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Malaria in the WHO European Region



ON THE ROAD TO ELIMINATION 2000–2015

SUMMARY

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Vladimir Sergiev
Alla Baranova
Rossitza Kurdova-Mintcheva
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Abstract

This is a summary of the publication in Russian (in print). The publication is devoted to elimination of malaria in the WHO European Region, which, through the huge efforts of affected countries, WHO and the international community, became the first WHO region to interrupt transmission of indigenous malaria. The report summarizes the lessons learnt, experiences accumulated and results achieved in curbing epidemics and outbreaks after malaria resurgence, eliminating malaria and preventing the re-establishment of its transmission in malaria-affected countries and the entire Region. The publication has been prepared by WHO staff members and international consultants of the WHO Regional Office for Europe and national malaria counterparts who have been committed to and involved in epidemic containment, malaria elimination and prevention over the past 16 years (2000–2015). The publication is intended for health managers and personnel, researchers, teachers, students and everyone who is interested in tropical diseases, medical parasitology and public health.

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Abbreviations

ACD	active case detection
ACTED	Agence d'Aide a la Cooperation Technique et au Developpement [Agency for Technical Cooperation and Development]
ECHO	European Commission's Humanitarian Aid and Civil Protection department
Global Fund	The Global Fund to Fight AIDS, Tuberculosis and Malaria
IFRC	International Federation of Red Cross and Red Crescent Societies
IRS	indoor residual spraying
MERLIN	Medical Emergency Relief International
MPTP	mass prophylactic treatment with primaquine
RBM	Roll Back Malaria
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development

Introduction

This is a summary of the publication in Russian entitled “Малярия в Европейском регионе ВОЗ: на пути к элиминации, 2000–2015” [Malaria in the WHO European Region: On the road to elimination, 2000–2015] (1). The book continues the tradition of WHO to develop publications describing the fight against the main communicable diseases. These publications not only contain and offer readers the results achieved in controlling particular diseases, but, more importantly, describe the strategies, policies and approaches used to reduce or prevent the social burden of infectious and parasitic diseases.

The first successes in controlling malaria in the WHO European Region were excellently described in the monograph by L. J. Bruce-Chwatt and J. De Zulueta (2). In this historical and epidemiological study, the authors, who spent many years working for WHO, summarized their own experience of direct participation in elaborating and implementing the first attempts to eradicate malaria in the 1960s and the contribution made by other countries and experts. Different countries had already developed their own approaches in controlling and eliminating malaria back then. This experience was put to use after the disease returned to some countries in Europe in the form of post-eradication epidemics and outbreaks of varying intensity.

The next historic stage in fighting post-eradication malaria in Europe was described in a subsequent publication presenting the situation over the 20th century's final three decades (3). This was a new chapter in the battle, marked by the broad spread of resistance of the malaria pathogen to anti-malarial medicines, and of the vector mosquitoes to chlorine- and organophosphate insecticides. The authors described in this context countries' efforts to control endemic malaria foci, along with the new phenomenon of mass and practically uncontrolled import of the malaria pathogen from all malaria-

endemic parts of the world to countries where malaria transmission had been effectively interrupted.

The WHO European Region had made substantial progress in reducing incidence of malaria in endemic countries by the beginning of the 21st century. This success paved the way for a transition from malaria control programmes in endemic countries to its elimination in the Region. This transition was officially formulated in 2005 in the *Tashkent Declaration: The Move from Malaria Control to Elimination in the WHO European Region: A Commitment to Action* (4). The Tashkent Declaration, signed by 10 endemic countries, urged countries to eliminate malaria in the Region by 2015. In 2006, the WHO Regional Office developed the new regional strategy entitled *From Malaria Control to Elimination in the WHO European Region 2006–2015* (5). The new strategy's goal was to interrupt transmission of *P. falciparum* malaria in central Asia by 2010 and, ultimately, eliminate malaria in the European Region in general by 2015.

Over the following years, some countries achieved success, and this was confirmed by WHO experts. WHO certified malaria elimination in Turkmenistan (2010) (6), Armenia (2011) (7), and Kyrgyzstan (2016) (8), while Uzbekistan has been completing this process too.

On 20 April, 2016, the WHO Regional Director for Europe declared that the Region had achieved interruption of indigenous malaria transmission (9). In the foreword to the World Malaria Report 2015 (10), the WHO Director-General stated that – for the first time since WHO began keeping score – the European Region is reporting zero indigenous cases of malaria. This is an extraordinary achievement that can only be maintained through continued political commitment and constant vigilance.

The road to elimination

The malaria elimination concept that was developed at the beginning of the 21st century substantially changed the approach to malaria eradication concept (11). The main difference between these concepts lay in the ultimate goal: interrupting indigenous transmission and ensuring health services' ability to maintain this status at global (eradication) and national (elimination) levels. Malaria eradication target came with a set time frame, but malaria elimination timeframes vary depending on local conditions. Malaria control envisages reducing mortality and morbidity to a level where the disease no longer poses a public health problem. Malaria elimination is about interrupting indigenous transmission of the disease in a particular territory, resulting in absence of indigenous cases, though imported cases of malaria might continue to be registered.

The unanimous desire to suppress post-eradication epidemics in all WHO European region countries affected by malaria at the end of the 20th century and start of the 21st century, at all social and political levels, including international participation, led to understanding the need for prompt and radical responses to the newly emerging malaria problem. Endemic countries were supported by the WHO and international partners of the Roll Back Malaria (RBM) strategy, the World Bank, the Global Fund to Fight AIDS, Tuberculosis and Malaria (the Global Fund), European Commission's Humanitarian Aid and Civil Protection department (ECHO), Italian oil and gas company ENI, International Federation of Red Cross and Red Crescent Societies (IFRC), Centers for Disease Control and Prevention, Agence d'Aide a la Cooperation Technique et au Developpement [Agency for Technical Cooperation and Development, ACTED], Medical Emergency Relief International (MERLIN) and United States Agency for International Development (USAID) in their malaria control efforts. All endemic countries in the Region reviewed their national malaria control strategies and reorganized their national anti-malaria programmes in line with RBM principles. Governments in endemic countries and international organizations carried out a series of measures needed to prevent a return of malaria epidemics. These efforts significantly reduced malaria incidence in 1999–2005 (5,12).

The Tashkent Declaration: a commitment to action

The successes attained in endemic malaria countries in the European Region were recognized and commended in October 2005 *Tashkent Declaration: The Move from Malaria Control to Elimination* (4). The signatory countries expressed their commitment to focusing greater efforts on eliminating malaria on their territories. This commitment was reflected too in the WHO Regional Office's policy of promoting and supporting the new initiative to eliminate malaria in the Region by 2015. The endemic countries, for their part, asked for WHO support to develop detailed regional and national elimination strategies and turned to RBM partners for increased financial aid to implement the approved malaria elimination goals and objectives in all endemic countries in the Region. Attention was also drawn to the need to address the issue of malaria in border areas, both within the European Region and for European Region countries bordering countries in other WHO regions.

The adoption of Tashkent Declaration paved the way to an official agreement between WHO and the endemic countries on beginning a regional elimination campaign that would be incorporated into each country's national policy, strategy and action plans.

The Regional Strategy "From Malaria Control to Elimination": a policy for action

Success in reducing incidence of cases made it possible to start setting more ambitious goals and bring countries closer to their stated aim. The rationale for development of the new malaria strategy in 2006 aimed at moving from control to elimination is based on the following principles (5).

- Past successful elimination of malaria in practically all of Europe was achieved through universal and adequate detection and treatment of cases, rational use of vector control, primarily through indoor residual spraying (IRS) with insecticides, and effective epidemiological surveillance, which dramatically reduced intensity of transmission and led to its interruption in areas with low transmission levels.

- Progress in curbing transmission achieved through the Roll Back Malaria strategy made possible achieving elimination of malaria.
- Political commitment of the endemic countries, WHO and other stakeholders and organizations making substantial contributions to control and eliminate malaria led to improvement of epidemiological situation on malaria throughout the Region.
- Efficacious technologies and tools available to control and eliminate malaria in the regional context made this process in the Region feasible.

The above provided sufficient grounds for considering realistic plans to achieve elimination in the WHO European Region and a universal transition to new strengthened measures in endemic countries. All 10 countries affected by malaria – Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Russian Federation, Tajikistan, Turkmenistan, Turkey, and Uzbekistan – signed the Tashkent Declaration of 2005. This event marks the move from malaria control to elimination.

The ultimate goal of the new regional strategy was to interrupt the transmission of malaria by 2015 and eliminate the disease within affected countries of the Region. In areas and countries where malaria had been eliminated, attention was given to maintaining the malaria-free status (5).

At the attack elimination phase, a two-pronged swift and energetic action based on vector control with focus on IRS and enhanced epidemiological surveillance including case management (strong quality assured laboratory support, free diagnosis by microscopy, and radical treatment) has been applied, with a view to interrupt indigenous transmission as soon as possible all over the target area (in all new and/or residual foci of malaria). In support of these operations, mass prophylactic treatment with primaquine (MPTP) has been considered under the following circumstances in areas: 1) when small foci of malaria continue to exist after indigenous transmission has been interrupted elsewhere; 2) when an outbreak is reported in the attack and consolidation elimination phase – in addition to IRS, intense surveillance and response; and 3) when residual insecticide spraying does not fully interrupt transmission in the attack elimination phase. In the consolidation elimination phase the epidemiological forces took authority to finish the battle against malaria. In the attack and consolidation elimination phase passive and active case detection (household visits and screening of risk groups), as well as

prompt notification, recording and reporting and epidemiological investigation of all confirmed cases and all malaria foci, their epidemiological classification were carried out as soon as possible with the aim 1) to classify the case and focus, 2) to discover evidence of any continuation of malaria indigenous transmission and to reveal its underlying causes, 3) to recommend measures to interrupt local transmission, 4) to prevent occurrence of new cases and, finally, 5) to substantiate the fact that elimination has been achieved in a given area/country. Interventions were directed to foci and individual cases (locally acquired and imported). Entomological surveillance was in place, too.

Leading and coordinating role of WHO in a regional malaria elimination initiative

Over the last decade, the Regional Office has provided technical assistance to all affected countries for developing and reviewing national malaria control and elimination strategies, epidemic monitoring guidelines, vector control, malaria diagnosis and treatment, preparedness for epidemics, and operational research.

Regular country visits by WHO personnel and consultants have made a substantial contribution to assessing and monitoring countries' situations and the recommendations made have helped to reorient national programmes where needed.

Regional meetings were organized to facilitate exchange of best practice in eliminating malaria between countries and regions (the WHO European and Eastern Mediterranean regions).

The Regional Office developed and published a number of guidelines for assisting health personnel in countries affected by malaria in the Region in planning, organizing, implementing and evaluating national elimination programmes as well as preparing for certification of malaria elimination. Publications include: *Practical recommendations on epidemiological surveillance of malaria in countries of the WHO European Region facing resurgence of malaria* (2006) (13); *Recommendations on vector control* (2006, 2007, 2008) (14–16), *Practical guidelines on malaria elimination in the countries of the WHO European Region* (2010) (17); *Operational framework on integrated vector management* (2012) (18); *Training module for entomologists on malaria vectors and vector control* (2012) (19).

The Regional Office has provided technical assistance to Member States to draft proposals

for submitting to the Global Fund and for their subsequent implementation. Azerbaijan, Georgia, Kyrgyzstan, Tajikistan and Uzbekistan have received and made successful use of grants from the Global Fund. All of this clearly demonstrates WHO's leading and coordinating role at the various stages of malaria control in the Region and in intensified efforts in the endemic countries in Europe to eliminate malaria.

Strengthening decision making and institutional capacities in relation to epidemic containment, malaria elimination and prevention

The WHO Regional Office for Europe has placed particular emphasis on training managerial and technical personnel of malaria control programmes.

Over 1999–2014, WHO held numerous training courses on the various aspects of malaria control and elimination and applied research in this field for various categories of participants – epidemiologists, parasitologists, entomologists, and laboratory professionals from the endemic countries in Europe and neighbouring countries in the WHO Eastern Mediterranean Region.

Setting up and enhancing cross-border collaboration and co-ordination of activities on malaria elimination and prevention

In the context of malaria elimination, particular emphasis is given to situations, where there is a risk of spread of malaria between countries and regions.

To eliminate malaria in border regions, the Regional Office initiated and supported cross-border cooperation within the Region and at the interregional level, in particular with the countries of the Eastern Mediterranean. A number of meetings on this issue were held in Dushanbe, Tajikistan (2006), Antalya, Turkey (2009), Baku, Azerbaijan (2009), and Bishkek, Kyrgyzstan (2010).

Joint statements on cross-border collaboration have been signed between Azerbaijan and Georgia (2009), Turkmenistan and Afghanistan (2009), Tajikistan and Afghanistan (2010), Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan (2010). During operational meetings, participating countries discussed and developed practical modalities and joint plans to eliminate malaria and measures to prevent its resurgence in border areas.

Improving intersectoral collaboration on malaria elimination and prevention

During the malaria elimination and prevention of reintroduction phase, when the number of malaria cases is minimal and the disease ceases to be a major social and economic problem, maintaining inter-sectoral cooperation and ensuring sufficient financing for the final stage of malaria elimination work were critical.

Successful implementation of the elimination programme required the participation and cooperation of ministries and agencies, including finance, agriculture, utilities, education, trade, defense, and tourism, as well as the private sector. Inter-sectoral collaboration at national level facilitated introduction of various malaria control systems. Also critical in the malaria elimination effort was including malaria control in national economic development plans. The Region's experience demonstrates that collective effort made it possible to reduce more rapidly the risk of malaria's spread. Reducing the social and economic burden of malaria contributed in turn to speeding up countries' socioeconomic development.

Strengthening national and regional capacity for focused research on malaria

Applied research on *P. vivax* malaria is important at the stages of controlling, eliminating, and preventing resurgence of the disease in malaria-free territory. Research conducted in the endemic countries of the Commonwealth of Independent States during this time pursued the following practical objectives for improving the epidemiological surveillance system.

1. Assess the needed quantity of public testing for malaria.
2. Identify the spatial structure of foci.
3. Study the level of glucose-6-phosphate dehydrogenase (G6PD) deficiency in the population.
4. Assess malaria susceptibility of territory and infection risks for the public.
5. Identify the time period and share of *P. vivax* malaria incidence with long incubation.
6. Study the sensitivity of *P. vivax* to anti-malarials used to treat malaria.

