijan • The entire territory of Georgia except some areas bordering Azerbaijan • The entire territory of Turkey except its south-eastern areas	***The maintenance phase of the malaria elimination programme:*** • To maintain the results achieved • To prevent re-introduction of malaria transmission • To prevent severe and complicated imported *P. falciparum* cases and mortality due to malaria
• *P. vivax* transmission is limited in space • Incidence of *P. vivax* is low (less than 50 per 100 000 population) • There is risk of outbreaks • There is importation of malaria	• Some areas of Armenia bordering Turkey and Azerbaijan • The entire territory of Azerbaijan except Lenkoran and Kura-Araksin lowlands	***The consolidation phase of the malaria elimination programme:*** • To interrupt transmission of *P. vivax* malaria in the near future • To prevent re-introduction of malaria transmission on a large-scale basis
• *P. vivax* transmission is widespread • Incidence of *P. vivax* is moderate (from 50 to 300 per 100 000 population) • Outbreaks of *P. vivax* take place • There is importation of malaria	• Most districts in eastern part of Georgia bordering Azerbaijan • Most districts in Lenkoran and Kura-Araksin lowlands • Some districts in south-eastern part of Turkey	***The attack phase of the malaria elimination programme:*** • To reduce the incidence of *P. vivax* malaria in the near future • To interrupt transmission of *P. vivax* malaria in the foreseeable future
• *P. vivax* transmission is widespread • Incidence of *P. vivax* is high (more than 300 per 100 000 population) • Outbreaks of *P. vivax* take place • Endemic malaria is present	• Most districts in Lenkoran and Kura-Araksin lowlands • Some districts in south-eastern part of Turkey	***Malaria control programme:*** • To reduce the incidence of *P. vivax* in the near future • To reduce number of active foci of *P. vivax* in the foreseeable future
• There is imported malaria only	Mountain and arid areas	***Programme in originally non-malarious (non-receptive) areas:*** • To prevent severe and complicated imported *P. falciparum* and mortality due to malaria

In case of *P. vivax* malaria, radical treatment with CQ and PQ is recommended, but it is quite problematic to ensure that all malaria patients complete the full course of anti-relapse treatment with PQ, if supervision is inadequate.

Since the frequency of clinical and parasitological failures following CQ has become unacceptably high in Tajikistan, CQ is no longer recommended for treatment of uncomplicated *P. falciparum* malaria in affected countries of the Region. First of all, it concerns countries of Central Asia where the first case of autochthonous *P. falciparum* malaria was reported in the southern part of Kyrgyzstan in 2004, and there is a suspicion that this type of malaria may have surfaced in Uzbekistan. Drug efficacy monitoring trials have been carried out in Azerbaijan, Georgia, Kyrgyzstan, Tajikistan and Turkey (see Focussed research and development), and the updating of national antimalarial treatment guidelines is based on the results thereof. In Tajikistan where there is a relatively high degree of resistance of *P. falciparum* malaria to CQ and treatment failure rates with sulfadoxine-pyrimethamine (S-P) is about 15 %, the combination of artemisinin derivatives with S-P is recommended for the treatment of uncomplicated *P. falciparum* malaria.

Presumptive treatment with CQ is recommended for persons presumed to have or suspected of having malaria. The objective of this treatment is to relieve symptoms or prevent transmission until the diagnosis is confirmed and the patient radically treated. Mass drug administration (MDA), meaning the distribution of antimalarial drug(s) (CQ, PQ, PYR etc.) to every individual in a given population, does not interrupt malaria transmission, but entails a noticeable reduction in parasite prevalence and also has a marked transient effect on malaria-related morbidity and mortality *(66)*. MDA is recommended in situations where the consolidation and attack phases of malaria elimination programmes have been implemented. At present, it can be considered under the following circumstances in areas with a limited season of malaria transmission:

1. when small foci of malaria continue to exist after transmission has been interrupted elsewhere;
2. when an outbreak is reported in the consolidation and attack phases – in addition to insecticide spraying and other measures; and
3. when residual insecticide spraying does not fully interrupt transmission in the attack phase – in addition to spraying and other measures.

There are, however, numerous difficulties connected with the use of mass drug administration. It is therefore not a procedure that should be adopted without very careful consideration.

EPIDEMIC PREPAREDNESS AND RESPONSE

Malaria epidemics and the health and socio-economic consequences in the WHO European Region are linked to the introduction of malaria carriers, often asymptomatic, to malaria-free yet receptive areas in which favourable conditions for malaria transmission exist (Armenia, Azerbaijan, Georgia and Kyrgyzstan) and where seasonal labour migration of non-immune individuals into endemic areas (Turkey) occur. In both cases, non-immune people exposed to *P. vivax* malaria suffer a serious deterioration in their health status even though *P. vivax* is not directly fatal. Since transmission in these areas is markedly seasonal and people seldom ac-

THE EVOLUTION OF MALARIA EPIDEMIC AND ITS CONTROL IN KYRGYZSTAN

While in May 2002 just one district was affected, the epidemic assumed greater proportions as it spread across the south-western part of Kyrgyzstan, and by July, the number of affected districts had increased to five. By the end of August, malaria cases had been reported from eight districts, and the incidence rate had reached 50 or more per 100 000 population in five districts. Most cases were registered in areas bordering Uzbekistan. By the end of 2002, 2712 cases of *P. vivax* malaria had been reported in Kyrgyzstan. This figure contrasted sharply with the total number of reported cases for 2001, when only 15 autochthonous cases of malaria were registered. In 2003, as a result of the large-scale deployment of epidemic control interventions (reinforced surveillance, targeted indoor residual spraying, improved disease management) within malaria-affected areas, supported by the WHO Regional Office for Europe and USAID/CAR, a substantial decrease in the reported number of malaria cases was observed - 465 (Fig. 6).

quire immunity, morbidity rates are highest at the time of greatest need for agricultural work.

Explosive epidemics and outbreaks in Tajikistan, Azerbaijan, Armenia, Turkmenistan, Georgia and, most recently, in Kyrgyzstan, have revealed that basic preparedness and rapid response mechanisms were not in place in epidemic-prone areas, and the countries were unable to detect malaria cases early and react quickly to emergencies. As a result, the countries have put forth enormous efforts and resources in order to cope with these abnormal situations. During the last years selective indoor spraying with residual pyrethroid-based insecticides, as a major part of epidemic containment measures, was applied in order to make countries capable of coping with epidemic and outbreak situations. Recently most epidemic-prone situations have been identified, emergency preparedness has been improved and mechanisms of response to malaria epidemics and outbreaks have been activated. Specialized and general health staff has been trained to recognize epidemic situations and mobilize required support for epidemic control. However, all epidemic-prone countries of our region continue to struggle with inadequate local capacities to work out contingency plans for epidemic control and maintain the reserve of insecticides, drugs and spraying equipment for rapid deployment. Steps are being taken presently to set up epidemic surveillance mechanisms in order to forecast and prevent any abnormal situation related to malaria.

PROMOTING INTEGRATED VECTOR CONTROL

Vector control methods presently available differ widely in their technical feasibility and operational applicability, the extent, rapidity and duration of their impact on malaria situations, their cost-effectiveness and resource requirements. Some of them need substantial financial support while other vector control options have to rely heavily on community participation. Vector control measures are aimed at reducing larval abundance, vector density, the vector life span and adult survival, and man-vector contact.

Selective indoor residual spraying, as the main vector control approach, is currently applied in affected areas where malaria incidence is high, autochthonous *P. falciparum* malaria is reported, declining efficacy of antimalarial drugs is observed, outbreaks/epidemics of malaria take place, and in project development sites (Tab. 5). Larvivorous fish are used to control ma-