7. Identify the taxonomy, systematics and spread of main malaria vectors in the Central Asian and Caucasus parts of the WHO European Region.
8. Study vector resistance and sensitivity to insecticides.
9. Identify the polytypical nature of *P. vivax* malaria vectors.
10. Perform knowledge, attitudes and practice (KAP) surveys to study attitudes to the measures implemented.
11. Use geographical information systems (GIS) in epidemiological studies.

Advocacy actions and WHO publications on epidemic containment, malaria elimination and prevention

Over the 15-year period, the WHO European Region countries have produced a large number of publications on malaria control, elimination and prevention. The Regional Office has published monographs, guidelines, training modules, and materials/reports. These documents contain valuable knowledge on planning, implementing, monitoring and evaluating anti-malaria activities at the different stages of control, elimination and prevention. Significance of the publications should be seen as a guidance for action (20).

Preventing malaria reintroduction, certification of malaria elimination

From elimination to preventing reintroduction in malaria-free territories

In 2015, for the first time ever in the WHO European Region, there were no reported cases of indigenous malaria (9). This was the milestone marking the move to a new stage, that of preventing malaria resurgence. This means that the Region's countries must now review their current national plans and develop programmes for preventing reintroduction of indigenous malaria transmission in their countries.

To help decision-makers and malaria programme managers carry out effectively their tasks in planning, organizing, implementing measures on prevention of malaria reintroduction and certifying malaria elimination, the WHO Regional Office for Europe developed the *Regional Framework for Prevention of Malaria Reintroduction and Certification of Malaria Elimination 2014–2020* (21). This publication addresses the issues concerning possible reintroduction of malaria in the post-elimination period, programme aims and objectives, key methods and measures for preventing malaria reintroduction, and practical, organizational and methodological aspects of the malaria elimination certification process.

Countries that have succeeded in eliminating malaria must develop strategies for preventing reintroduction of the disease. The move from elimination to remaining malaria-free can be effective only if countries have adequate systems for early detection of suspected malaria cases, objective information on absence of indigenous transmission, and reliable classification of all detected imported cases of malaria. National programmes to prevent reintroduction of malaria in malaria-free territories must continue until global eradication of all known forms of malaria in humans is achieved.

Assessing the risk of reintroduction of malaria transmission

The combined effects of receptivity (ability of local vectors to support malaria transmission in a favourable epidemiological season) and vulnerability (likelihood of import of malaria parasites into the country) determine a particular territory's risk of resurgence of indigenous malaria transmission. The real possibility for resurgence of transmission in malaria-free territory depends on many factors: Environmental, climatic, social, demographic, epidemiological, entomological, and others. The level of risk will depend on the presence of the above-listed factors, the level of healthcare systems' work, and the quality of efforts to implement

practical measures for preventing reintroduction of malaria to disease-free territory.

Assessing risk of indigenous transmission resurgence should take into account the following real factors: a) increase in the share of non-immune people following import of the disease by infected people or vectors into territory that had been freed of malaria; b) ability of local vectors to be infected by pathogenic phenotypes imported into the country; c) upsurge in mosquito activity resulting from creation of numerous anopheles-breeding water reservoirs following abundant precipitation and high river levels; d) penetration of a highly effective vector and regeneration of populations of previously eradicated vectors in potentially endemic territory.

Table 1 below can be used to assess malaria reintroduction risks.

During the prevention of reintroduction of malaria transmission phase, risks of malaria reintroduction must be identified sufficiently early for timely mobilization of the needed capacity and resources to limit the infection's spread.

The current socio-political situation makes it essential to conduct periodic assessment of risks of indigenous malaria transmission resurgence due to increased vulnerability in central and southern Europe following the 2015 migration crisis.

Prevention of consequences of malaria importation

Territories at risk of resurgence of clinical and epidemic consequences of imported parasitic disease require ongoing training and preparedness of medical personnel to diagnose, treat, and prevent such disease. This calls for early detection of

imported cases and preventing their spread. It is crucial that travellers be informed of the precautions to take against tropical diseases and follow doctors' recommendations, which depend on the locality, conditions, length of stay and time of year.

The main obvious preventive measures for dealing with imported malaria are early detection, reliable diagnosis, and full and radical treatment of patients and parasite carriers identified. Each case of imported malaria must be subject to epidemiological surveillance, with clarification of the conditions and circumstances of the infection and clear classification of the social group: Migrants, refugees, tourists, foreign students, local citizens returned from an endemic country.

Epidemiological surveillance in malaria-free territories or areas

During the phase of prevention of re-introduction malaria surveillance should be maintained, as there are many challenging factors (e.g. malaria importation in receptive areas) that need monitoring and response, because in the absence of appropriate action, an area is likely to become malarious again.

The main task of the epidemiological surveillance system in malaria-free territory is to ensure uninterrupted monitoring of the malaria situation in the country and carry out measures to prevent resurgence of indigenous transmission of the disease. A vigilance system should be integrated into the general system for epidemiological surveillance of communicable diseases. WHO recommends the following main approaches.

- If receptivity and vulnerability are low, early case detection by a vigilant general health service

Table 1. Assessment of the risk of malaria reintroduction in malaria-free areas

Scenarios	Assessment of risk factors		Risk of malaria reintroduction
	Receptivity	Vulnerability	
1.	+	+	From high to low depending on severity of risk factors
2.	+	-	Absent, but could emerge if vulnerability increases
3.	-	+	Absent, but could emerge if there are changes to receptivity
4.	-	-	Absent

complemented by epidemiological investigation of every case and focus, and appropriate remedial measures, may be sufficient to prevent re-establishment of transmission.

- If receptivity and vulnerability increase, countries must ensure active detection of cases of infection during the malaria transmission season, which could be combined with other regular visits to residents' homes (patronage of newborns, injections or bandaging for patients at home).
- In localities of high vulnerability it is necessary to reduce receptivity by the use of environmentally safe methods based on ongoing entomological monitoring.

Entomological surveillance in the prevention of reintroduction phase

Entomological surveillance continues after malaria elimination, with countries keeping in place their system for monitoring, assessing, forecasting and planning measures to regulate vector populations in order to prevent resurgence of indigenous malaria transmission in malaria-free territory, and to control potential outbreaks. At the same time, interruption of indigenous malaria transmission requires modification and even exclusion of some components of entomological monitoring. Preference should be given during this period to environmentally safe mosquito-control measures taken to improve local populations' quality of life. Below is a list of entomological monitoring measures that should be taken at the prevention of malaria reintroduction phase:

1. perform oversight of operation, planning and construction of hydro-engineering facilities and the condition of other breeding sites of *Anopheles* mosquitoes;
2. monitor the abundance of preimaginal forms of *Anopheles* mosquitoes;
3. monitor the abundance of adult *Anopheles* mosquitoes;
4. identify the start and end of the malaria transmission season;
5. assess effectiveness of mosquito control measures; and
6. monitor resistance and susceptibility of mosquitoes to insecticides used.

Main approaches and activities for preventing malaria reintroduction

Continued political commitment from countries and allocation of the needed capacity and resources to maintain malaria-free status are critical conditions for preventing reintroduction of malaria. Not only local healthcare agencies but also governments have an obligation to ensure the needed personnel and resources for carrying out required preventive measures throughout the entire process of global eradication of malaria.

Tables 2 and 3 present recommended possible preventive measures to be implemented through the national programme for maintaining malaria-free status and preventing malaria reintroduction in different types of epidemic situation.

Table 2. Recommended curative and preventive measures for different risks of malaria reintroduction

High receptivity and vulnerability	Low receptivity and vulnerability
<ul style="list-style-type: none"> • Passive case detection • Active case detection during the transmission season conducted every 14 days or more often in cases of renewed local malaria transmission related to imported cases • Hospitalization of patients • Epidemiological investigation of all cases and foci of malaria • Timely treatment of all confirmed cases of malaria using primaquine for radical treatment of <i>P. vivax</i> malaria 	<ul style="list-style-type: none"> • Passive case detection • Hospitalization of patients • Epidemiological investigation and epidemiological classification of all cases and foci of malaria • Timely treatment of all confirmed cases of malaria using primaquine for radical treatment of <i>P. vivax</i> malaria

Table 3. Recommended set of vector control measures for different risks of malaria reintroduction

High receptivity and vulnerability	Low receptivity and vulnerability
<ul style="list-style-type: none"> • Environmental management aimed at sustained improvement of areas and rational planning of hydro-engineering and drainage projects • Introduction of <i>Gambusia</i> fish into all sites where <i>Anopheles</i> mosquitoes breed • Other activities against <i>Anopheles</i> larvae can also be applied, but only in breeding sites where the effectiveness of introduction of <i>Gambusia</i> is reduced by overgrown vegetation • Indoor residual spraying should be carried out only in exceptional cases, such as when there is extensive importation of malaria by refugees or agricultural workers, or when infected mosquitoes invade the border areas 	<ul style="list-style-type: none"> • Vector control activities carried out as part of the general mosquito management programme

Certification of malaria elimination

Certification of malaria elimination is the official recognition of the achievement of malaria elimination in a specific country. It is granted by WHO when it has been proved:

- beyond reasonable doubt, that the chain of local malaria transmission by *Anopheles* mosquitoes has been fully interrupted throughout the country for at least three consecutive years; and
- that the existing health system (in particular the curative and preventive services and the epidemiological service) and an adequate surveillance and response system for preventing malaria reintroduction and possible reestablishment of local transmission is fully functional across the entire territory of a given country.

The malaria certification procedures are set out in WHO documents.

Official recognition of a country's malaria-free status brings direct and indirect economic dividends in terms of international tourism, investment in business and mutually advantageous cooperation in various areas of international relations. For the international community, it is important to have accurate information on the real spread of malaria, which impacts a country's socioeconomic development, and on potential infection risks.

After malaria elimination certification, countries must continue epidemiological surveillance of malaria and carry out preventive measures needed to maintain the status achieved and prevent a resurgence of indigenous malaria transmission in disease-free territory via import of malaria.

Since indigenous malaria transmission resurgence in the WHO European Region in the 1990s, three countries in the Region have been officially certified by WHO as malaria-free – Turkmenistan (2010), Armenia (2011) and Kyrgyzstan (2016).

Conclusion

The WHO European Region's vast experience in containing a regional epidemic, eliminating malaria and preventing its re-establishment should serve as a valuable example for planning and implementing of such interventions around the world to reduce the extent of this disease. At the same time, continuous importation of malaria from endemic countries and consequent recent resumption of local malaria transmission in limited areas of Georgia, Greece and Turkey that was halted by deliberate efforts of the countries, underscores the need to continue effective epidemiological surveillance of malaria in all countries where elimination has been

achieved. Bearing in mind that in 2015 the World Health Assembly approved the Global Technical Strategy for Malaria 2016–2030 with the goal of eliminating malaria in 35 countries and preventing the re-establishment of malaria to territories that have eliminated the disease, the WHO European Region's positive lessons learnt and experience accrued over the past years on malaria elimination and prevention can be important for consideration of those countries that are on the move to eliminate malaria and prevent its re-introduction into territories where indigenous transmission of malaria has been interrupted.

Country profiles

- **Armenia**
- **Azerbaijan**
- **Georgia**
- **Kazakhstan**
- **Kyrgyzstan**
- **Russian Federation**
- **Tajikistan**
- **Turkey**
- **Turkmenistan**
- **Uzbekistan**

Armenia

Transmission of *Plasmodium vivax* malaria was interrupted in Armenia in 2006, and the country was officially certified by WHO as malaria free in 2011.

Anopheles maculipennis is the main malaria vector in the country. Others include *An. sacharovi* and *An. claviger*. The appearance of *An. sacharovi* (the main vector in Transcaucasia) in the Ararat valley has created more favourable conditions for malaria transmission in the country.

Short history of malaria and malaria control

Malaria has been highly endemic in Armenia since ancient times but was absent for 31 years, during the period 1963–1994.

From 1963, when no indigenous malaria cases were reported, control operations were sharply reduced. After 1991, however, following the collapse of the former Soviet Union, the malaria-free status of the country was jeopardized. Several factors placed Armenia at risk for the re-emergence of malaria. Severe financial constraints contributed to reduction of vector control activities and, because of inadequate epidemiological control, new malaria cases were not diagnosed, treated or reported properly. Nevertheless, despite sporadic imported cases, Armenia maintained its malaria-free status until 1993 owing to a well-developed network of public health institutions.

In 1994, the first indigenous case was registered since malaria eradication, and 196 imported cases of malaria (5.1 per 100 000) were recorded among military personnel. All the cases were due to *P.*

vivax. The epidemiological situation and distinctive spread of malaria in Armenia was similar to that in south Asian countries.

In 1995, the number of imported cases increased to 502 among both the military and civilians, but no indigenous cases were detected that year. In 1996, 149 of 347 cases were reported as indigenous. During 1997–1998, the number of imported and indigenous cases continued to rise, with 567 indigenous cases in 1997. In 1998, the epidemic reached its peak, with 1156 malaria cases. Although 30 of 81 districts recorded malaria cases, in 1998, 89% of the indigenous cases were detected in the Masis district of the Ararat valley, an area bordering Turkey.

The malaria situation started to improve after 1999, when 616 *P. vivax* malaria cases were reported in Armenia, 376 in Masis district.

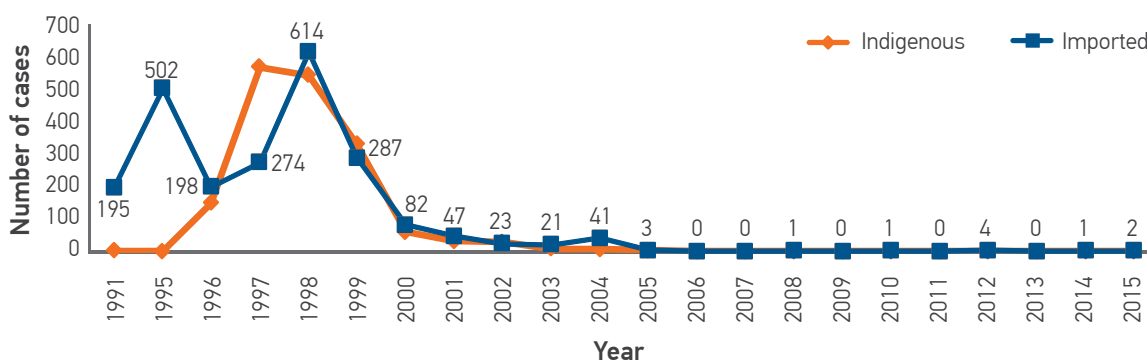
Malaria situation between 2000 and the present

After 2000, due to epidemic control interventions, the number of malaria cases (imported and indigenous) continued to decline. Altogether, 79 malaria cases were registered in 2001 (32 indigenous), 52 in 2002 (13 indigenous), 29 in 2003 (8 indigenous) and 47 in 2004 (6 indigenous). The last three indigenous cases in Armenia were reported in 2005. The dynamics of malaria morbidity in Armenia in 1994–2006 is shown in Fig. 1.

Strategies, policies and interventions

After 1994, when malaria cases began to be registered in the country again, the Government paid particular attention to the problem. The

Fig. 1. Malaria cases in Armenia, 1994–2015 and phases of malaria programme



Source: National Centre for Disease Control, Armenia.

national policy during this period focused on protecting the population from an epidemic.

In 1998, the Ministry of Health, with technical support from WHO and financial contributions from the governments of Italy and Norway, resumed malaria control activities. With WHO, United Nations Children Fund (UNICEF) and IFRC, a RBM programme was implemented to eliminate recently established foci of malaria and to prevent further spread of the disease.

The first malaria control programme was adopted by the Government Council in 1999, and a national coordination council for malaria was established by a decision of the President and the Prime Minister. The coordination council consisted of various ministers, the heads of Government agencies (including health, agriculture, internal affairs, defense and water resources) and the governors of malaria-endemic districts.

Broad consensus was built among local authorities, Government departments, civil society and the media to tackle the malaria problem in the 11 regions of the country, where regional councils were formed. Particular emphasis was paid to Ararat, Armavir and Yerevan City, where malaria control activities are currently being implemented.

In 2005, Armenia and other malaria-affected countries in the WHO European Region, taking into consideration the progress achieved in control of malaria (Fig. 2), endorsed the Tashkent Declaration. In 2006, Armenia prepared a national malaria elimination strategy, based on the results achieved so far and with the goal of eliminating *P. vivax* malaria by 2010.

Activities that played significant roles in the control and elimination of malaria in Armenia were:

- inclusion of malaria control and prevention activities in the general plans of action of local health authorities;

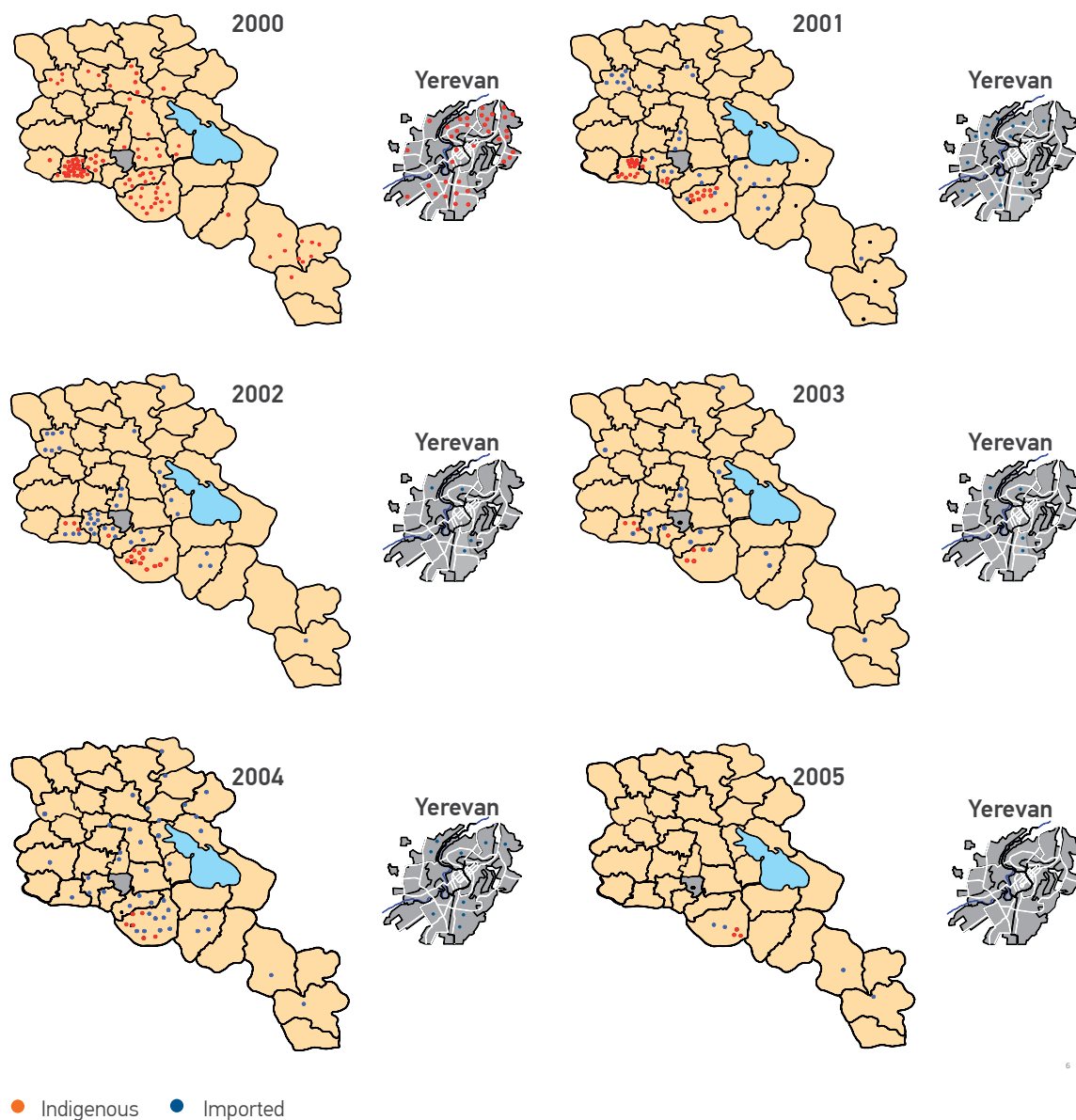
- staff training and re-training;
- preparation of inpatient facilities for malaria patients (window nets, regular disinsection, stocks of antimalarial drugs);
- provision of guidance to medical personnel;
- laboratory testing of samples, with clinical and epidemiological observation, to ensure early detection and treatment of cases;
- establishment of a reserve stock of antimalarial agents;
- strengthened capacity of parasitological laboratories;
- establishment of internal and external quality assurance for clinical and epidemiological diagnosis of malaria; and
- social mobilization and communication for the population.

Prevention of reintroduction of malaria

In 2011, the Government adopted the national programme and plan of action for the prevention of malaria reintroduction for 2011–2015. The key strategies for implementing the programme were:

- consolidation of the system for preventing reintroduction of malaria;
- integration of measures for preventing malaria reintroduction into the activities of the emergency programme;
- a cross-border cooperation policy;
- adaptation of the epidemiological surveillance system to prevention of reintroduction;
- improved preventive and anti-epidemic measures in foci of infection;
- preventive activities and measures for high-risk groups;
- dissemination of information on malaria prevention and hygiene to the population; and
- recruitment and training personnel for malaria prevention.

Fig. 2. Mapping of malaria cases, Armenia, 2000–2005



Source: National Centre for Disease Control, Armenia.

Outlook

The experience of reintroduction of malaria into Armenia after more than 30 years of interruption showed the importance of sustained surveillance for the prevention of resurgence. Now that the country has been certified by WHO as malaria free, continuous efforts and resources are needed to maintain a high level of vigilance and preparedness for a prompt response to prevent reintroduction of the disease.

Azerbaijan

Transmission of *Plasmodium vivax* malaria was interrupted in Azerbaijan in 2013, and the country is now in the prevention of malaria reintroduction phase.

The malaria vectors in Azerbaijan comprise *Anopheles maculipennis* (in the Caucasus), *An. sacharovi* (in the Kura-Araksin and Lenkoran lowlands) and *An. persiensis* (in the Lenkoran lowlands bordering the Islamic Republic of Iran).

Short history of malaria and malaria control

Azerbaijan has a long history of malaria. In the past, malaria was widespread, and high mortality from *P. falciparum* malaria was recorded in the highly endemic valleys of Kura-Araz, Samur-Devechi and Lenkoran and the Nakhchivan Autonomous Republic. In some settlements, the mortality rate was 70–100%.

During the period 1951–1960, scientific and practical organizational measures for malaria control resulted in elimination of malaria in the country. The measures included:

- a wide network of institutions for treatment and prevention, staffed by specialized, highly skilled personnel;
- sufficient stocks of effective medicines (quinine, proguanil, plasmocide) and domestically produced insecticides (DDT and hexachlorocyclohexane); and
- evidence-based malaria control methods for the different geographical areas of the country.

By 1960 malaria in Azerbaijan was practically eliminated.

The malaria situation deteriorated rapidly after 1990 as a result of almost complete cessation of malaria control interventions, hydro-engineering projects and mass displacement of nearly one million refugees and internally displaced people during armed conflicts. In 1996, 13 135 cases of malaria were reported, mainly in the Kura-Araksin and Lenkoran lowlands, areas that were highly malaria-endemic in the past. In 1997, the situation was aggravated by mudslides throughout these districts, and mosquito-breeding sites increased dramatically.

The first three-year malaria control programme was implemented in 1999, with financial support from the Italian oil company Eni, which contributed US\$ 760 000 through the WHO Regional Office for Europe.

Malaria situation between 2000 and the present

Remarkable progress was achieved in malaria control after 1997 as a result of full-scale implementation of malaria control measures, including public awareness, throughout the country. Reductions in malaria morbidity were registered each year: in 2002 and 2003, 506 and 482 malaria cases were registered, as compared to 13 135 cases in 1996, representing reductions of 25.9 and 27.3 times. The malaria incidence per 100 000 population in 2002 and 2003 was 6.3 and 6.0, respectively. The large-scale epidemic that occurred in 1994–1997 was thus controlled within 5–6 years.

In 2005, Azerbaijan endorsed the Tashkent Declaration, committing itself to elimination of malaria in the country by 2015.

In 2008, after the 120-times reduction in the number of indigenous cases of malaria from the peak of the epidemic in 1996, the Minister of Health endorsed the national malaria elimination strategy for 2008–2013. Implementation of the strategy was supported by the Government, WHO and the Global Fund.

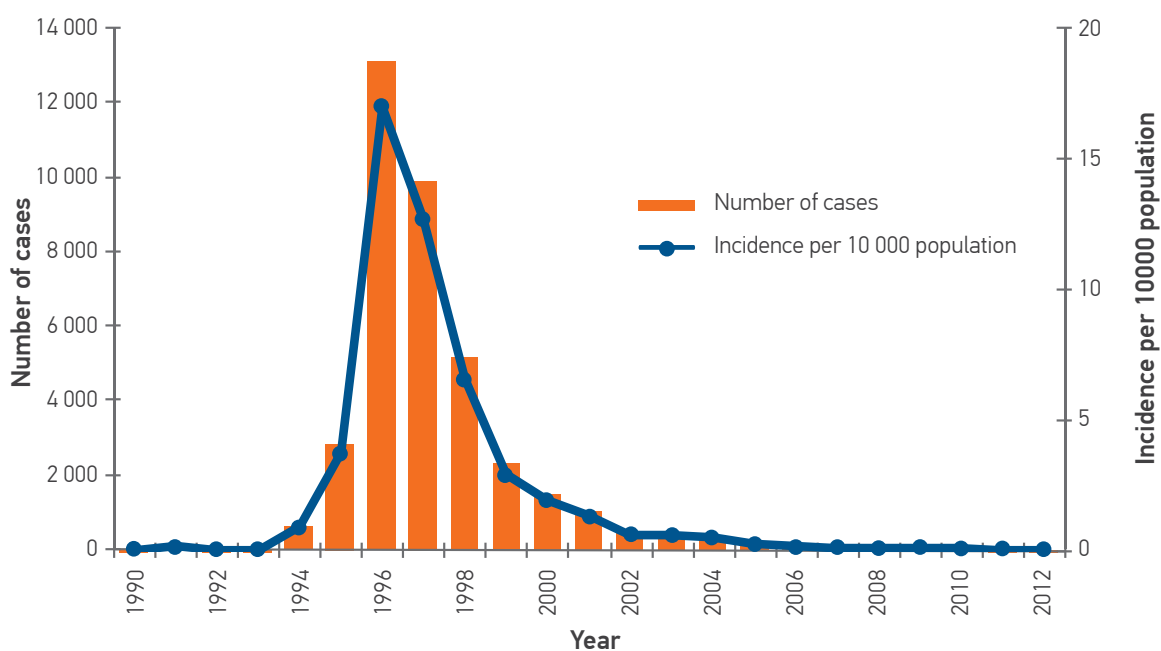
In 2013, malaria transmission in Azerbaijan was considered to be interrupted, with, for the first time since 1960, zero indigenous malaria cases (Fig. 3).

Strategies, policies and interventions

The goal of the malaria elimination strategy was to interrupt transmission by 2013, followed by certification of malaria elimination. In areas where malaria had been eliminated, attention was directed to maintaining the malaria-free status. Particular emphasis was placed on the growing problem of imported malaria. The interventions in the strategy included the following measures.

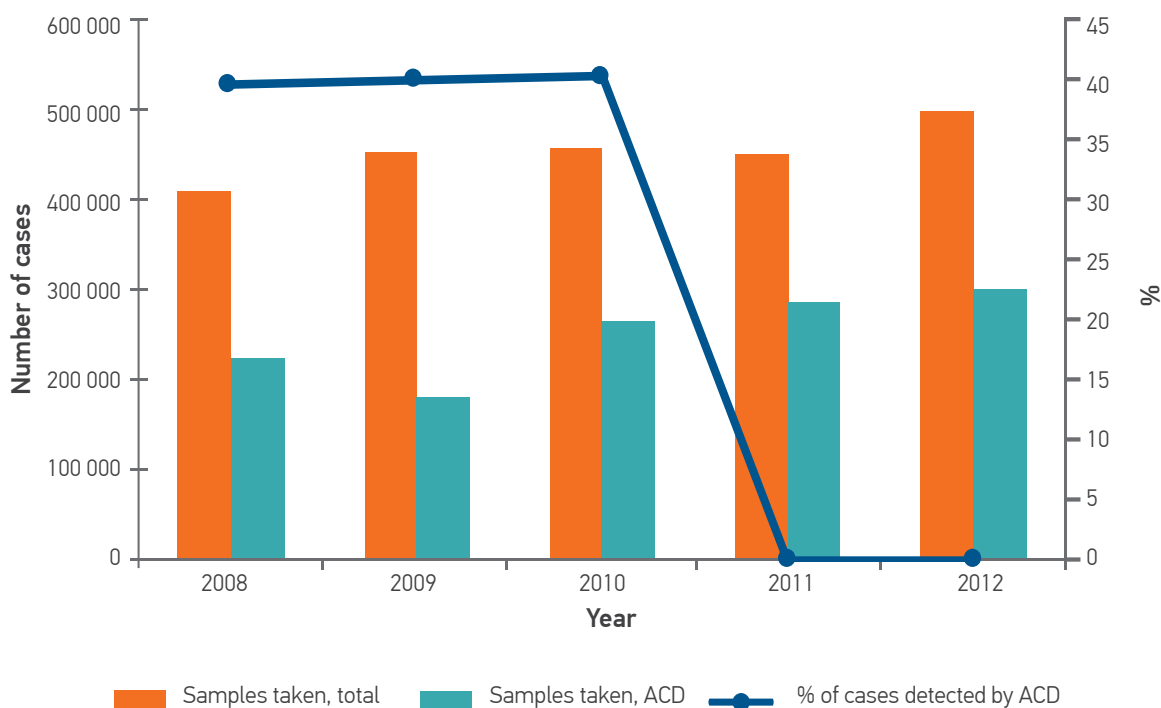
- Early detection, diagnosis and treatment of malaria: To detect malaria cases, blood slides were taken for parasitological examination from febrile patients and clinically suspected malaria cases. Passive case detection, consisting of screening for malaria cases at health facilities, was given priority over active case detection (Fig. 4); however, active case detection was conducted once a week during the transmission season in active foci and in cases of massive importation of malaria by migrants. All cases were treated free of charge.
- Vector-control measures: indoor residual spraying, larval control and insecticide-treated materials.