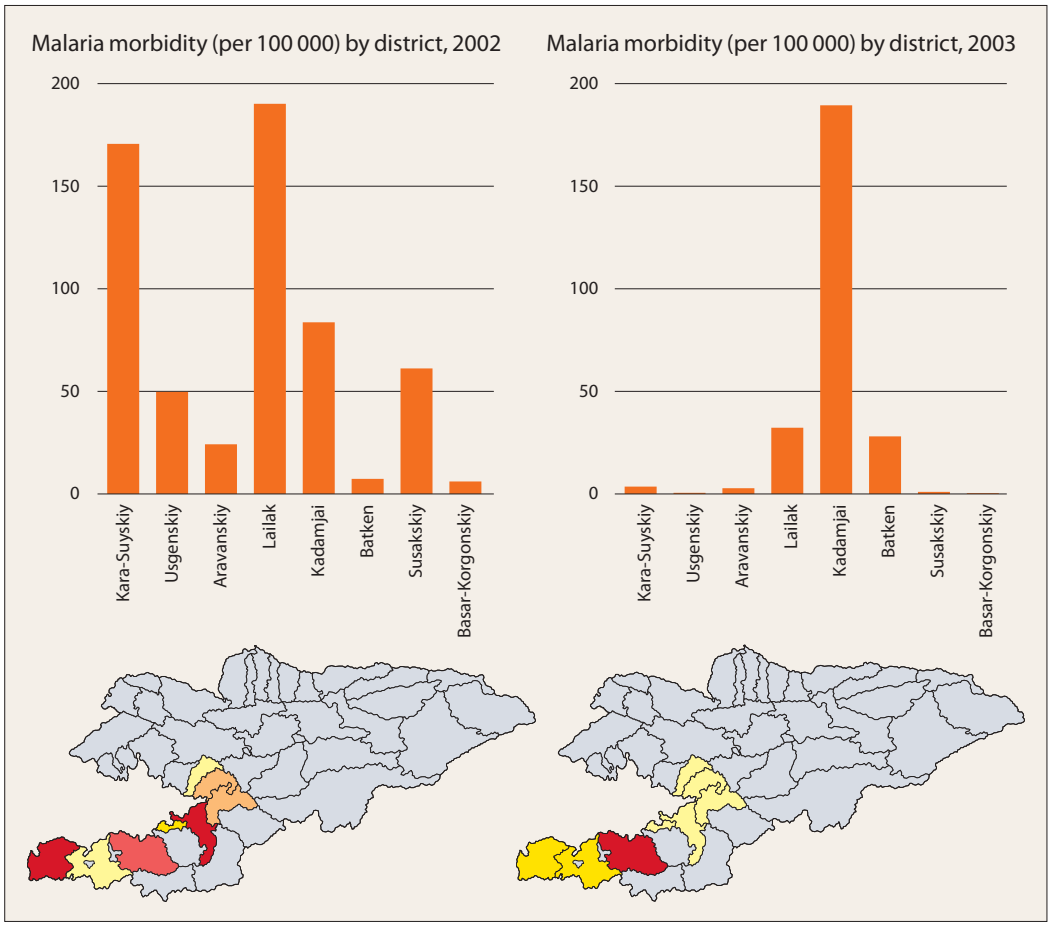


Fig. 6; Malaria morbidity in Kyrgyzstan by district, 2002–2003

Source: Roll Back Malaria, WHO Regional Office for Europe, 2004

laria in all malaria affected countries of the Region. Each national programme in the Region reviews its vector control activities to consider alternative vector control options, in order to apply an integrated approach towards cost-effective and sustainable vector control. The use of predatory fish and impregnated mosquito nets are combined with indoor residual spraying in some areas of Tajikistan and Kyrgyzstan while the latter is applied successfully along with environmental management measures in Azerbaijan. Impregnated mosquito nets are being promoted, along with the use of larvivorous fish (in rice fields) in endemic settings and against outdoor-resting *Anopheles* species in some Central Asian republics.

REINFORCING MALARIA SURVEILLANCE.

Malaria surveillance, which can be defined as the systematic collection, analysis and interpretation of malaria-related data, aims to support the planning, implementation and evaluation of public health interventions and programmes related to malaria. Information and reporting systems are considered as integral parts of the surveillance. All countries of the region have malaria surveillance systems in place. Malaria surveillance is presently conducted to report on the number of deaths due to malaria, microscopically confirmed cases by malaria species and their epidemiological classification (autochthonous: introduced, indigenous and relapsing

cases or imported or induced cases). All autochthonous and imported cases are classified by gender and age groups. Member States are also requested to report on the total number of imported malaria cases by species of malaria parasite, by continent and country where malaria was acquired and by population groups: immigrants, refugees, temporary employed professionals and laborers, students, military personnel, tourists, and sea and air crew. All malaria data collected by the respective Ministries of Heaths are sent to the WHO Regional Office for Europe on an annual basis. The received information is categorized according to the five impact indicators, and is incorporated into the regional computerized information system for infectious diseases (CISID):

1. autochthonous malaria cases;
2. deaths due to malaria;
3. imported malaria cases;
4. imported *P. falciparum* cases; and
5. total malaria cases.

Table 5; The use of insecticides in malaria affected countries of the WHO European Region, 2000–2004

COUNTRY	YEAR	CLASS OF INSECTICIDES	AMOUNT OF FORMULATION USED (KG OR L)
Georgia	2002	Pyrethroid	471
	2003	Pyrethroid	200
	2004	Pyrethroid	200
Azerbaijan	2000	Pyrethroid	2 000
	2001	Organophosphate	3 480
	2002	Pyrethroid	1 570
Kyrgyzstan	2002	Organophosphate	500
	2002	Pyrethroid	100
	2003	Pyrethroid	500
	2004	Pyrethroid	1 000
Tajikistan	2000	Organophosphate	7 000
	2001	Pyrethroid	2 000
	2002	Pyrethroid	2 000
	2003	Pyrethroid	2 000
	2004	Pyrethroid	1 800
Turkmenistan	2000	Pyrethroid	400
	2000	Organophosphate	2 000
	2000	Carbamate	2 000
Armenia	2001	Pyrethroid	500
Turkey	2000	Organophosphate	18 500
	2000	Insect Growth Regulator	8 000
	2001	Pyrethroid	5 000
	2001	Organophosphate	9 000
	2001	Insect Growth Regulator	8 500
	2002	Pyrethroid	8 000
	2002	Organophosphate	13 000
	2002	Insect Growth Regulator	3 000
	2003	Pyrethroid	5 000
	2003	Organophosphate	32 000
	2003	Insect Growth Regulator	8 000

At the stage where the number of malaria cases becomes low, as observed in a number of affected countries of the Region, the use of the conventional malariometric indicators, like API (Annual Parasite Incidence) often becomes meaningless, and the main question is then to ascertain whether malaria transmission is still taking place in a given area. At this stage all the cases that are reported should be subject to epidemiological investigation. This procedure is not mandatory in areas where the interruption of malaria transmission is not envisaged. The result of the investigation is an epidemiological diagnosis of each malaria case in terms of its place, time and source. The presence of particular categories of cases is the basis for classification of malaria foci. A malaria focus is defined as "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" *(67)*. This concept is crucial for those malaria control programmes that aim at a limitation or interruption of malaria transmission (all malaria affected countries in the WHO European Region), since the focus as a minimum entity is the object of malaria action. The identification and monitoring of the functional status of malaria foci is a cornerstone for success in the interruption of malaria transmission or prevention of its reintroduction. A WHO classification of malaria foci classifies foci depending on (1) their age – residual versus new, and (2) the presence of malaria transmission – non-active versus active versus potential. As a result, it distinguishes the following types of foci:

1. **residual:**
   - non-active (transmission interrupted; no indigenous cases, but possible occurrence of relapsing ones);
   - active (transmission not interrupted);
2. **new:**
   - potential (presence of imported cases; no evidence of transmission, but its renewal possible);
   - active (renewed transmission), which can be sub-divided into two categories (a), in which only introduced cases are present or where malaria has already been established, and (b) where indigenous cases are present.

Status of every focus should be periodically reviewed and re-categorized when necessary. This approach is being implemented by a number of countries in the European Region (Fig. 7).

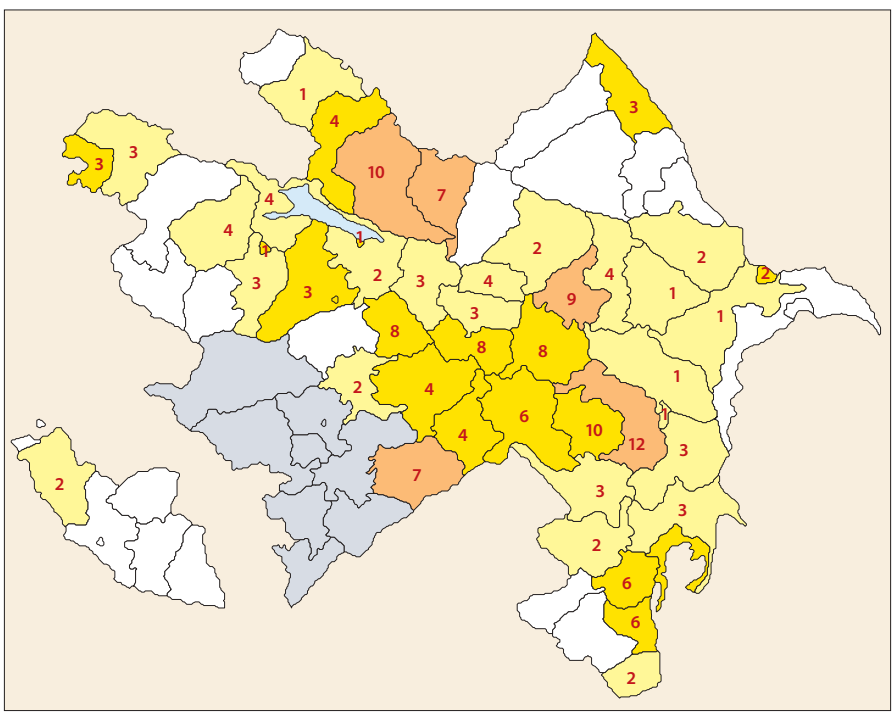


Figure 7;
Number of reported malaria cases and residual active foci of malaria by district in Azerbaijan, 2003

Source: Roll Back Malaria, WHO Regional Office for Europe, 2004

In order to monitor the evolution of the malaria situation in a given setting and to evaluate outcomes of control measures being implemented, base-line surveys to assess problems and needs related to malaria and impact surveys to measure progress and assess achievements are being carried out, and mechanisms for regular collection and analysis of operational, epidemiological and socio-economic data relevant to malaria are presently being reinforced by a number of countries.

ADVOCACY WORK AND PUBLICATIONS

A number of advocacy materials and news bulletins on progress with rolling back malaria in Europe and innovative tools, including CDs on the topics of the determination of transmission seasons, distribution of malaria vectors in Europe, and reference abstracts on *P. vivax* malaria (1970–2000) have been produced and distributed. Information, communication and educational materials related to malaria control and prevention have been designed, produced, and disseminated by a number of national malaria programmes within their respective countries. Substantial effort has been directed towards the preparation and publication of technical reports and practical guidelines and manuals on malaria and its control (Tab. 6).

Table 6; RBM advocacy materials and publications in the WHO European Region, 2000–2004

YEAR	ADVOCACY MATERIALS AND TECHNICAL DOCUMENTS AND REPORTS	PRACTICAL GUIDES AND INSTRUCTION MANUALS
2000	1. Second Interregional Malaria Coordination Meeting, report on a WHO coordination meeting (English), Baku, Azerbaijan 2. Progress with Roll Back Malaria in the WHO European Region (English and Russian), WHO Regional Office for Europe 3. Rolling Back Malaria in Azerbaijan, Progress Report, Ministry of Health of Azerbaijan and WHO Regional Office for Europe	1. Malaria Microscopy (Russian), first edition, WHO Regional Office for Europe
2001	1. Progress with Roll Back Malaria in the WHO European Region, Regional and Country Updates (English), WHO Regional Office for Europe 2. Malaria vectors and approaches to their control in malaria affected countries of the WHO European Region, (Almaty, Kazakhstan), proceedings of a regional meeting on vector biology and control (English and Russian), WHO Regional Office for Europe 3. Malaria Border Coordination Meeting (Dushanbe, Tajikistan), report on a WHO inter-country meeting (English and Russian), WHO Regional Office for Europe 4. Roll Back Malaria in the Trans-Caucasian countries and Turkey, Project Documents 2000–2005 (English), WHO Regional Office for Europe	1. CD-ROM on *Plasmodium vivax* malaria, Reference abstracts 1970–2000 (English), WHO Regional Office for Europe 2. CD-ROM on the Mosquitoes of Europe (English and French), WHO Regional Office for Europe and Ministry of Labour of France 3. CD-ROM on Malaria Sporogony Assessment Model (MALSAM), WHO Regional Office for Europe

Table 6; continued

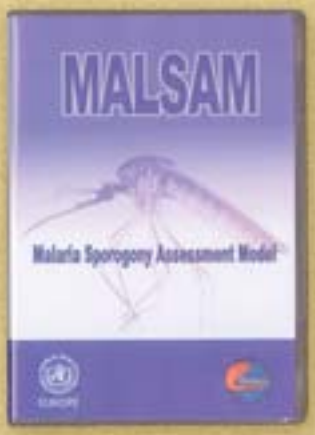
YEAR	ADVOCACY MATERIALS AND TECHNICAL DOCUMENTS AND REPORTS	PRACTICAL GUIDES AND INSTRUCTION MANUALS
2002	1. Roll Back Malaria in Central Asia and Kazakhstan, Project Documents 2000–2005 (English), WHO Regional Office for Europe 2. Roll Back Malaria Highlights 2000–2001 (English), WHO Regional Office for Europe 3. Malaria outbreak in Kyrgyzstan, CD News, Communicable Disease Report, No. 29, October, WHO Regional Office for Europe 4. Agricultural Development and its Impact on Malaria in Azerbaijan, project report (English), WHO Regional Office for Europe and International Service for National Agricultural Research (ISNAR) 5. Epidemiological Surveillance of Malaria in Countries of Central and Eastern Europe and Selected Newly Independent States (Sofia, Bulgaria), report on a WHO inter-country meeting (English), WHO Regional Office for Europe 6. Scaling up the Response to Malaria in the European Region of WHO, Regional Resolution, EUR/RC52/ Conf.Doc./7, Regional Committee for Europe, Fifty-second session, WHO Regional Office for Europe	1. Experience and Perspectives of the Use of Larvivorous Fish for Malaria Control (Russian), by M. Artemiev, WHO Regional Office for Europe
2003	1. Scaling up the response to malaria in the European Region of WHO, CD News, Quarterly Communicable Disease Report, No. 32, December, WHO Regional Office for Europe	1. Malariology, Second Edition (Russian), by A. Lysenko, A. Kondrachine & M. Ejov, WHO Regional Office for Europe 2. Vectors of Malaria in the Newly Independent States (Russian), by A. Zvantsov, M. Ejov & M. Artemiev, WHO Regional Office for Europe 3. Malaria Microscopy (Russian), Second edition, WHO Regional Office for Europe
2004	1. Imported malaria and the risk of malaria reintroduction in Europe, CD News, Quarterly Communicable Report, No. 34, August, WHO Regional Office for Europe 2. Implementation of Geographic Information System (GIS) for malaria surveillance and control activities in Kyrgyzstan, CD News, Quarterly Communicable Report, No. 35, December, WHO Regional Office for Europe 3. Malaria cross-border coordination meeting: Iraq, the Syrian Arab Republic and Turkey, CD News, Quarterly Communicable Report, No. 35, December, WHO Regional Office for Europe 4. Strengthening institutional capacities of national malaria control programmes, CD News, Quarterly Communicable Report, No. 35, December, WHO Regional Office for Europe	1. The Vector-Borne Human Infections of Europe, Their Distribution and Burden on Public Health (English), by N. Gratz, WHO Regional Office for Europe 2. Training guide on malaria for public health personnel (Russian), by A. Beljaev, T. Avdukhina, A. Zvantsov & M. Ejov, WHO Regional Office for Europe 3. Practical guide on malaria surveillance (Russian), by A. Beljaev, A. Zvantsov & M. Ejov, WHO Regional Office for Europe 4. Integrated approach to vector control, by A. Zvantsov & M. Ejov, WHO Regional Office for Europe

Advocacy work and publications

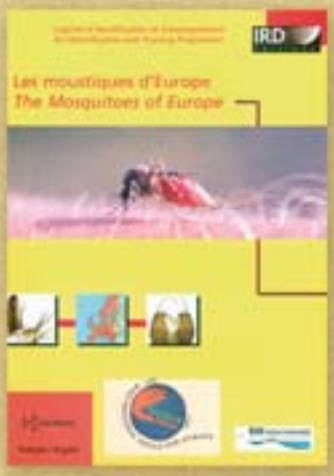
The regional RBM web site (www.euro.who.int/malaria), launched in August 2002.

Training guide on malaria for public health personnel (Russian). By A. Beljaev, T. Avdukhina, A. Zvantsov & M. Ejov. World Health Organization, Regional Office for Europe, Copenhagen, 2004

Plasmodium vivax malaria: Reference abstracts 1970-2000, CD ROM (English). World Health Organization, Regional Office for Europe, Copenhagen, 2001



MALSAM: Malaria Sporogony Assessment Model, CD ROM (English). World Health Organization, Regional Office for Europe, Copenhagen, 2001



The mosquitoes of Europe, CD ROM (English/French). Institut de recherche pour le développement, EID Mediterranée, Ministère de l'Emploi et de la Solidarite & WHO Regional Office for Europe, 2002

Experience and Prospects of the Use of Larvivorous Fish for Malaria Control (Russian). By M. Artemiev.World Health Organization, Regional Office for Europe, Copenhagen, 2002

Vectors of Malaria in the Newly Independent States (Russian). By A. Zvantsov, M. Ejov & M. Artemiev. World Health Organization, Regional Office for Europe, Copenhagen, 2003

Malariology (Russian), Second edition. By A. Lysenko, A. Kondrachine & M. Ejov. World Health Organization, Regional Office for Europe, Copenhagen, 2003

Malaria in Europe, 1970-2000 (Russian). By V. Sergiev, A. Baranova, G. Majori & M. Ejov. World Health Organization, Roll Back Malaria, Geneva in collaboration with the WHO Regional Office for Europe, 2004

Malaria microscopy (Russian), Second edition. World Health Organization, Regional Office for Europe, Copenhagen, 2003

The Vector-Borne Human Infections of Europe, Their Distribution and Burden on Public Health (English). By N. Gratz. World Health Organization, Regional Office for Europe, Copenhagen, 2004