Fig. 3. Malaria cases and malaria incidence per 10 000 population, Azerbaijan, 1990–2012



Source: Republican Center of Hygiene and Epidemiology, Ministry of Health, Azerbaijan.

Fig. 4. Numbers of blood samples tested and malaria cases detected by active case detection (ACD), Azerbaijan, 2008–2012



Source: Republican Center of Hygiene and Epidemiology, Ministry of Health, Azerbaijan.

- **Control and prevention of epidemics:** Experience during the explosive epidemic of malaria in Azerbaijan in 1994–1996 showed that basic preparedness and rapid response mechanisms were not in place in epidemic-prone areas, obviating early detection of malaria cases and rapid reaction. Emphasis was therefore placed on establishing mechanisms to predict, detect and rapidly respond to epidemic situations to prevent an outbreak of malaria.
- **Surveillance:** Since 2009, malaria cases have been reported in an electronic integrated disease surveillance system, which integrates human and veterinary case data, demographic information, geographical information, laboratory analyses, sample tracking, epidemiological analyses, clinical information and response measures.
- **Staff development and training:** Relevant specialists were trained regularly, and guidelines and instruction materials on malaria elimination were made available.
- **Operational research for identification of *Anopheles* mosquitoes,** their distribution in different eco-epidemiological settings and their role in malaria transmission, vector resistance to insecticides and integrated vector control in different settings.
- **Community mobilization:** A number of communication campaigns were conducted, with effective information, education and communication strategies and targeted materials.
- **Cross-border collaboration:** Effective operational cross-border cooperation with Georgia was established.
- **A reliable system for monitoring and evaluation** was established, providing systematic analysis of the situation, and national malaria case and laboratory registers were established.

Prevention of reintroduction of malaria

In 2015, the Minister of Health endorsed the national strategy for prevention of malaria reintroduction for 2015–2020. The goal of the strategy is to maintain the malaria-free status of the country by preventing introduced cases, linked epidemiologically to imported cases, and indigenous cases secondary to introduced cases. The objectives are:

- early detection, notification and prompt diagnosis and treatment of all malaria cases;
- determination of the probable causes of reintroduction of malaria transmission;
- immediate action in the event of renewed local malaria transmission; and
- prevention of new local transmission.

Outlook

The experience of Azerbaijan once more demonstrates that high receptivity and vulnerability in the absence of adequate prevention and response mechanisms can lead to a rapid resurgence of malaria. Strong public health system infrastructure, political commitment and support, rapid resource mobilization and sustained funding are required to maintain malaria-free status.

Georgia

In Georgia, transmission of *Plasmodium vivax* malaria was interrupted in 2010. Two introduced cases were detected in 2011 and 2012; no locally acquired cases were reported in 2013. Georgia is now in the “prevention of malaria reintroduction” phase.

The main and secondary vectors are *Anopheles maculipennis*, *An. superpictus*, *An. sacharovi*, *An. atroparvus*, *An. hyrcanus*, *An. claviger* and *An. melanoon*.

Short history of malaria and malaria control

In ancient times, malaria was widespread and epidemic in Georgia. In the 1920s, approximately 30% of the population was infected ($\geq 80\%$ in the lowlands), and the mortality rate was 0.2% in 1924–1928. Comprehensive, nationwide antimalarial measures led to a sharp decrease in morbidity by 1954 and interruption of local transmission and sustained malaria elimination by 1970.

In the middle of the 1990s, a resurgence of malaria began, with imported cases from large-scale malaria epidemics in neighbouring countries due to social and economic collapse in the region after the disintegration of the former Soviet Union, which resulted in the breakdown

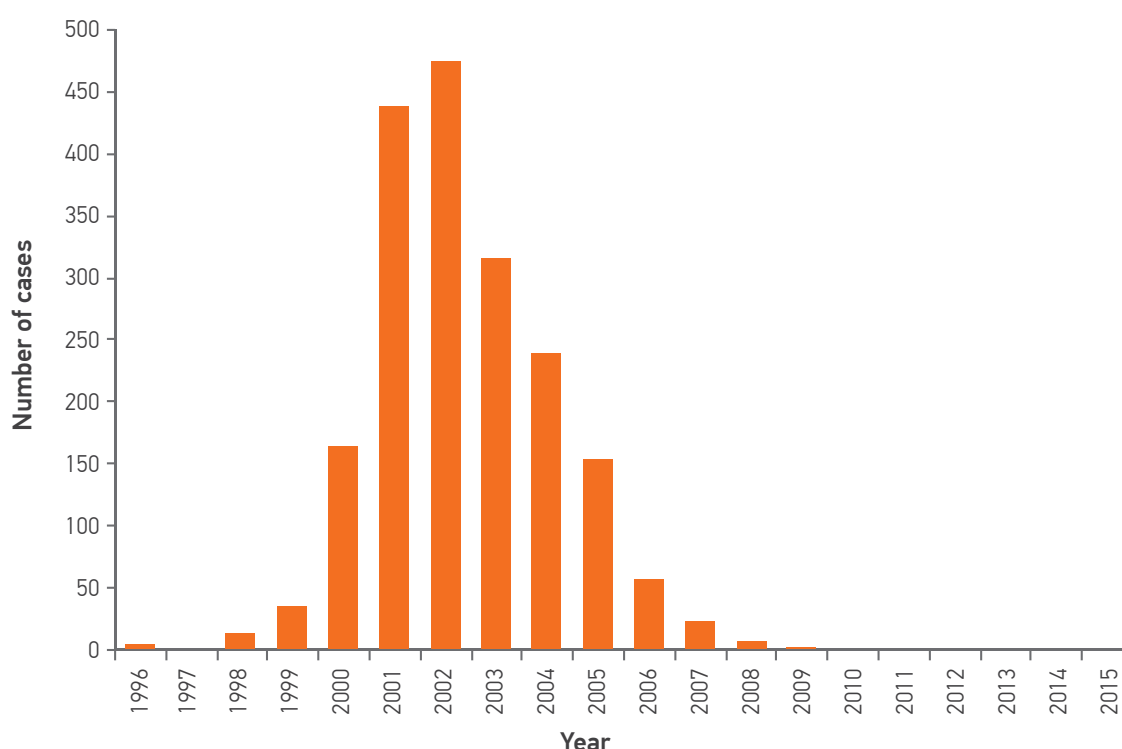
of public health networks, including the malaria prevention and control infrastructure. In 1996, the first three indigenous *P. vivax* cases were detected in a settlement bordering Azerbaijan. In subsequent years, the number of cases due to local transmission of *P. vivax* gradually increased, from 14 in 1998 to 35 in 1999, 164 in 2000 and peaks of 437 cases in 2001 and 474 cases in 2002 (Fig. 5).

Malaria situation between 2000 and the present

The malaria situation deteriorated (Fig. 5), with increasing numbers of indigenous *P. vivax* cases and active foci. Most cases occurred in the eastern part of the country, due to importation from endemic areas of neighbouring Azerbaijan; however, there were also single cases and an outbreak (26 people affected in 2001) in the formerly endemic territories of western Georgia. Altogether, 1868 indigenous cases were reported in the period 2000–2009. With accelerated, large-scale malaria control interventions supported by both internal and external resources, the number of cases has decreased steadily since the peak in 2002. The last indigenous case was officially reported in 2009.

Importation of malaria from endemic countries continued in 2010–2015, with 4–7 cases annually. Two cases in local citizens in 2011 and 2012 were

Fig. 5. Number of indigenous cases of *P. vivax* malaria in Georgia, 1996–2015



Source: Centre for Disease Control and Prevention, Georgia.

classified as “introduced” by the National Malaria Programme. Prompt responses by public health facilities prevented complications and secondary cases. In 2015, a case of induced *P. falciparum* malaria was reported in a local nurse who was infected during venepuncture of a patient with imported *P. falciparum* malaria.

Strategies, policies and interventions

After the resurgence of malaria in 1996, the Ministry of Health started intensive scaling-up of control and surveillance activities. In 2000, the National Malaria Control Programme was established, according to the WHO RBM strategy, with the support of the WHO Regional Office for Europe. The programme began with only limited funds; however, financial support was provided by the Global Fund between 2004 and 2012.

Georgia has succeeded in containing outbreaks and interrupting local malaria transmission after malaria resurgence, with the following main approaches and interventions:

- strengthened institutional capacity of the National Malaria Control Programme and general health services and enhanced capacity for decision-making on malaria;
- better capacity for and access to timely case detection, early diagnosis and adequate treatment of malaria;
- a national treatment protocol, which is updated regularly, in which all cases positive for vivax malaria are radically treated with a standard course of 3 days of chloroquine and 14 days of primaquine on an outpatient basis, free of charge, with a sufficient stock of drugs ensured;

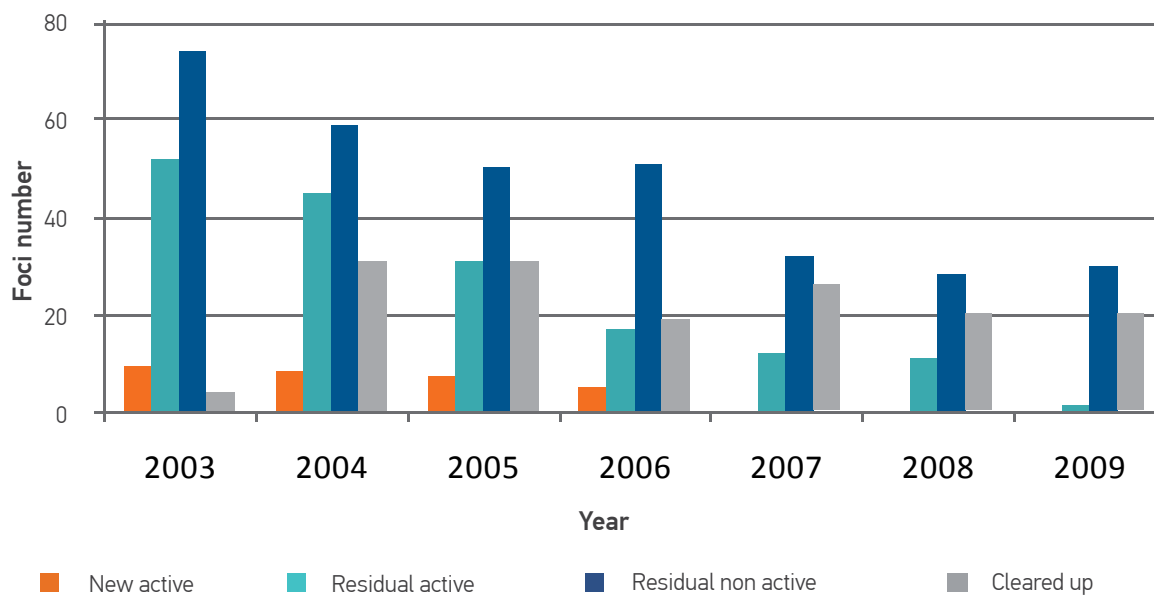
- reinforced surveillance mechanisms;
- cost-effective, sustainable vector control;
- improved capacity for timely response and prevention of malaria outbreaks and epidemics;
- increased community awareness and participation in malaria prevention;
- cross-border cooperation with neighbouring Azerbaijan; and
- operational research on the effectiveness of interventions (e.g. vector bionomics, malaria stratification, integrated vector control) and on cultural, social and economic factors (knowledge, attitudes and perceptions and other behavioural studies).

In 2005, Georgia endorsed the Tashkent Declaration and prepared a strategy and plan of action for malaria elimination in Georgia, in line with the new WHO regional strategy and other WHO documents. In accordance with the strategy, the country strengthened malaria surveillance for timely detection of each case and to clear up the last foci (Fig. 6). A central malaria database was created to register cases and foci and compile annual reports, in accordance with WHO recommendations, in preparation for WHO certification of Georgia as a country free of malaria.

Prevention of reintroduction of malaria

After successful interruption of local malaria transmission, work has been reoriented to sustain the results and prevent reintroduction. A programme for the prevention of malaria reintroduction has been incorporated in the State surveillance programme (2012), supported financially by the Government.

Fig. 6. Malaria foci in Georgia, 2003–2009



Source: Centre for Disease Control and Prevention, Georgia.

Outlook

Successful interruption of the resurgence of local malaria transmission in Georgia was due to strong political commitment, expertise, integrated approaches and sustainable resources. It was a long process, involving 14 years of continuous work by public and general health services, many other organizations and the entire population. Now, when the country has eliminated malaria, it should continue work to reduce receptivity and vulnerability, maintain adequate vigilance and ensure a timely response if needed.

Kazakhstan

Malaria was eliminated in Kazakhstan in 1967; subsequently, local *Plasmodium vivax* transmission was re-established in 1992 and then interrupted in 2000. The country is now in the “prevention of malaria reintroduction” phase. In 2012, Kazakhstan was added to the WHO supplementary list of countries free of malaria.

The malaria vectors in Kazakhstan are *Anopheles messeae* (the most common, found throughout the county), *An. superpictus*, *An. pulcherrimus*, *An. martinius*, *An. hyrcanus* and *An. claviger*.