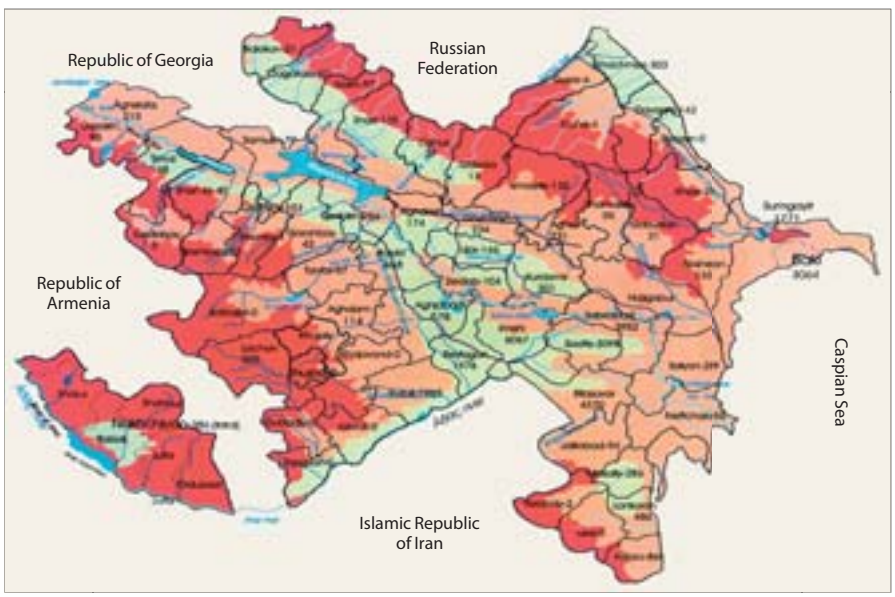
FOCUSSED RESEARCH AND DEVELOPMENT

From 17 to 21 September 2001, representatives from Armenia, Bulgaria, Georgia, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan, Turkmenistan and Uzbekistan participated in a Regional Workshop on Study Design and Research Methodology, held in Tashkent, Uzbekistan. The workshop was organized in collaboration with RBM WHO/headquarters, UNICEF, UNDP, the World Bank, and WHO/Special Programme for Research and Training in Tropical Diseases (TDR). The purpose of this workshop was to revise and finalize the proposals submitted to the 2001 TDR Call for Grant Applications and to develop competence in drafting operational research designs and protocols related to malaria, its control and prevention. During the workshop, facilitators offered instructions and hands-on guidance to ensure the revised versions of the proposals were up to standard in terms of conceptual framework, research objectives, methods, indicators, work plans and budgets. Over the long term, it is hoped that the outcome of the work-

AGRICULTURAL DEVELOPMENT AND ITS IMPACT ON MALARIA IN AZERBAIJAN

The association between agricultural practices and malaria was the focus of a joint project conducted by the International Service for National Agricultural Research (ISNAR) and the WHO Regional Office for Europe. Although the reported number of malaria cases in Azerbaijan has been declining since 1996, the conditions suitable for the spread of malaria still prevail. The re-distribution of land into small private farms and a re-orientation of cropping patterns from fruits and vegetables towards cereals, rice and cotton could have serious implications on the resurgence of malaria. The project findings have shown associations between changes in agricultural practices and malaria, envisage their possible short- and long-term effects, and propose strategies for improved environmental management and cost–effective vector control to the mutual benefit of both agricultural development and the health of the population (Fig. 8, 9 and 10).

Figure 8; Agricultural and irrigated land



Source: Joint project of ISNAR and WHO Regional Office for Europe, 2002

shop will be a strengthening of national research capabilities, increased competence on the part of malaria staff and research personnel, as well as the creation of a network for control-oriented research on malaria and other tropical diseases in the European Region.

The 1st International Workshop "Vector-Borne Diseases and Problems of Genetic Safety" funded by the WHO Regional Office for Europe and organized in collaboration with the Vavilov Institute of General Genetics took place in Moscow from 6 to 12 October 2002.

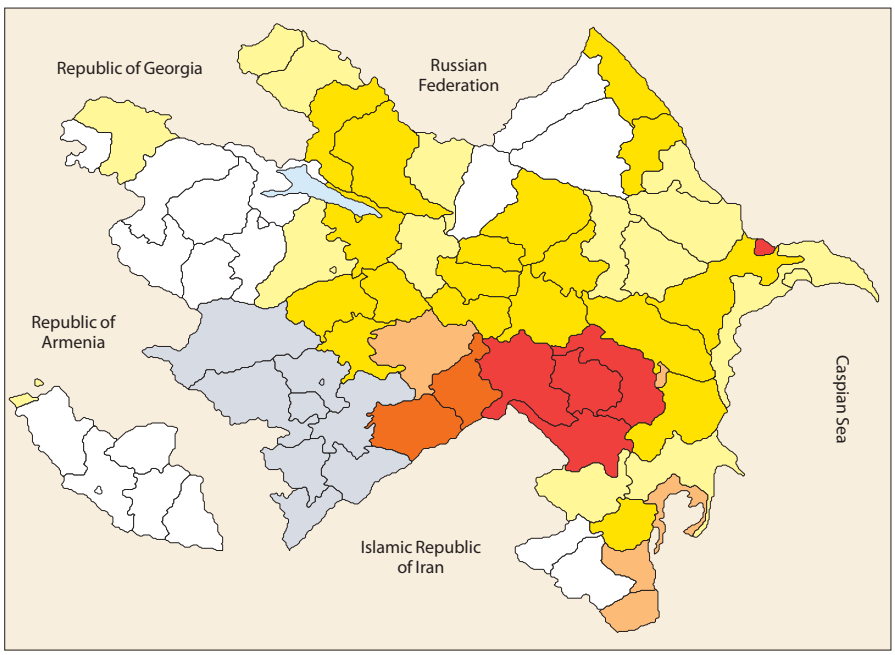


Figure 9;
Number of reported malaria cases by district in Azerbaijan, 1996

Number of malaria cases

- >1000 cases
- 500–1000
- 100–500
- 10–100
- ≤10
- No cases
- No data available

Source: Roll Back Malaria, WHO Regional Office for Europe, 2004

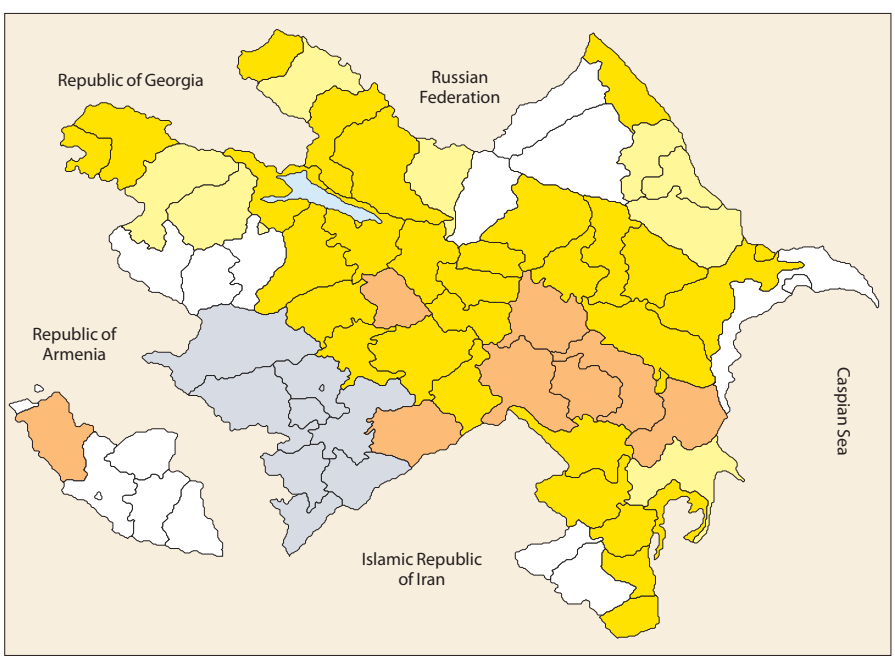


Figure 10;
Number of reported malaria cases by district in Azerbaijan, 1999

Number of malaria cases

- 100–500
- 10–100
- <10
- No cases
- No data available

Source: Roll Back Malaria, WHO Regional Office for Europe, 2004

Participants from Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan and Uzbekistan along with representatives from TDR/WHO headquarters and the WHO Regional Office for Europe, as well as international experts from USA, Israel, Kazakhstan, the Russian Federation and other countries attended the workshop *(68)*. Representatives from the WHO Regional Office for Europe participated in THE 2ND WORKSHOP organized by the Vavilov Institute of General Genetics on the same subject which was held in Moscow in FEBRUARY 2004.

GIS and malaria in Kyrgyzstan

Each malaria situation, which varies intensively from one place to another, requires an appropriate response that has to be based on a realistic assessment of the local situation. The computer-adapted geographic information system (GIS) can serve as a common platform for the convergence of such multisectoral information and is a powerful evidence-based tool for action by decision-makers. GIS offers the ability to process, display, and analyse data beyond the capacity of any manual system. Bringing together data leads to new insights for control strategies and new possibilities for monitoring. Recent explosive epidemics of malaria have become a serious concern in the southern part of Kyrgyzstan. The government's approach to malaria epidemics is based on the notion of targeted and site-specific vector control measures. Localities with high rates of malaria need to be carefully delineated so that appropriate control activities can be directed towards the populations at risk. Until the introduction of GIS, the regional health authorities and specialized staff dealing with malaria in Osh, Batken and Jalal-Abad have had no systematic approach to tracking the geographic spread of malaria, and no accurate environmental health maps of a scale that can be used for planning of malaria control. The GIS-based mapping has enabled the local health authorities to trace the evolution of the malaria problem and identify highly affected areas where epidemic control should be applied (Fig. 11).