Short history of malaria and malaria control

Malaria was common in Kazakhstan in the past. As a result of a large-scale, nationwide antimalarial campaign, local malaria transmission was interrupted by 1960, and malaria elimination was confirmed in 1967.

The country maintained malaria surveillance, and only imported cases were registered in the 1970s

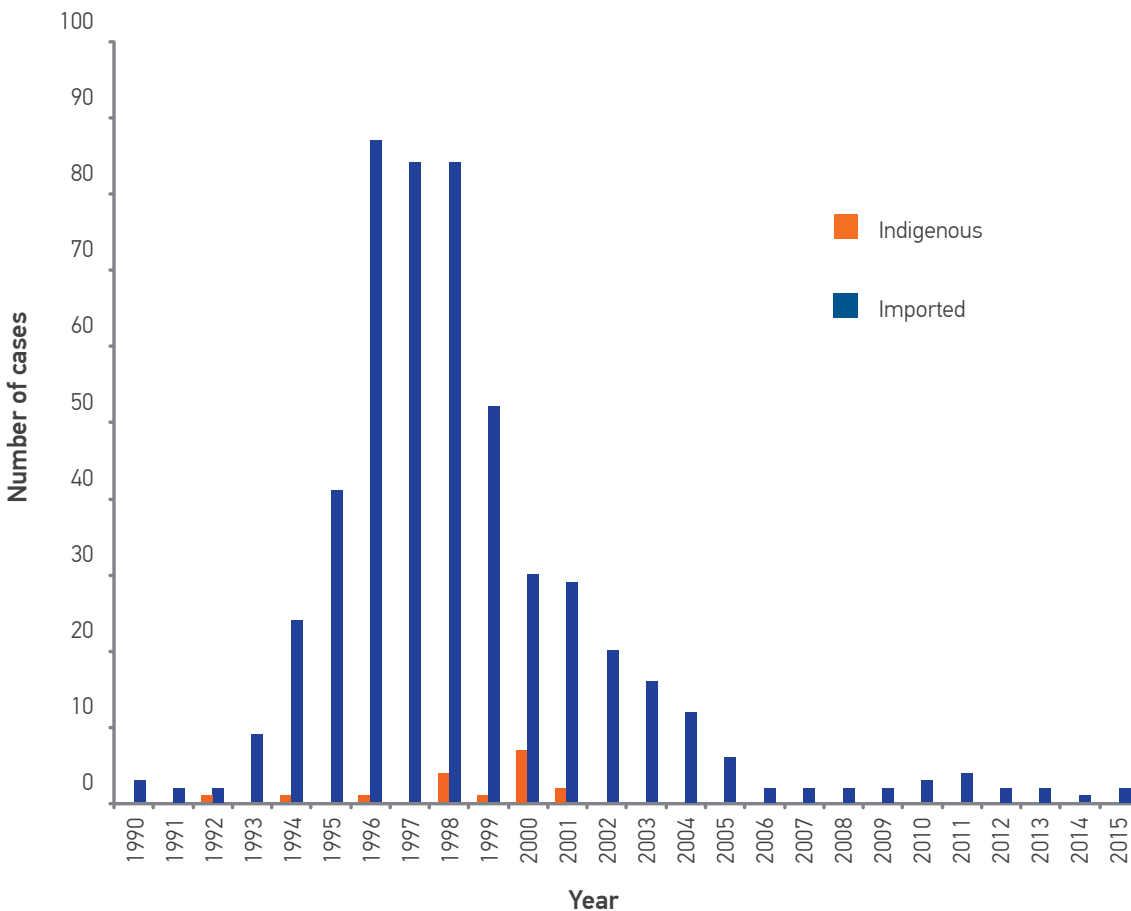
and 1980s. In 1992–1999, however, an increase in importation of *P. vivax* was seen from the countries of the former Soviet Union, where malaria epidemics had broken out, and a few introduced cases of *P. vivax* malaria were officially reported. Local transmission of *P. vivax* then resumed, and seven indigenous cases were recorded in 2000 and two in 2001 (Fig. 7).

Malaria situation between 2000 and the present

After resumption of local transmission of *P. vivax*, the Ministry of Health reinforced antimalarial activity, and the increased malaria control and surveillance quickly interrupted transmission and prevented further distribution of vivax malaria. Since 2002, no indigenous cases have been reported, although malaria importation continued. During the period 2000–2015 malaria, importation accounted for 135 cases.

Since 2000, after the sharp rise in the number of cases imported from malaria-endemic countries in the 1990s, there has been a steady decrease (see Fig. 7).

Fig. 7. Numbers of malaria cases in Kazakhstan, 1990–2015



Sources: Department for Monitoring of Parasitic Disease and Risk Assessment, Scientific and Practical Centre for Sanitary-Epidemiological Expertise and Monitoring, Consumer Protection Committee, Ministry of National Economy, Kazakhstan (unpublished data).

The majority of cases (114, 84.4%) were due to *P. vivax* and the rest to other species (*P. falciparum*, 14 cases; *P. malariae*, 3; *P. ovale*, 1; and mixed infection, 3).¹

Analysis of imported malaria cases in 2011–2015 showed that most were male (9 of 11), all were aged 20–40 years, more than half (6 cases) were foreign students, and malaria was imported predominantly from Pakistan (6 cases) but also from Afghanistan, Nigeria, and India. A potentially favourable factor for preventing local malaria transmission is that most cases were in towns, forming pseudofoci, and there was only one potential focus, which did not become active

Strategies, policies and interventions

For rapid interruption of the renewed *P. vivax* transmission and to achieve malaria elimination, the country mobilized resources and scaled up epidemiological surveillance and control. In 2000, a national plan for malaria prevention for 2001–2003 was set up. With application of indoor residual spraying in the new foci and larval control (*Gambusia affinis*) in mosquito habitats, the level of transmission was quickly reduced. Intensified case detection (passive and active), prompt diagnosis and radical treatment led to elimination of the sources of infection. Case-based surveillance, prevention and capacity-building helped to reach the target. These complex, integrated interventions, supported by the Ministry of Health, WHO and USAID, resulted in prevention of the spread of malaria in the country, and the last indigenous malaria cases were reported in 2001.

Kazakhstan has committed itself to eliminating malaria, and, in 2005, signed the Tashkent Declaration.

Prevention of reintroduction of malaria

After achieving interruption of local malaria transmission, the malaria programme was reoriented to prevention of malaria reintroduction.

In Kazakhstan, 4.5 million citizens in the 26 provinces live in potentially malarious areas,

although differences in eco-climatic settings, landscape, vector species distribution and occupational and migration patterns make the malariogenic potential heterogeneous. The areas at highest risk for resumption of malaria transmission are Almaty, Jambyl and South, West and East Kazakhstan and also the cities of Almaty, Astana and Karaganda.

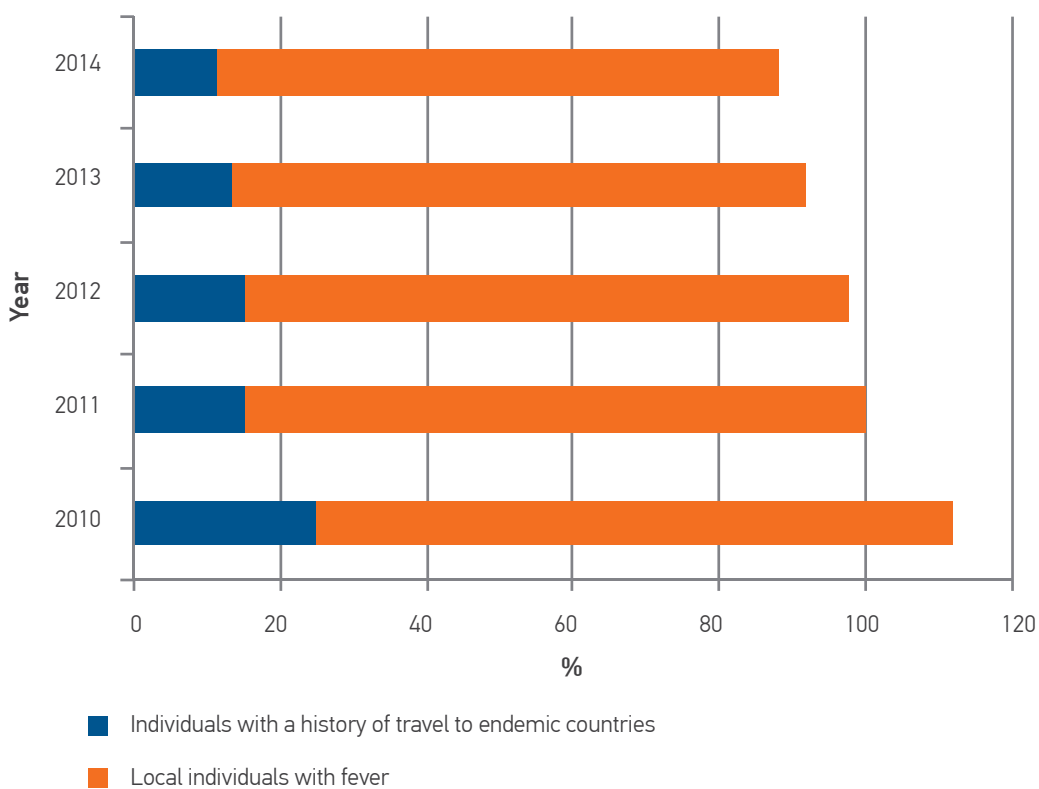
A recent decrease in the number of imported cases and the improved malaria situation in neighbouring and other countries of the former Soviet Union have reduced vulnerability, although increasing migration throughout the world may change the situation rapidly.

The aims of the programme for prevention of malaria reintroduction in Kazakhstan are to reduce malaria potential (receptivity and vulnerability), prevent imported malaria and its consequences and establish and maintain high vigilance for cases.

The main approaches and operations are as follows:

- timely passive and active detection of malaria cases on clinical and epidemiological indications (fever, history of travel to malaria-endemic countries) (Fig. 8);
- quality-assured laboratory diagnosis;
- treatment of malaria free of charge;
- comprehensive investigation of all imported cases and new foci and management of foci, in line with national legislation;
- entomological monitoring at selected control points and studies on insecticide resistance;
- vector control mainly through larval control and environmental management (Indoor residual spraying has not been used since 2010.);
- continuous work to reduce malaria importation;
- numerous Ministry of Health regulations and guidelines, which are updated periodically;
- continuous training and retraining of staff to maintain malaria expertise; and
- an agreement for cross-border cooperation for malaria elimination with Kyrgyzstan, Tajikistan and Uzbekistan, signed in 2010 in Bishkek.

Fig. 8. Percentages of people examined for malaria on clinical and epidemiological indications, Kazakhstan, 2010–2014



Sources: Department for Monitoring of Parasitic Disease and Risk Assessment, Scientific and Practical Centre for Sanitary-Epidemiological Expertise and Monitoring, Consumer Protection Committee, Ministry of National Economy, Kazakhstan.

Outlook

The experience of Kazakhstan shows the importance of sustainable surveillance in preventing malaria resurgence. Now, having achieved malaria elimination again, the country requires resources to maintain high levels of vigilance and preparedness to ensure a prompt response to any reintroduction of the disease.

Kyrgyzstan

Transmission of *Plasmodium vivax* malaria was interrupted in Kyrgyzstan in 2011, and the country is now in the “prevention of malaria reintroduction” phase. The process of certification of malaria elimination was initiated in 2014 and in November 2016 the country was certified by WHO as malaria-free.

Malaria vectors in the country included *Anopheles pulcherimus*, *An. superpictus*, *An. hyrcanus*, *An. martinius*, *An. claviger* and *An. messeae*.

Short history of malaria and malaria control

Malaria was eradicated in Kyrgyzstan in 1959, and the country was free of malaria between 1960 and 1981. A surveillance system was set up to prevent the reintroduction of malaria transmission.

In 1981, an imported case of *P. vivax* malaria was detected, and the number of imported cases continued to increase, leading to resumption of local malaria transmission and infection of the local population. Local transmission was re-established in Kyrgyzstan in 1986, when four indigenous cases of *P. vivax* were found among nine cases registered and were classified as “introduced” (first-generation local transmission). Ten more cases were detected in 1987.

Malaria situation between 2000 and the present

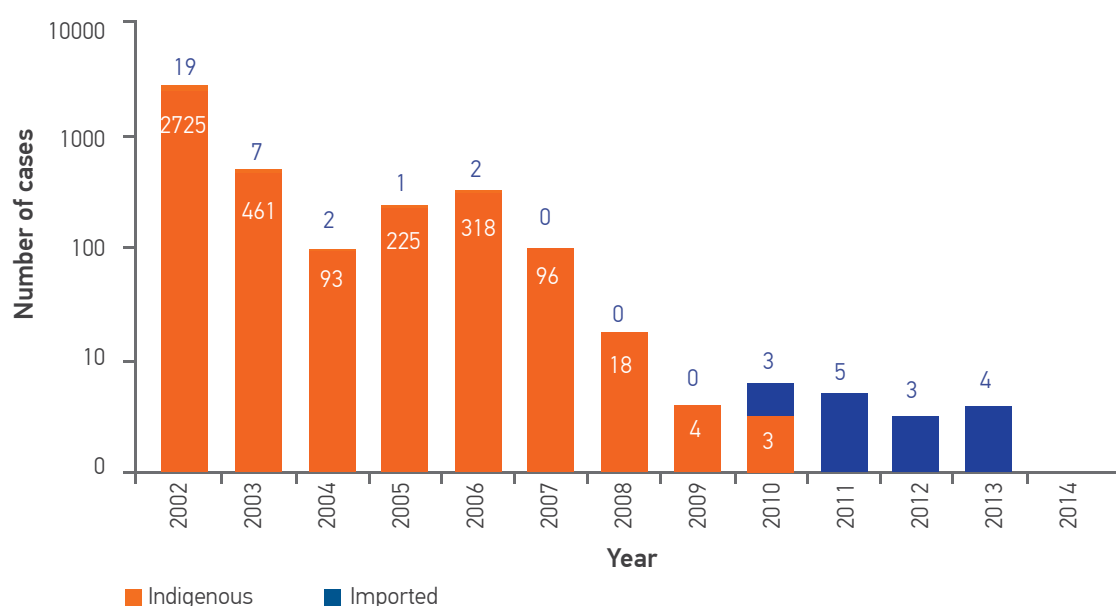
In 2002, explosive resumption of *P. vivax* malaria transmission became an epidemic situation, with an incidence much higher than those reported in

the past. The number of indigenous cases rose sharply from June onwards in southern regions of the country, including Batken, Osh and Jalal-Abad provinces, reaching 2744 by the end of the year (Fig. 9). The majority of cases (2725) were due to local transmission.

The main factors in the 2002 epidemic were:

- intensive importation from endemic Tajikistan and probably from Uzbekistan by seasonal workers returning from those countries to villages in Osh, Batken and Jalal-Abad provinces;
- delayed detection and case management due to the weakened national malaria programme and low level of vigilance of the general provincial and district health services due to the long absence of malaria from the country, which resulted in insufficient knowledge to make a clinical diagnosis, inadequate clinical examination of patients, weak laboratory skill in identifying plasmodia, wrong primary diagnosis (26% delayed diagnoses) and late referral of patients to hospital (52%);
- lack of antimalarial drugs and laboratory consumables for microscopic diagnosis at the beginning of the epidemic;
- understaffing of the State epidemiological service with parasitologists and assistant parasitologists, leading to delayed epidemiological investigations of cases and foci, reporting and the necessary measures;
- insufficient transport for conducting epidemiological investigations of cases and foci and control activities in malaria foci;

Fig. 9. Numbers of malaria cases, Kyrgyzstan, 2002–2014



Source: Ministry of Health, Kyrgyzstan.

- lack of the necessary insecticides and spraying equipment at the beginning of the epidemic; and
- insufficient knowledge about malaria in the population, so that 52% of malaria patients delayed seeking medical assistance.

In response to this serious malaria epidemic, the Government included malaria control in its development priorities as part of the response to the Millennium Development Goals. A targeted, comprehensive malaria programme of the Ministry of Health and an action plan for malaria control and prevention were implemented in 2001–2005. The aim was to decrease malaria incidence and prevent malaria mortality.

The national malaria control programme mobilized a network of public health facilities and scaled up interventions, with technical and financial support from WHO, ACTED, MERLIN, USAID and other organizations, resulting in containment of the first epidemic of malaria and a significant reduction in morbidity.

In 2003, the number of indigenous cases was reduced to 461, due to intense control and preventive interventions. The epidemic in the southern part of the country was contained, with a tendency to stabilization, and, by 2004, the number of

officially registered indigenous cases had dropped to 93.

In 2005, however, due to large-scale internal migration, the number of reported indigenous cases increased again to 225, with deterioration of the malaria situation in the north of the country (Fig. 10).

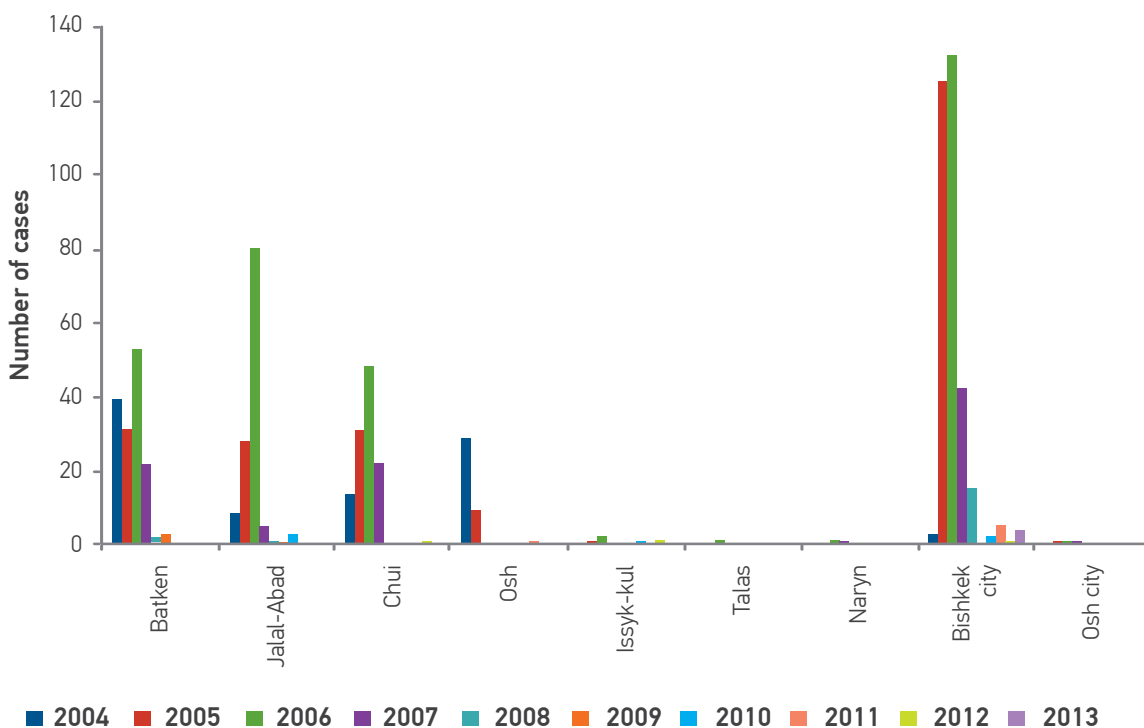
In October 2005, Kyrgyzstan signed the Tashkent Declaration. The last three indigenous cases of malaria in Kyrgyzstan were registered in 2010. Since 2011, no indigenous cases have been reported.

Strategies, policies and interventions

The epidemics in Kyrgyzstan were quickly contained by a strengthened malaria control programme and anti-epidemic activities. The main interventions were:

- comprehensive plans of action for epidemic containment prepared by the Ministry of Health and transmitted to local governments and related organizations at meetings, round-tables and other means;
- establishment of village committees for social mobilization and assistance in malaria control and prevention;
- indoor residual spraying in affected provinces;

Fig. 10. Malaria cases by province, Kyrgyzstan, 2004–2013



Source: Ministry of Health, Kyrgyzstan.

- distribution of larvivorous *Gambusia affinis* fish in mosquito breeding sites, especially in rice fields;
- improved entomological surveillance;
- intensified active and passive case detection;
- improved, timely epidemiological investigation of cases and foci;
- timely notification of cases and reporting;
- inter-seasonal preventive treatment with primaquine (15 mg/day for 14 days) of all patients in the previous year (in Tashkomur);
- capacity-building of health staff;
- inter-sectoral collaboration;
- health education of the population; and
- cross-border collaboration.

Prevention of reintroduction of malaria

In order to maintain malaria-free status, prevent the resumption of local malaria transmission and establish effective mechanisms for the post-elimination period, a programme to prevent reintroduction of local malaria transmission, 2014–

2018 was approved by the Government on 31 July 2014.

The goals of the programme are to maintain a stable malaria-free status, prevent the reintroduction of local malaria transmission and obtain international certification of the country as free from malaria. The objectives are:

- early diagnosis and notification of all cases of malaria and timely radical treatment;
- identification of all cases and causes of any reintroduction of malaria transmission;
- immediate (emergency) response in case of reintroduction of transmission;
- continuous training and retraining of health care professionals;
- increased social mobilization and coordinated intersectoral actions;
- partnerships with international and donor organizations; and
- cross-border cooperation.

Outlook

By using contemporary, scientifically based strategies, Kyrgyzstan managed to contain a malaria epidemic after resurgence of local malaria transmission, dramatically reduce the malaria burden and attain malaria elimination. This required strong political commitment, adequate funding, a well-developed surveillance system and enormous effort to set up and implement the malaria elimination programme.

To maintain its malaria-free status, the country will maintain vigilance and its rapid epidemic response system.

Russian Federation

The Russian Federation endorsed the Tashkent Declaration in 2007, when only 10 indigenous (introduced) malaria cases were reported. The country is in the “prevention of malaria reintroduction” phase. In 2012, the country was added to the WHO supplementary list of countries free of malaria.

Short history of malaria and malaria control

Malaria was eradicated in 1960 by a multi-disciplinary approach, taking into account the characteristics of each epidemiological stratum of the country.

In the 1960s and 1970s, however, the country registered the highest numbers of imported cases of all the republics of the former Soviet Union, because of its large territory, the many people travelling to and from Africa and the large number of international airports. In the 1970s, *Plasmodium falciparum* was the main imported parasite species (72.3%), followed by *P. vivax* (12.5%), *P. ovale* (8.2%) and *P. malariae* (6.3%). Mixed cases constituted 0.7% of the total number.

Between 1977 and 1990, 2180 imported cases of *P. falciparum* malaria were registered, of which 17 resulted in death; in 1991–2000, there were 513 cases and 29 deaths.

Malaria importation increased in the 1980s, during the war in Afghanistan. Measures to prevent malaria reintroduction from Afghanistan included:

- preventive treatment of troops with primaquine for 14 days before their repatriation from Afghanistan;
- reporting by each returned soldier to local public health services; and
- follow-up and active case detection among returned soldiers.

Outlook

The Russian Federation demonstrates the same trend as observed in other countries of the WHO European Region: the increased importation of malaria to urban areas due to the growing population employed in the economy (industry, social and technical services and other sectors). Malaria cases in cities show a reduced level of local transmission through mosquitoes and varying risk of infection in different city districts – lower in the central part and elevated on the outskirts where there are more mosquito breeding sites.

Malaria control strategies in cities differ from those in rural areas. They are characterized by an increased role for environmentally safe prevention measures: hydrotechnical and larvicidal, and also by earlier detection of patients due to the better knowledge of health workers on malaria and higher public awareness of protection measures against mosquito bites.

After the collapse of the Soviet Union in 1991, malaria was imported from endemic countries into all territories of the Russian Federation throughout the decade, with a tendency for decreasing importation from tropical Africa and Asia.

From 1993, isolated cases were introduced, reaching a peak in August–September 2001. A total of 134 *P. vivax* malaria cases were detected in 121 settlements, with no cases in children, illustrating the sporadic nature of local transmission.

Malaria situation between 2000 and the present

Indigenous transmission of malaria in 2002–2008 was reported mainly in Moscow and Moscow oblast, probably because they are attractive for labour migrants. Several cases of internal importation within the country were also reported.

In 2008, for the first time in 15 years, the proportion of imported *P. falciparum* cases was higher than that of *P. vivax*, indicating importation not only from the newly independent states but also from Africa and South-East Asia. In 2010–2014, 436 malaria cases were imported, of which only 12 were from the newly independent states. The vast majority (96.6%) were registered in urban areas (Table 4).

Little importation was seen during the short transmission season and occurred mainly in large cities with low receptivity. The low proportion of *P. vivax* cases in the importation pattern significantly reduced the risk for resurgence of malaria (Fig. 11).

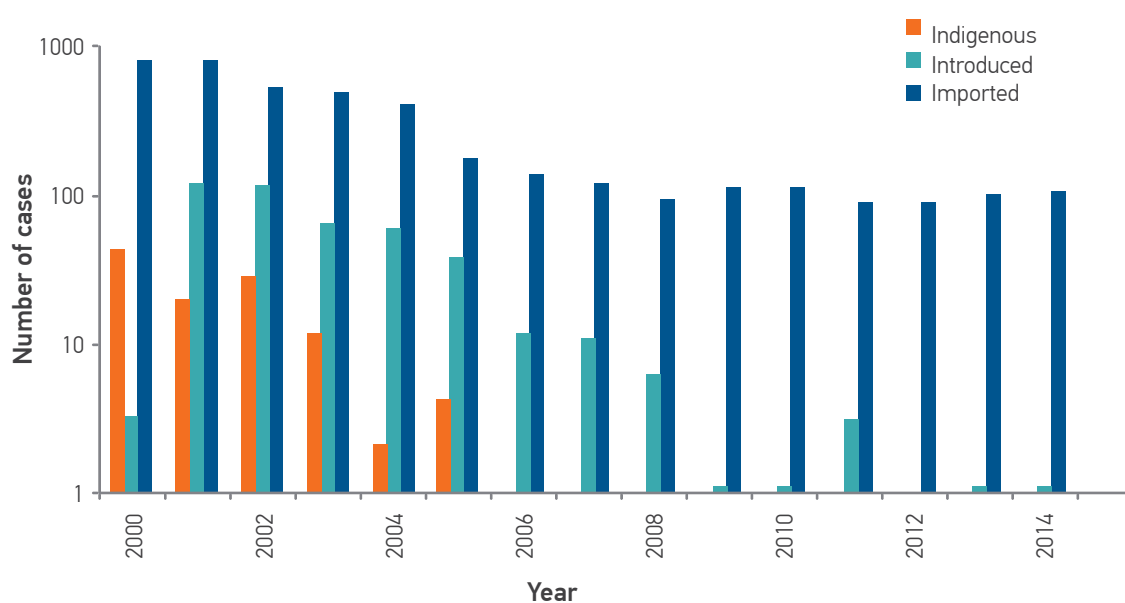
Prevention of reintroduction of malaria

Preventive measures are used mainly in potential foci, when imported cases have occurred and when local transmission originated in a new active focus. The measures include active case detection, entomological surveillance and vector control, the last only when local transmission has occurred.

Table 4. Areas of the Russian Federation with the highest numbers of imported malaria cases, 2010–2014

No	Subjects of the Russian Federation	Years					Total
		2010	2011	2012	2013	2014	
1	Moscow	38	26	24	26	22	136
2	Saint Petersburg	8	5	13	5	8	39
3	Moscow Region	6	6	4	5	2	23
4	KhMAO – Yugra	1	0	1	8	8	18
5	Tyumen	7	4	3	3	0	17
6	Tatarstan	2	2	3	2	2	11
7	Rostov	1	3	5	1	1	11
8	Chelyabinsk	0	2	1	5	3	11
9	Belgorod	1	2	0	2	4	9
10	Voronezh	1	3	2	0	2	8
11	Irkutsk	1	1	3	2	1	8
12	Smolensk	1	2	0	2	3	8
13	Ryazan	4	1	0	0	1	6
14	Samara	1	1	0	0	4	6
TOTAL		72	58	59	61	61	311

Fig. 11. Dynamics of indigenous, introduced and imported malaria cases in the Russian Federation, 2000–2014



Source: Ministry of Health, Russian Federation.

Tajikistan

In 2015, for the first time, Tajikistan reported zero indigenous cases. Transmission of *Plasmodium falciparum* malaria in the country was interrupted in 2009.

The malaria vectors in Tajikistan include *Anopheles superpictus*, *An. pulcherimus*, *An. macullipennis*, *An. hyrcanus* and *An. martinius*. Studies on vector resistance to insecticides (DDT, fenitrothion, cyfluthrin and deltamethrin) showed that all the vectors are susceptible.

Short history of malaria and malaria control

After malaria eradication was achieved in Tajikistan in 1960, isolated cases were registered only in areas bordering Afghanistan and were associated with the introduction of infected vectors from that country.