Assessments of antimalarial drug efficacy for the treatments of uncomplicated *falciparum* and *vivax* malaria in countries of the WHO European Region have been conducted over the past three years funded by RBM/WHO headquarters and executed by RBM/WHO Regional Office for Europe. The results have shown that there are no signs of CQ resistance in *P. vivax* malaria in Georgia, Azerbaijan, Tajikistan and Kyrgyzstan *(69)*, but there is a suspicion of *P. vivax* CQ failures in Turkey. CQ treatment is associated with high treatment failures and the cure rates of *P. falciparum* with CQ has become low (44%) in Tajikistan. A moderate degree of resistance of *P. falciparum* malaria to sulfadoxine-pyrimethamine (16%), which has never been officially recommended as the second-line drug for the treatment of uncomplicated *P. falciparum* malaria, has been reported in Tajikistan.

Polymerase chain reaction (PCR) assays are the most sensitive and specific methods to detect malaria parasites, and have acknowledged value in research settings. In a study conducted in malaria affected areas of Central Asia, 500 blood samples from patients with clinically suspected malaria were tested by PCR-hybridization assay, and compared with the results of light microscopy. By light microscopy, *P. vivax* and *P. falciparum* were detected in 64 specimens (12.8%) while by PCR assay *P. vivax* and *P. falciparum* parasites were found in 186 specimens (37.2%). This study shows that the reservoir of infection in the central Asian region is much larger than what the official data available indicates. Approximately 55% of 250 blood sam-

ples taken in an endemic setting in Tajikistan were detected as malaria positive by PCR assay while only 10% of them had been detected as true cases of malaria by light microscopy. In Kyrgyzstan, faced with the recent return of malaria, 20% and 5% of 250 blood samples taken

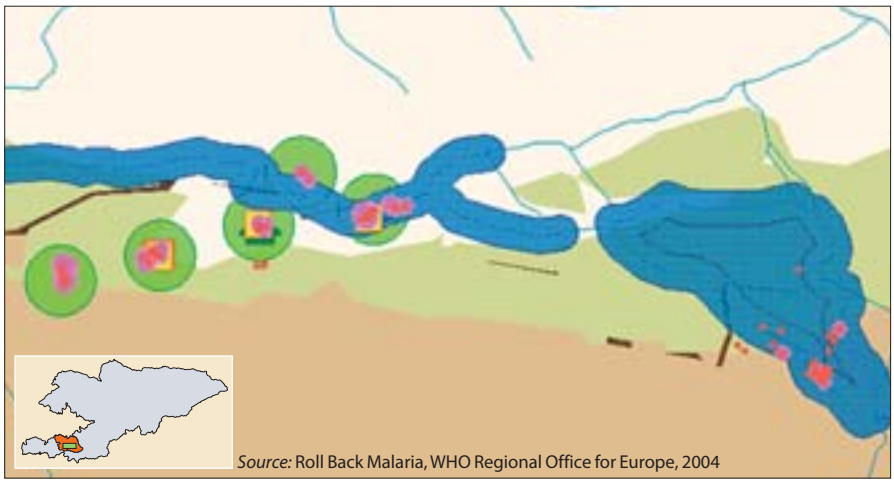


Figure 11; Households affected by malaria in the Kadamjai district, Kyrgyzstan, 2000–2003

from clinically suspected cases were detected with malaria parasites by PCR and light microscope, respectively.

Another study included the analysis of genetic structure of different *Anopheles* species in Central Asia. The method of random amplified polymorphic DNA (RAPD) was used for genome testing and estimation of population genome structure. Seven populations of *An. superpictus* and two populations of *An. pulcherimus* exhibit significant heterogeneity across their population range in countries of Central Asia. Genetic linkage distances were calculated using the 15 RAPD-locus analysis. Genetic differences between populations agree with their geographic distribution. In Central Asia and Kazakhstan, *An. maculipennis*, *An. martinius* and *An. messeae* are ecologically isolated, and the limits of their distribution within Uzbekistan, Tajikistan, Kyrgyzstan and Kazakhstan are poorly known. The morphological identification of these species is undeveloped. The elaboration of molecular diagnostic methodology may help to define the current ecology, distribution and epidemiological significance of these species. Comparison of the ITS2 structure of *An. maculipennis* populations and the sequences in GeneBank has shown that *An. maculipennis* is the predominant vector in the northern part of Tajikistan. It is the first time this species has been found in this part of Tajikistan *(70)*. By means of PCR, the molecular diagnostics of *An. maculipennis*, *An. messeae*, *An. beklemishevi*, *An. claviger* and *An. plumbeus* have been worked out. The ITS2 regions of *An. beklemishevi* and *An. plumbeus* were sequenced for the first time. Molecular and cytogenic data from Central Asia suggest a new species of *An. artemievi*, which is closely allied to *An. messeae*, in the *An. maculipennis* species complex. This species was found in the territories of Osh, Batken and Jalalabad regions, where malaria epidemics occurred during 2002–2003. Further research on the species composition of malaria mosquitoes may contribute to a better understanding of malaria vector populations and their epidemiological role.

REMAINING CHALLENGES

The National Malaria Programmes of the Member States face many problems and constraints of technical, operational, administrative and managerial nature for the implementation of their activities.

Major technical problems include:

1. occurrence and spread of *P. falciparum* resistance to CQ and S-P in Tajikistan, and most probably in neighbouring countries of Central Asia;
2. agricultural malpractices resulting in an increase in vector breeding;
3. an increase in importation of malaria into malaria-free areas, primarily by imported labour force and displaced populations.

The latter problem is of a particular interest in the WHO European Region. Cross-border population movements of people, including asymptomatic carriers of malaria, seeking employment are a major source of importation of *P. vivax* and *P. falciparum* malaria and their re-introduction into new receptive territories.

Operational problems and administrative and managerial constraints, listed below, are present at various degrees in all malarious countries of the Region, but they are particularly acute in the countries with the highest burden of malaria:

- the toll of malaria is underestimated, and there is a huge gap between the reported and the actual number of malaria cases. There are unreliable population denominators and administrative data;
- malaria is a focal problem, and ad hoc surveys may not be nationally representative;
- poor rapid assessment capacities to detect abnormal malaria situations at country level;
- a lack of epidemic preparedness, including shortages of insecticides and spraying equipment for epidemic control;
- under-staffing of national parasitological and entomological services;
- shortages of qualified trainers at country level;
- a lack of malaria surveillance, including routine monitoring;
- a lack of knowledge in research methodology and institutional facilities related to malaria and its control at country level;
- communities' lack of knowledge and skills in malaria prevention; and
- a lack of intersectoral collaboration to implement vector control operations.

Generally speaking, the services responsible for malaria control are well aware of the problems and constraints they face and of possible remedial actions. Although they strive to implement effective control measures, they are often limited by a shortage of resources invested in malaria control.

REGIONAL PRIORITIES

Taking into account the malaria trends over the past years and the actual magnitude of the malaria issues faced as described above, it is logical to conclude that affected countries in the European Region will continue to face a public health problem caused by malaria, unless a more serious commitment for sustainable malaria control efforts is made on the part of malaria-affected countries as well as the international community. Agricultural development, social unrest, extensive and often uncontrolled population movements from endemic/epidemic to non-malarious areas, combined with fluctuating meteorological and ecological changes favourable for the enhancement of malaria transmission, could all serve as determinants to the possible aggravation of the malaria problem in years to come. It is worth noting that the future malaria situation in the Region is heavily dependent on further developments in Turkey, taking into account its history of explosive malaria epidemics, as well as the resources and capacities available to tackle the malaria problem in Azerbaijan, Georgia, Kyrgyzstan, Tajikistan and neighbouring countries, bearing in mind the actual magnitude of the problem and potential threats.

Despite the overall improvements and the relative simplicity of the malaria picture in the European Region, there is no call for being over-optimistic, and the objectives stated will not be reached without the existence of national diseases control programmes with a strong, but flexible management structure, capable of mobilizing partnerships and implementing technically sound and cost-effective measures adapted to national conditions and responding to local needs. Today, only a few countries in the Region can boast of adequate national capacities to ensure appropriate malaria control in accordance with the principles of the regional malaria resolution. Nearly all contemporary malaria control programmes within the countries of the WHO European Region facing the resurgence of malaria, lack dedicated staff and sufficient technical expertise to guide programmes at the national level, and they are severely hampered by inadequate resources. Unless these issues are resolved and deficiencies are overcome, it would be unrealistic to expect that the malaria situation in the Region remains under control. The following criteria should be taken into consideration for strengthening national malaria control programmes:

1. the formulation of precise long- and medium-term objectives and targets based on the commitments and capabilities of the country;
2. a properly functioning system for easy access to early/reliable diagnosis and prompt/adequate antimalarial treatment for every inhabitant of a malaria-affected area;
3. a built-in rapid response capability to cope with emergency situations;
4. training programmes continuously adapted and appropriate to the implementing strategy;
5. vector control guided by considerations of technical and operational feasibility, effectiveness and sustainability;
6. adequate epidemiological services and information systems, with an operational research component, capable of planning, monitoring and evaluating control interventions; and
7. participation of a motivated community in malaria prevention activities.

Recent experience has shown that within the Region, it is important to place heavy emphasis on the establishment of mechanisms to predict, detect at early onset and rapidly respond to epidemic situations. The epidemiological identification of areas prone to epidemics will result in improved and timely targeting of those who are at the highest risk. Epidemic risk factors being identified should be under constant monitoring by all health personnel concerned. Within epidemic-prone areas, emergency preparedness and rapid-response mechanisms need to be strengthened. In accordance with the most likely risk scenarios, national contingency plans should be worked out with an indication of the channels to be used in order to import any necessary supplies, and an identification of resources to be rapidly mobilized. The effectiveness of preventive action is heavily dependent on the degree of preparedness of national health services to mobilize the necessary resources in the real time available for implementing an appropriate response after the recognition of the imminent risk.

A distinction also needs to be made between temporary outbreak situations (Turkmenistan, Armenia and most probably Kyrgyzstan) and large-scale epidemics leading to the establishment of endemic malaria or an increase in levels (Turkey, Tajikistan and possibly Azerbaijan) as the interventions in each setting are different. At the initial stage, emergency action is critical for the control of both types of epidemics, however, the return of endemic malaria and a rise in levels require a more long-term commitment to tackling the disease. For instance, different approaches to control endemic malaria should be applied in the southern part of Tajikistan, the south-eastern part of Turkey and some areas of Azerbaijan. In these cases, particular attention should be paid to the development of peripheral health infrastructures, the strengthening of curative services, community involvement in malaria prevention, and the use of cost-effective and sustainable vector control options, including environmental management. The results achieved within the field of malaria control in Armenia and Turkmenistan need to be sustained and further consolidated with the goal of disease elimination. In these countries, where malaria is focal and transmission continues only in very limited areas, all efforts should be directed towards the maintenance and further improvement of surveillance systems. Such systems, deployed widely at country level, would be capable of preventing the resurgence of malaria.

In order to achieve the stated programme objectives, it is essential to maintain a core technical group of adequately trained professionals with the necessary epidemiological expertise at national level to understand the changing malaria situations and to advise on strategies and approaches adapted to new situations and to develop appropriate training and learning materials adapted to specific country conditions and responding to local needs. Training, which is a key component of any programme, should be "task-oriented" and "problem-solving". Training should be very practical and be directed towards developing skills and competence. Basic training should be supplemented by regular supervision and refresher training courses. Training should increase motivation of health staff to maintain their skills and competence, and remain in service. The involvement of communities and their partnership with health sectors to empower them in their own health development is crucial. KAP assessments should be conducted on ways to promote compatibility of practices, customs and beliefs of various social groups and minorities with existing strategies and approaches, and to develop effective information, education and communication (IEC) strategies and targeted materials.

Community and family care and preventive practices should be strengthened through the provision of IEC materials, capacity building, the mass media and community support.

Indoor residual spraying with insecticides remains an effective tool for transmission control and should be selectively applied in areas with ongoing malaria epidemics, and where autochthonous *P. falciparum* malaria and its resistant form is reported. It is logical to assume that a combination of different vector control options may compensate for deficiencies of each individual method, and the integrated vector control approach can provide the most effective means of tackling the malaria problem. The application of vector control measures and their combinations should be guided by consideration of their technical feasibility, operational applicability, cost-effectiveness and sustainability. There is a desperate need for strengthening the entomological component of each national malaria programme in the Region. It is advisable that entomologists participate in decision-making and play a great part in decision-making on malaria and its control. At present top priority should be given to the entomological training in all malaria-affected countries of the Region.

All malaria programmes need to strengthen their capabilities to undertake operational research on issues of direct relevance to malaria control and, most probably, its elimination in the foreseeable future. Such research should be conducted with the assistance of research institutions. The objectives of the research should be closely tied to the particular situation and problems identified within a particular country or a number of countries. In the European Region vector biology and control research is of particular interest, which has been neglected, but is presently being reconsidered in order to make vector control more effective in producing a desired result. The following studies may be considered: species identification and vector incrimination, species complexes and the role of sibling species in malaria transmission, biology of vectors, vector resistance, integration of vector control strategies in different malaria settings, use of impregnated mosquito nets in *P. vivax* settings, treating livestock with insecticides (livestock sponging), vector control in rice fields and vector control impact assessment.

In recent years the malaria situation has deteriorated in some border areas of countries within the Region, and it is expected that malaria-related problems in those areas may assume larger dimensions in the near future. All necessary steps should be taken to improve coordination among neighbouring countries for solving common problems in the control and prevention of malaria. Particular emphasis should be placed on analysis of the current malaria situations and identification of problems and constraints encountered in border areas, and development of a strategy for increased coordination of malaria control in border areas and practical modalities for regular exchange of relevant information, and, finally, development and implementation of joint action plans in order to coordinate and synchronize malaria control activities in border areas. Countries belonging to the WHO European and Mediterranean Regions share many commonalities in relation of eco-epidemiological malaria settings and malaria-related problems encountered, and therefore a closer coordination should be promoted through the exchange of technical reports and documents of mutual interest, notification on malaria situations in border areas, organization of border meetings between countries belonging to the two Regions, attendance in international training courses organized by the other Region, visits of senior malaria programme personnel, and participation of the regional malaria advisers in events organized by the other Region.

NEED FOR CONCERTED ACTION

The RBM movement has successfully mobilized the collective efforts of international agencies, bilateral organizations, the NGO community and others to create greater awareness of the malaria problem and to increase the amount of overall resources available for malaria in the WHO European Region. However, the ways and means to tackle the malaria problem at the country level have varied widely over the past nine years (1996–2004), even following the implementation of the regional RBM programme (1999–2004). In Tajikistan, Azerbaijan and Turkey, where epidemics of malaria began in the early or mid-1990s, resources were mobilized, technical consensus was generated and visible results were achieved in advance of the inception of the regional RBM initiative. Since the inception, national programmes have received an increased level of support and accelerated their activities. On the other hand, RBM has undoubtedly enabled Armenia, Turkmenistan, Georgia, Azerbaijan, Tajikistan and Kyrgyzstan to cope with their epidemic and outbreak situations.

The advocacy actions which were enthusiastically undertaken by RBM/WHO Regional Office for Europe to promote better cooperation among partners and freeing up of additional resources for use in malaria control, found a positive response from the international community only after malaria epidemics had occurred in the Region, but it was never sustained longer than 2–3 years. In other situations, such as small-scale outbreaks, occurence of sporadic cases and high risks of its resurgence, partner response has traditionally been weak. Throughout the Region, it is widely believed that affected countries can only rely heavily on WHO for regular technical and financial assistance. A strong participatory approach with clear roles and responsibilities of all partners concerned should be encouraged at the sub-regional and country levels. WHO should continue to provide leadership and technical support in the field of malaria control, while other partners should fill existing gaps in line with their policies and commitments. Regular exchange of information and consultations between partners and national programmes should be encouraged and promoted, in order to better coordinate malaria control actions and enable the RBM partnership to function more effectively.

At present, despite the widespread recognition of the need for additional resources for the global RBM programme, resources for malaria control in Europe remain severely constrained and all national programmes in affected countries are chronically dependent on external support. The malaria elimination successes in Europe have demonstrated that large-scale application of intensive vector control measures (indoor residual spraying with insecticides) combined with adequate coverage and quality of disease management activities could bring the transmission of malaria down sharply and even completely in areas with a relatively low intensity of transmission. The aim of the regional malaria control strategy, which is presently being implemented, is to reduce the impact of the disease on the health of the population to the lowest possible level that can be achieved with the available financial and manpower resources, and existing control technologies and tools. The reduction in the reported incidence of malaria by almost 83% over the past decade is the most conspicuous achievement of the regional RBM programme so far. Each successful milestone in the reduction of a disease al-

lows for the establishment of new and more demanding objectives along the path to achieving these goals. The demonstrated feasibility of malaria elimination in the past, the visible impact of RBM interventions at present, the strong political commitments to move further from control to elimination at national level, and the availability of effective control technologies and tools may facilitate future decisions towards undertaking the new elimination effort within malaria-affected countries of the Region. The main obstacle for all elimination programmes is their cost, which is much beyond the resources available. To attract and sustain the donor interest in malaria elimination, new possibilities and approaches for additional resource mobilization, including innovative financial mechanisms (e.g. GFATM), should be widely explored at global, regional and national levels.

In order to sustain the results achieved within malaria-affected countries of the European Region, to consolidate them and to move further from malaria control to elimination, at least in some countries, the regional RBM programme would require annual contributions between USD 6 and 7 million over the next five years. A shortfall in funding would limit the scope of regional RBM programme activities.

CONCLUSIONS

The malaria situations, RBM partnership actions and programme priorities at regional and country levels have been highlighted with the purpose of consolidating the results achieved and of moving further from malaria control to elimination within affected countries of the European Region.