During 1963–1980, 135 malaria cases were detected in 25 settlements in seven of eight districts bordering Afghanistan. With the beginning of the war in Afghanistan in the 1980s, malaria incidence began to increase in Tajikistan. In 1980, 36 indigenous cases were registered, and the number rose to 121 in 1981.

The increase continued until 1985, although use of indoor residual spraying, mass drug administration, training of local medical staff and health education of the population led to a reduction in malaria incidence.

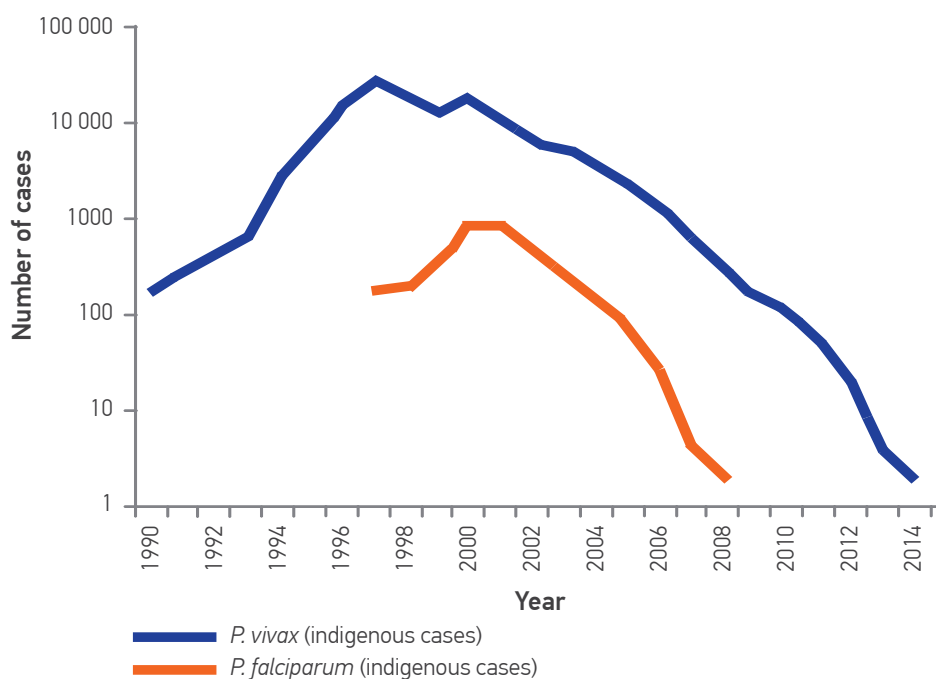
The epidemiological situation in Tajikistan deteriorated further in 1993, when an influx of refugees from Afghanistan resulted in mass importation of *P. vivax* and *P. falciparum* malaria to receptive areas of Kurgan-Tube. In 1993, 628 malaria cases were registered, in 1994, there were 2410, and in 1995, 2410 cases were detected. In 1997, at the peak of the epidemic, 29 794 malaria cases were officially reported in the country (Fig. 12).

Tajikistan was the only country in the WHO European Region that had a resurgence of *P. falciparum* malaria, which constituted up to 5% of all malaria cases.

Considerable financial, scientific and practical support from various international organizations, such as WHO and UNICEF, ECHO, the Food and Agriculture Organization of the United Nations, ACTED, MERLIN, USAID, and from the governments of Italy, Japan and Norway played a crucial role in controlling the malaria epidemic. The support was instrumental in the re-establishment of specialized malaria control services in Tajikistan, including the central and 10 regional tropical disease control centres.

In 1997, the first national programme for control of tropical diseases (malaria) was established in Tajikistan for 1997–2005. Various epidemic control measures were used, such as indoor residual spraying with an effective insecticide, use of lavivorous fish and mass drug administration

Fig. 12. Numbers of malaria cases in Tajikistan, 1990–2014



Source: Republican Tropical Diseases Center, Ministry of Health, Tajikistan.

in stable malaria foci, resulting in a rapid decrease in morbidity. Between 1997 and 1999, the number of malaria cases was reduced by more than 50%, from 29 794 to 13 493 cases. The malaria situation nevertheless remained serious because of its spread throughout the country and the re-emergence of local transmission of *P. falciparum* malaria. In 2000, 19 064 cases of *P. vivax* and 831 cases of *P. falciparum* malaria were reported in the country.

Malaria situation between 2000 and the present

In 2005, Tajikistan and other affected countries in the WHO European Region signed the Tashkent Declaration, committing themselves to eliminate *P. falciparum* malaria by 2010 and *P. vivax* malaria by 2015.

On 30 December 2005, the Government approved the national malaria control programme for 2006–2010, with the aims of interrupting *P. falciparum* malaria transmission and reducing malaria morbidity to less than 20 per 100 000 population. The programme was successful, and transmission of *P. falciparum* was interrupted in 2009.

In 2011, the Government endorsed the national programme for interruption of malaria transmission for 2011–2015. In 2015, for the first time, the country reported zero indigenous cases (Fig. 12).

The goals of the strategy were to eliminate local transmission of malaria in Tajikistan by 2015 and to maintain the malaria-free status in areas in which the disease has been eliminated.

The strategy had the following objectives:

- interrupt local transmission of *P. vivax* malaria, although ephemeral transmission may occur in areas bordering Kunduz, Tahir and Badahshan in Afghanistan;
- prevent reintroduction of *P. falciparum* malaria, which was eliminated in 2009;
- prevention reintroduction of malaria transmission in districts in which it as been interrupted; and
- prevent deaths due to imported malaria.

A total of 41 districts (Fig. 13) have been identified for malaria control interventions on the basis of the current distribution of malaria cases in the country, the risk for malaria transmission and rational use of resources.

Strategies, policies and interventions

In 2001, a WHO Roll Back Malaria field office was established in the Khatlon region of Tajikistan to evaluate the extent of the malaria problem, particularly in regard to *P. falciparum*. Operational studies conducted there provided a baseline for future interventions. The activities in 2002–2003 included early diagnosis and radical treatment of malaria, selective indoor residual spraying, promotion of biological means of vector control, distribution of insecticide-impregnated mosquito nets, seasonal prophylaxis for high-risk groups, training in malaria, surveillance, community mobilization and operational research.

In 2003, WHO, in cooperation with the United States Agency for International Development, initiated a malaria control programme in Central Asia. In Tajikistan, the project covered the most severely affected regions. In 2003–2005, 92 parasitologists, 19 assistant parasitologists, 306 laboratory technicians, 43 entomologists and 13 assistant entomologists were trained or retrained in malaria. During the project, 105 070 houses were covered by indoor residual spraying, protecting 748 125 people. In 2003–2005, 126 supervisory visits were made by international staff and 433 by local staff. All medical facilities were provided with sufficient amounts of antimalarial drugs. During the project, 302 public awareness sessions for 11 222 people were conducted.

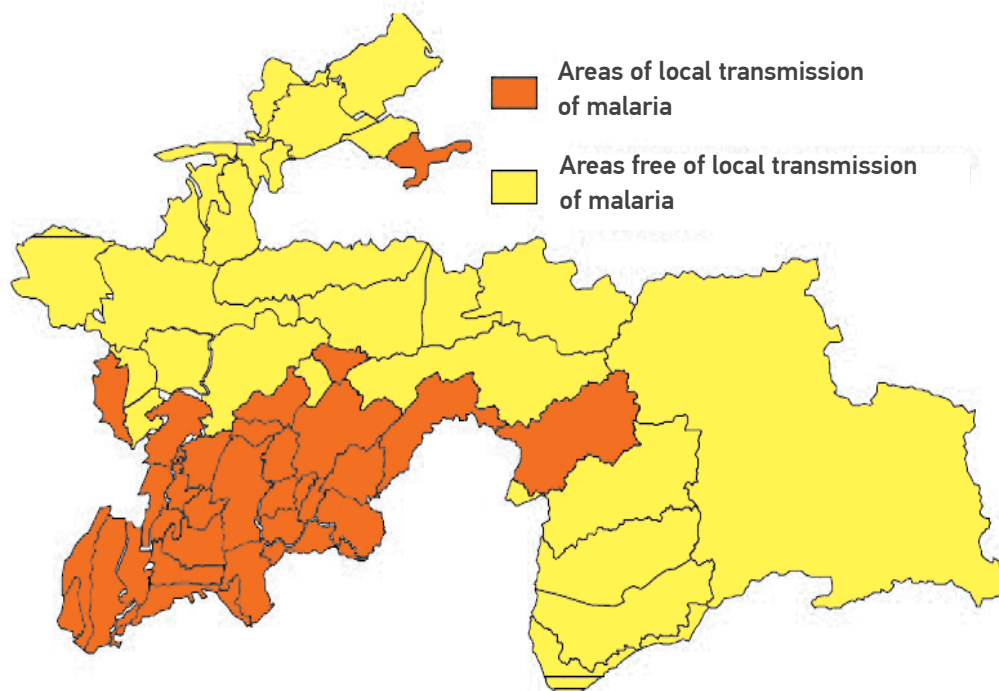
In the districts covered by the project, the number of malaria cases fell noticeably. While *P. falciparum* malaria was registered in 24 of the 38 districts included in the project in 2002, the numbers of districts fell to 20 in 2003, 18 in 2004 and 14 in 2005. A similar trend was observed for *P. vivax* malaria, with 4658 registered cases in 2003 and 2067 in 2005.

In 2005, Tajikistan received the first grant for malaria from the Global Fund. This funding played a significant role in achieving interruption of malaria transmission in the country.

Prevention of reintroduction of malaria

After interruption of local transmission of malaria, all efforts should be directed to preventing its reintroduction. A national strategy is being prepared.

Fig. 13. Map of priority target districts for malaria control, Tajikistan, 2011–2015



Source: Republican tropical diseases center, Ministry of Health, Tajikistan.

Outlook

Despite the remarkable achievements, the risk for reintroduction of malaria into Tajikistan remains high, primarily in the districts bordering Afghanistan, due to possible importation of cases and infected mosquitoes. The high receptivity (presence of local vectors and environmental and climatic conditions favourable for malaria transmission) of the southern part of the country means that even limited importation of malaria could lead to reactivation of foci that have been cleared. The close proximity of Afghan and Tajik settlements in border areas (within 3–5 km or even 100 m) aggravates the situation, as 3–5 km is the common flight range of *Anopheles* mosquitoes.

The maintenance of strong vigilance, timely detection of any malaria case and effective response should be assured in the future.

Turkey

Turkey has trod a long road to malaria elimination. In the past, three *Plasmodium* species, *P. vivax*, *P. falciparum* and *P. malariae*, were present in Turkey, with *P. vivax* predominating. Since 1970, *P. vivax* has been the only parasite species transmitted locally.

In 2015, only three malaria cases, which were imported, were registered in the country.

Ten *Anopheles* species have been identified in Turkey. *An. sacharovi* is the most significant vector of malaria, followed by *An. superpictus*, *An. maculipennis* and *An. subalpinus*.

Short history of malaria and malaria control

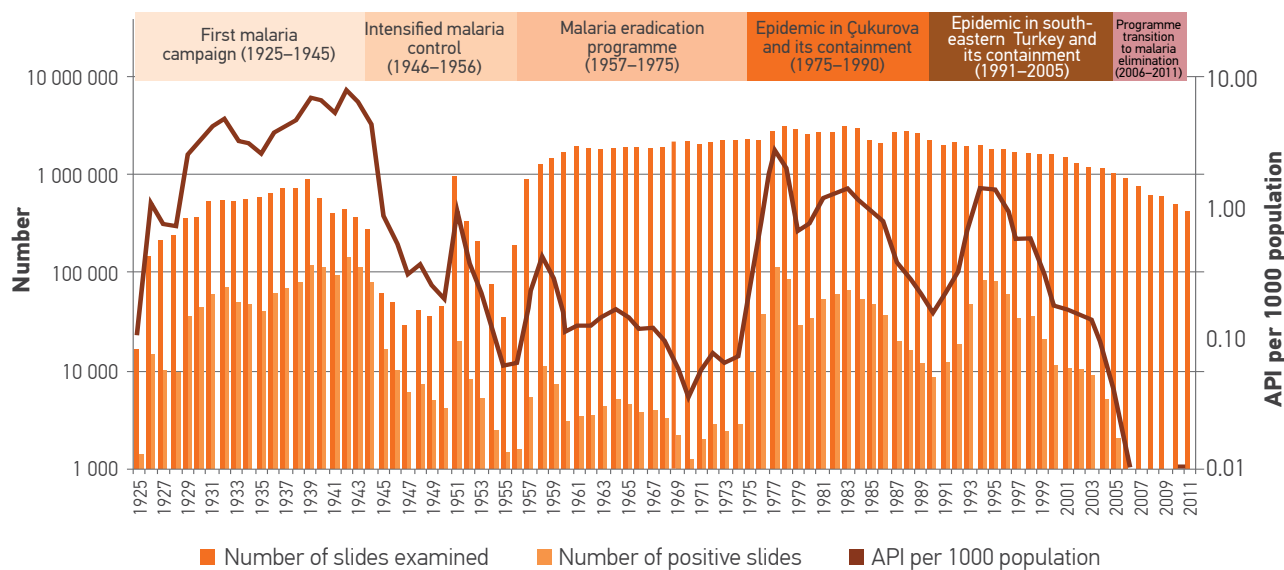
Turkey was highly endemic for malaria in the past and has a long history of fighting the disease, launching its first malaria control campaign in 1926. After the Second World War (1939–1945), intensified, extended malaria control interventions with the use of new tools, especially DDT, led to a dramatic decrease in the malaria burden by the 1950s (Fig. 14). A national malaria eradication programme was launched in 1957, which succeeded in reducing the area affected by local malaria transmission to a few provinces in south-east Turkey. An ambitious insecticide spraying campaign was conducted in 1963 that achieved coverage of 93–96% of the population; this was complemented by intensive larviciding and environmental management. Intensified malaria

surveillance, covering more than 17 million people by 1962, also did much to reduce the sources of infection. By the end of 1974, 93% of the country was in the consolidation phase; *P. falciparum* and *P. malariae* transmission had been interrupted completely, and *P. vivax* had been limited to focal areas in the south east. The final goal of eliminating local transmission nationwide was, however, not achieved, and major epidemics ensued in the 1970s and 1990s.