In order to achieve a greater impact on the regional malaria situation, the following should be explicitly addressed in future actions to control and eliminate malaria in the Region:

- ensuring Roll Back Malaria issues remain high on the WHO agenda throughout affected countries of the European Region;
- intensifying RBM partnership actions at sub-regional and country levels;
- promoting the move towards a coordinated approach in the field of malaria among Member States, WHO and RBM partners at country level; and
- stimulating the flow of additional resources, including innovative financial mechanisms (e.g. GFATM).

REFERENCES

1. Drobozina et al. *The occurrence of resistance of An. sacharovi to DDT in the Azerbaijanskaya SSR*. Meditsinskaya Parasitologiya, 1972, 41 (4): 460-464.
2. Chagin KP et al. *The malaria situation in Azerbajianskaya SSR in 1970–1976: Epidemic control measures applied, the assessment of their effectiveness and future activities aimed at malaria eradication in the republic*. Proceedings of the scientific conference on contemporary issues of malaria prevention in Azerbaijanskaya SSR, Martsinovsky Institute of Medical Parasitology and Tropical Medicine, 1979, 6–12.
3. Abdullaev KL et al. *Malaria control in Azerbaijanskaya SSR in 1979–1983*. Proceedings of the scientific conference on malaria control in USSR at the present time, Martsinovsky Institute of Medical Parasitology and Tropical Medicine, 1985, 9–18.
4. Vakhabov EF et al. *Experience with containment of malaria outbreak in Masallinsky district of Azerbaijanskaya SSR*. Proceedings of the scientific conference on malaria control in USSR at the present time, Martsinovsky Institute of Medical Parasitology and Tropical Medicine, 1985, 30–40.
5. Abrashkin-Zhychkov RG et al. *G6PD deficiency and its epidemiological role for P. vivax malaria in Azerbaijanskaya SSR*. Proceedings of the scientific conference on contemporary issues of malaria prevention in Azerbaijanskaya SSR, Martsinovsky Institute of Medical Parasitology and Tropical Medicine, 1979, 67–73.
6. Orlov VS et al. *Present malaria situation in USSR, and future scientific and practical tasks to achieve the complete eradication of malaria in the country*. Proceedings of the scientific conference on malaria control in USSR at the present time, Martsinovsky Institute of Medical Parasitology and Tropical Medicine, 1985, 9–17.
7. Lysenko AY et al. *Results of three-years of work directed at the practical eradication of malaria in Tadjikskaya SSR*. Proceedings on malaria and other infectious diseases, Stalinabadsky Institute of Epidemiology and Hygiene, 1960, 11: 5–21.
8. Abdullaev IT. *Concerning migration of malaria vectors through Amu-Darya river in the Termez district*. Proceedings of the scientific conference on malaria control in USSR at the present time, Martsinovsky Institute of Medical Parasitology and Tropical Medicine, 1985, 259–261.
9. Kasatsky AI et al. *A rise in the incidence of malaria in Tadjikskaya SSR and malaria control activities applied in 1984–1985*. Proceedings of the scientific conference on malaria control in USSR at the present time, Martsinovsky Institute of Medical Parasitology and Tropical Medicine, 1985, 73–84.
10. Kasatsky AI et al. *Tactical approaches and the effectiveness of malaria control measures taken in the period of P. vivax malaria epidemic in Pyanj district of Tadjikskaya SSR in 1978–1984*. Proceedings of the scientific conference on malaria control in USSR at the present time, Martsinovsky Institute of Medical Parasitology and Tropical Medicine, 1985, 85–93.

11. Yermishev YV et al. *Analysis of epidemiological situation in foci of P. vivax in the Moscow district of Tadjikskaya SSR in 1981–1983*. Proceedings of the scientific conference on malaria control in USSR at the present time, Martsinovsky Institute of Medical Parasitology and Tropical Medicine, 1985, 94–102.
12. Ramsdale CD, Haas E. *Some aspects of epidemiology of resurgent malaria in Turkey*. Transactions of the Royal Society of Tropical Medicine and Hygiene, 1978, 72: 570–580.
13. Onori E, Grab B. *Quantitative estimates of the evolution of a malaria epidemic in Turkey if remedial measures had not been applied*. Bulletin of the World Health Organization, 1980, 58: 321–326.
14. De Zulueta J. *Insecticide resistance in Anopheles sacharovi*. Bulletin of the World Health Organization, 1959, 20: 797–822.
15. Ramsdale CD et al. *Recent development of insecticide resistance in some Turkish Anophelines*. Journal of Tropical Medicine and Hygiene, 1980, 83: 11–19.
16. Ramsdale CD. *Insecticide resistance in the Anopheles of Turkey*. Transaction of the Royal Society of Tropical Medicine and Hygiene, 1975, 69: 226–235.
17. World Health Organization. *World malaria situation 1983*. World Health Statistics Quarterly, 1985, 38: 193–231.
18. Kasap H et al. *Residual efficacy of pirimiphos-methyl (Actellic) on Anopheles sacharovi in Cukurova, Turkey*. Journal of the American Mosquito Control association, 1992, 8: 47–51.
19. Zvantsov AB, Ejov MN, Artemiev MM. *Malaria vectors in the Newly Independent States*. WHO Regional Office for Europe, Roll Back Malaria Programme, 2003, 309 pp.
20. Sokolova LV, Volegova KV. *Changes in population number of Anopheles messeae in the Moscow Region after DDT application cessation*. Meditsinskaya Parazitology I Parazitarnye Bolezni, 1980, 49, 68–69.
21. Zahar AR. *Vector bionomics in the epidemiology and control of malaria. Part II*. WHO European Region and WHO Eastern Mediterranean Region, WHO, VBC/90.2 Geneva, 1990, 226 pp.
22. Zamburlini R, Cargnus E. *Remaining anophelines in the upper Adriatic region 50 years after the disapprearence of malaria*. Parasitologia, 1998, 40 (4): 431–437.
23. Kruger A, Rech A, Su Xin-Zhuan, Tannich E. *Two cases of autochthonous Plasmodium falciparum malaria in Germany with evidence for local transmission by indigenous Anopheles plumbeus*. Tropical Medicine & International Health, 2001, 6 (12): 983–985.
24. Baldari M, Tamburro A, Sabatinelli G, Romi R, Severini C, Cuccanga P et al. *Introduced malaria in Maremma, Italy, decades after eradication*. Lancet, 1998, 351: 1246–1247.
25. Rubio JM, Benito A, Berzosa PJ, Roche J, Puente S, Subirats M et al. *Usefulness of semi nested multiplex PCR in surveillance of imported malaria in Spain*. J. Clin. Microbiolog., 1999, 37: 3260 – 3264.
26. Isaacson M. *Airport malaria: a review*. Bulletin of the World Health Organization, 1989, 67:737–743.
27. Zulueta J, Ramsdale CD, Colluzzi M. *Receptivity to malaria in Europe*. Bulletin of the World Health Organization, 1975; 52: 109–111.
28. Lopez-Velez R, Viana A et al. *Clinicoepidemiological Study of Imported Malaria in Travelers and Immigrants to Madrid*. Journal of Travel Medicine, 1999, 6, 2 :81–86.

29. Blazquez J. *Entomologic investigation on anophelism in the Ebro River delta*. Rev. Sanid Hig. Publica (Madrid), 1974, 48: 363–377.
30. Eritja R, Aranda C, Padros J, Coula M. *Revised checklist of the Spanish mosquitoes*. Acta Virologica Portuguesa, 1998, 5:25.
31. Personal communication, Drs. Dormann A and Wejda B, Dpt. Of Gastroenterology and Infectious Diseases, Minden Hospital in Westphalia, Germany.
32. Gratz N. *The risk of resurgent malaria in the Balkans*. 27–34. In: Proceedings of the 1st Balkan Conference on Malaria and Mosquito Control, April 2001, Serres, Greece.
33. Kurdova RI, Vutchev DI, Petrov PP. *Malaria situation in Bulgaria and surveillance measures (1991–2000)*. Global Nest: the Int. J., 2001, Vol.3, No 3, pp 153–162.
34. Sergiev VP, Baranova AM, Arsenieva LP. *Importation of malaria from Afghanistan in 1981–90*. Medical Parasitology and Parasitic Diseases, 1992, 3: 15–18.
35. Sergiev VP et al. *Autochthonous cases of P. vivax and P. falciparum malaria in the Moscow Region*. Meditsinskaya Parasitologiya y Parasitarnye Bolezni, 2000, 2: 34–36.
36. Syskova TG, Baranova AM. *The Malaria situation in the Russian Federation*. Proceedings of the meeting on present problems with malaria surveillance, Ministry of Health of the Russian Federation, 2001, 32–37.
37. Handszuh H, Waters SR. *Travel and tourist patterns*. In: DuPont HL, Steffen R, eds. Textbook of travel medicine and health, Hamilton, Ontario, B.C Decker Inc., 1997: 20–26.
38. Jelinek T et al. *High prevalence of antibodies against circumsporozoite antigen of Plasmodium falciparum without development of symptomatic malaria in travellers returning from sub-Saharan Africa*. Journal of Infectious Diseases, 1996, 174: 1376–1379.
39. Muentener P, Schlagenhauf P, Steffen R. *Imported malaria (1985–95): trends and perspectives*. Bulletin of the World Health Organization, 199, 77 (7), 560–566.
40. Paxton LA, Slutsker L, Schultz LJ, Luby SP, Meriwether R, Matson P, Sulzer AJ. *Imported malaria in Montagnard refugees in North Carolina: implications for prevention and control*. Am. J. TroP. Med. Hyg., 1996, 54: 54–57.
41. Sabatinelli G, Ejov M, Joergensen P. *Malaria in the WHO European Region: 1971–1999*. Euro surveillance, 2001, volume 6, issue 4.
42. Jelinek T et al. *Imported Falciparum Malaria in Europe: Sentinel Surveillance Data from the European Network on Surveillance of Imported Infectious Diseases*. Clinical Infectious Diseases, 202, 34:572–576.
43. Legros F, Danis M. *Surveillance of malaria in European Union countries*. Euro surveillance Monthly archives, 1998, volume 3, issue 5.
44. Danis M, Legros F, Gay F, Brousse G, Bricaire F, Gentilini M. *Paludisme d'importation en France*. Med. Mal. Inf., 1999, 29 (3), 257–273.
45. Legros F, Fromage M, Ancelle T, Burg E, Janot C, Maisonneuve P, Danis M. *Enquete nationale de recensement des cas de paludisme d'importation en France metropolitaine pour l'annee*. Bull. Epidemiol. Hebdo, 1997, 11, 41–42.
46. Gautret P, Legros F, Koulmann P, Rodier MN, Jacquemin JL. *Imported Plasmodium vivax malaria in France: geographical origin and report of an atypical case acquired in Central or western Africa*. Acta Tropica, 2001, 78, 177–181.

47. Apitzsch L, Rasch G, Kiehl W. *Imported malaria in Germany in 1996*. Euro surveillance Monthly archives, 1998, volume 3, issue 4.
48. Phillips-Howard PA, Bradley DJ, Blaze M, Hurne M. *Malaria in Britain 1977–86*. BMJ, 1988, 296: 245–248.
49. Bradley DJ, Warhurst DC, Blaze M, Smith V, Williams J. *Malaria imported into the United Kingdom in 1996*. Euro surveillance, 1998, volume 3, issue 4.
50. Majori G, Sabatinelli G et al. *Imported malaria in Italy from 1986 to 1988*. J. R. Soc. Health, 1990, 110:88–89.
51. Sabatinelly G, Majori G. *Malaria surveillance in Italy: 1986–1996 analysis and 1997 provisional data*. Euro surveillance, 1998, 3:38–40.
52. Romi R, Boccolini D, Majori G. *Malaria incidence and mortality in Italy in 1999–2000*. Euro surveillance, 2001, 6, 10:143–147.
53. World Health Organization. *Strategy to Roll Back Malaria in the WHO European Region*. Regional Office for Europe, Copenhagen, Denmark, 1999.
54. Ejov M, Zvantsov A, Sergiev V. *Roll Back Malaria in the WHO European Region: its results and prospects*. Meditsinskaya Parasitologiya I Parazitarnye Bolezni, 2004, 3: 12–16.
55. World Health Organization. *Draft Resolution "Scaling up the Response to Malaria in the European Region of WHO"*. EUR/RC52/Conf.Doc./7. Regional Committee for Europe, Fifty-Second Session, Regional Office for Europe, Copenhagen, Denmark, 2002.
56. World Health Organization. *Progress with Roll Back Malaria in the WHO European Region*. Regional Office for Europe, Copenhagen, Denmark, 2000.
57. World Health Organization. *Progress with Roll Back Malaria in the WHO European Region*. Regional Office for Europe, Copenhagen, Denmark, 2001.
58. World Health Organization. *Malaria situation in countries of Central Asia facing the resurgence of malaria*. Regional Office for Europe, Copenhagen, Denmark, 2001.
59. *Malaria outbreak in Kyrgyzstan*. CD News, Communicable Disease Report, the WHO Regional Office for Europe, 29, 2002.
60. *Scaling up the response to malaria in the European Region of WHO*. CD News, Communicable Disease Report, the WHO Regional Office for Europe, 32, 2003.
61. World Health Organization. *Second Interregional Malaria Coordination Meeting*. Report of the WHO Coordination Meeting, Regional Office for Europe, Copenhagen, Denmark, 2000.
62. World Health Organization. *Malaria vectors and approaches to their control in malaria affected countries of the WHO European Region*. The proceedings of a Regional Meeting on Vector Biology and Control, the WHO Regional Office for Europe, Roll Back Malaria, 3–5 May, 2001, Almaty, Kazakhstan.
63. World Health Organization. *Malaria Border Coordination Meeting*. Report of the WHO Intercountry Meeting, Regional Office for Europe, Copenhagen, Denmark, 2001.
64. World Health Organization. *Epidemiological Surveillance of Malaria in countries of Central and Eastern Europe and selected Newly Independent States*. Report of a WHO Intercountry Meeting, Regional Office for Europe, Copenhagen, Denmark, 2002.

65. World Health Organization. *Report on the Malaria Cross-Border workshop between Iraq, Syrian Arab Republic and Turkey, 20–22 April 2004*. Regional Office for the Eastern Mediterranean, Cairo, 2004.
66. Seidlein LV, Greenwood BM. *Mass administration of antimalarial drugs*. Trends in Parasitology, Vol.19, No.10, October 2003, 452–460.
67. World Health Organization. *Terminology of malaria and malaria eradication*. Geneva, 1963.
68. *Proceedings of the First International Workshop on Vector-Borne Diseases and Problems of Genetic Safety, 6–12 October 2002*. Vavilov Institute of General Genetics, Russian Academy of Science, Moscow, 2003.
69. Valibayov A, Abdullaev F, Mammadov S et al. *Clinical efficacy of chloroquine followed.by primaquine for Plasmodium vivax treatment in Azerbaijan*. Acta Tropica,.Vol. 88, Issue 1, September 2003, 99–102.
70. Gordeev M, Ejov M et al. *The amendment to the list of Anopheles (Diptera, Culicidae) mosquitoes of Tajikistan and the predominant species of malaria vectors in present malaria foci in the country*. Meditsinskaya Parasitologiya I Parazitarnye Bolezni, 2004, 3: 16–21.

Taking into account the malaria trends over the past years and the actual magnitude of the malaria issues faced as described, it is logical to conclude that affected countries in the European Region will continue to face a public health problem caused by malaria, unless a more serious commitment for sustainable malaria control efforts is made on the part of malaria–affected countries as well as the international community.

Recent experience has shown that within the Region, it is important to place heavy emphasis on the establishment of mechanisms to predict, detect at early onset and rapidly respond to epidemic situations. In order to achieve the stated programme objectives, it is essential to maintain a core technical group of adequately trained professionals with the necessary epidemiological expertise at national level to understand the changing malaria situations and to advise on strategies and approaches adapted to new situations. It is logical to assume that a combination of different vector control options may compensate for deficiencies of each individual method, and the integrated vector control approach can provide the most effective means of tackling the malaria problem. There is a desperate need for strengthening the entomological component of each national malaria programme in the Region. All malaria programmes need to strengthen their capabilities to undertake operational research on issues of direct relevance to malaria control and, most probably, its elimination in the foreseeable future. All necessary steps should be taken to improve coordination among neighbouring countries for solving common problems in the control and prevention of malaria.

WHO should continue to provide leadership and technical support in the field of malaria control, while other partners should fill existing gaps in line with their policies and commitments. Regular exchange of information and consultations between partners and national programmes should be encouraged and promoted, in order to better coordinate malaria control actions and enable the RBM partnership to function more effectively.

The aim of the regional malaria control strategy, which is presently being implemented, is to reduce the impact of the disease on the health of the population to the lowest possible level that can be achieved with the available financial and manpower resources and existing control technologies and tools. The reduction in the reported incidence of malaria by almost 83% over the past decade is the most conspicuous achievement of the regional RBM programme so far. Each successful milestone in the reduction of a disease allows for the establishment of new and more demanding objectives along the path to achieving these goals. The demonstrated feasibility of malaria elimination in the past, the visible impact of RBM interventions at present, the strong political commitments to move further from control to elimination at national level, and the availability of effective control technologies and tools may facilitate future decisions towards undertaking the new elimination effort within malaria-affected countries of the Region. The main obstacle for all elimination programmes is their cost, which is much beyond the resources available. To attract and sustain the donor interest in malaria elimination, new possibilities and approaches for additional resource mobilization, including innovative financial mechanisms (e.g. GFATM), should be widely explored at global, regional and national levels.

World Health Organization
Regional Office for Europe
Scherfigsvej 8
DK-2100 Copenhagen Ø, Denmark

Tel.: +45 39 17 17 17
Fax: +45 39 17 18 18
E-mail: postmaster@euro.who.int
Web site: www.euro.who.int

E85718