Containment of both epidemics required complex interventions, which were coordinated by the national malaria network, with mobile teams of specialists assigned to the affected areas. Elements of the efficient, integrated approach included

- vector control operations designed to reduce the mosquito population density rapidly with a combination of IRS, thermal fogging and ultra-low volume applications, chemical larviciding primarily in and around urban centres, large-scale distribution of larvivorous fish (*Gambusia affinis*) and environmental management (cleaning of drainage canals);
- surveillance to reduce sources of infection by prompt identification of cases both actively and passively, prompt, comprehensive investigation of every case, notification of each case to the National Malaria Control Programme and radical treatment of malaria cases; and
- preventive measures in populations in foci and in the most receptive areas by mass drug

Fig. 14. A century of malaria control in Turkey



Source: WHO (22).

administration (chloroquine and pyrimethamine at 2-week intervals) and intensive health education.

Malaria situation between 2000 and the present

Once the epidemic had been contained by intensive attack-phase and mopping-up operations, the Malaria Control Programme continued control interventions. Despite a number of challenges, the Programme achieved an impressive reduction in the disease burden, the number of the indigenous cases dropping from 11 381 in 2000 to 2036 in 2005. *P. vivax* malaria was endemic only in the south-eastern part of the country, mainly in Diyarbakır, Şanlıurfa and Mardin provinces (Fig. 15).

The stable reduction in the number of malaria cases in the previous two decades and restriction of transmission to a few provinces in the south east of the country encouraged the Government to endorse the Tashkent Declaration. By 2006, considerable progress had been made, with, for the first time, fewer than 1000 locally acquired cases. In 2008, after further progress in malaria control, the Turkish Government decided to reorient the malaria programme to elimination, with the goal of interrupting indigenous transmission of malaria in the country by 2015. With the support of the WHO Regional Office for Europe, a national strategy and plan of action for malaria elimination were drawn up and implemented.

The malaria elimination programme adopted a comprehensive, integrated approach, directing interventions to the main components of the epidemiological process: the source of infection, mode of transmission and receptive populations.

The National Malaria Control Programme continued to clear up the remaining foci. Local transmission was limited to same provinces in the south east of the country (Fig. 14) that had posed a problem in earlier eradication efforts. Most of the cases and foci were clustered in Diyarbakır and the neighbouring provinces of Şanlıurfa and Batman. A few endemic foci have existed for years in the southern part of Mardin Province.

The number of malaria cases continued to decrease, to 166 in 2008 and 38 in 2009. Nine cases reported in 2010 and four reported in 2011

were classified as relapsing cases of infections contracted the previous year.

In 2012, however, as a result of *P. vivax* importation by lorry drivers entering Turkey from endemic countries and a delay in recognition of the index cases, a malaria outbreak was registered in Mardin Province, with 218 introduced and indigenous cases. The outbreak was brought under control, and only 34 cases of relapsing malaria due to the outbreak were registered in 2013. Five introduced cases were officially reported in 2014 and only three in 2015.

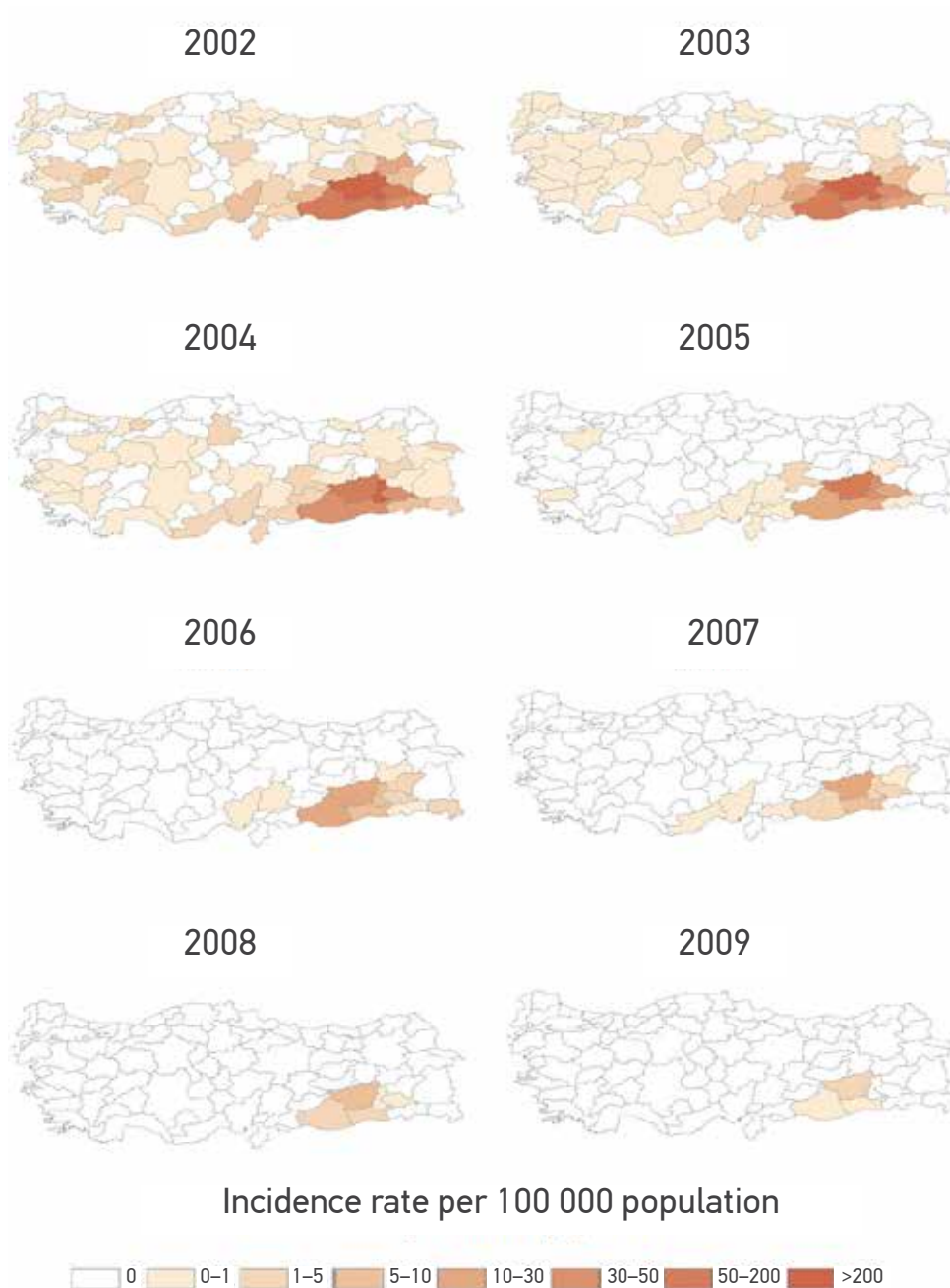
Prevention of reintroduction of malaria

At present, the focus is on identifying imported cases. Because of the country's geographical location, it receives many travellers from other countries, posing a risk for imported malaria. Moreover, the number of Turkish nationals travelling to malaria-endemic countries for business, trade and tourism is increasing.

The Ministry of Health has prepared a legislative and regulatory framework for the prevention of malaria among travellers to and from endemic countries and has established a Directorate General of Health for Border and Coastal Areas. A branch of the Directorate General, the Health Services Department, coordinates the work of 26 travel health centres in the country, which provide consultations for people travelling to endemic countries, issue international certificates of vaccination and provide the necessary pre-travel vaccinations and malaria chemoprophylaxis free of charge. The drugs and vaccines are provided by the Ministry of Health.

Temporary workers migrate seasonally from remote areas of south-eastern Turkey, in which the remaining residual foci of active malaria were located, to other parts of the country. Regulations require that these workers, who usually live in camps, be examined by local malaria workers. Turkey also has many international migrants, mostly from Iraq, the Islamic Republic of Iran, Pakistan and the Syrian Arab Republic. At provincial level, there is collaboration between malaria control and health facilities and the Ministry of Internal Affairs, which allows appropriate, timely coverage of migrants with examinations for malaria and follow-up.

Fig. 15. Malaria incidence in provinces of Turkey with malaria transmission, 2002–2009



Source: WHO (22).

Outlook

Although Turkey has had a turbulent history of malaria, the country has made significant progress towards national elimination. Strong political commitment, sustainable Government financial support and the necessary operational and technical capacity are prerequisites for maintaining the progress.

While population movement can increase the risks for reintroduction and localized outbreaks of malaria in Turkey, the country's experience shows that a well-prepared health system can prevent reintroduction of vector-borne diseases.

Turkmenistan

Malaria was eliminated in Turkmenistan in 1961, reintroduced in 1998 and eliminated again, followed by official WHO certification of a country free of malaria in 2010.

The principal malaria vectors are *Anopheles pulcherrimus* and *An. superpictus*; *An. hyrcanus* possibly plays a minor role.

Short history of malaria and malaria control

In the past, malaria was one of the major infectious diseases in Turkmenistan, devastating the rural population. During the Global Malaria Eradication Programme, *P. vivax* transmission was interrupted in 1960.

Turkmenistan then set up a surveillance system to prevent malaria reintroduction. Between 1960 and 1980, sporadic imported and introduced

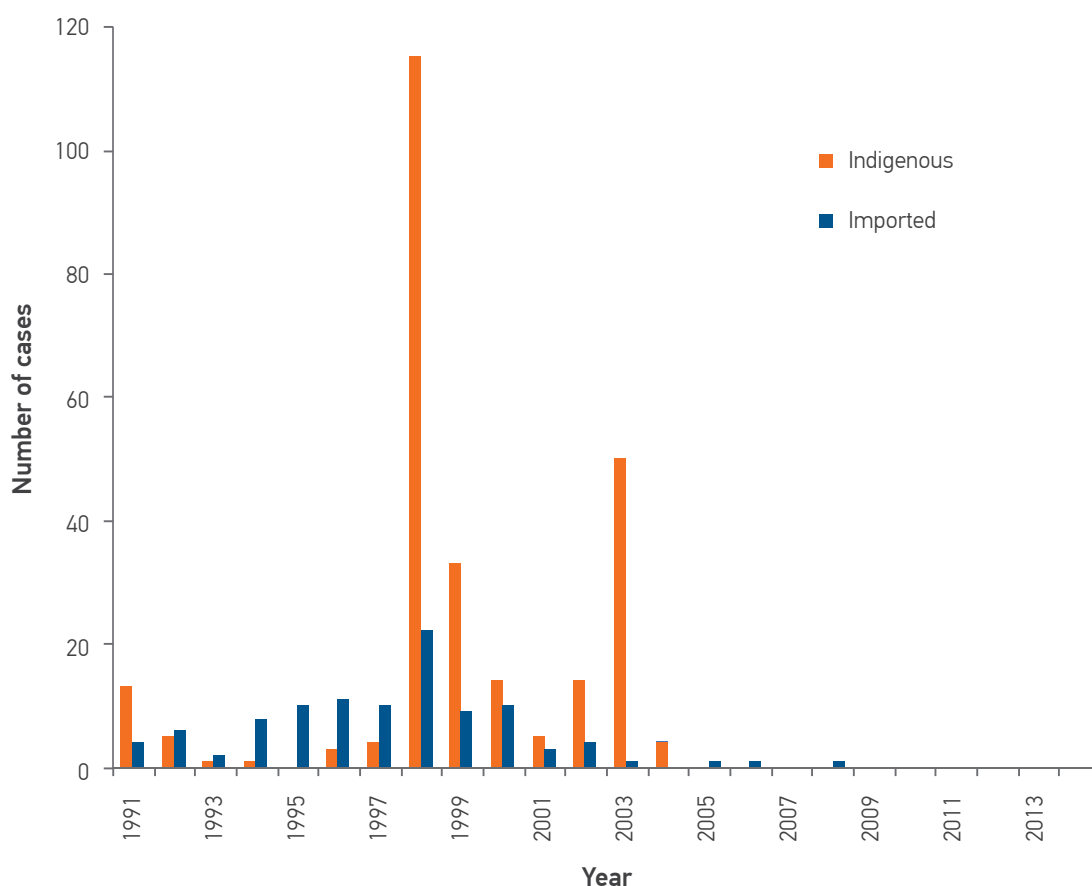
P. vivax cases were reported, mainly at the border with Afghanistan. These cases had no epidemiological consequences.

From the late 1990s onwards, the receptivity of some areas in the country increased due to the construction and exploitation of major water projects, including the Karakum Canal, and extension of irrigation and rice fields. Vulnerability also increased, especially in districts bordering Afghanistan, due to growing population movement. These changes were reflected in increasing importation of malaria in the 1980s and 1990s, followed by increased numbers of indigenous cases and two outbreaks of *P. vivax* malaria near the border with Afghanistan in 1998–1999 and 2002–2003 (Fig. 16). Programmatic factors also played a role, as the malaria surveillance system was unable to respond rapidly to the increased vulnerability and receptivity in the country, and recognition of the outbreaks was delayed.

Malaria situation between 2000 and the present

The epidemiological situation during this period deteriorated, with two malaria outbreaks. In 1998, 108 cases of *P. vivax* malaria (78.8% of all cases reported in 1998) were detected in Gushgi (now Serkhetabad) district in Mary Province,

Fig. 16. Officially reported malaria cases, Turkmenistan, 1991–2014



Sources: WHO (23); Centralized Information System for Infectious Diseases. Copenhagen: WHO Regional Office for Europe.

mainly among military personnel in a training camp near the border with Afghanistan in which highly endemic settlements were located. In 1999, asymptomatic carriers among demobilized military personnel exported the infection from the first active focus in Gushgi to the eastern part of the country – to Dashkovuz (two foci with two cases each) and Lebap (eight foci with 13 cases) provinces. In Gushgi, five local cases were detected in the same year. Among the 33 locally acquired cases, four were in children under 14 years (3,5–9). Malaria interventions initiated in 1998 resulted in containment of the epidemic and a significant decrease in malaria morbidity in the foci in subsequent years.

A new outbreak occurred in 2002–2003, affecting mainly three districts in Mary – Yoloten, Serhetabad and Taghtabazar – the last two bordering Afghanistan.

In 2003, 50 indigenous cases of *P. vivax* malaria and one imported case were detected in Turkmenistan by passive and active case detection. Malaria programme activities were again intensified; the outbreaks were contained and the foci cleared.

The last four indigenous cases in Turkmenistan were registered in 2004. Three were detected in Mary Province in February–March 2004, before the onset of the transmission season, probably resulting from transmission during 2003. The fourth case was detected in Ahal Province in an area that is considered non-endemic.

After the improvement in the malaria situation in 2004 and in line with the WHO malaria elimination strategy, the Government of Turkmenistan decided to reorient the malaria programme to eliminating the last foci and preventing reintroduction. In 2005, Turkmenistan signed the Tashkent Declaration. The country showed strong political commitment to maintaining interruption of malaria transmission, with large-scale interventions. An elimination strategy and a plan of action centred on intense malaria surveillance were prepared and

implemented with the technical support of the WHO Regional Office for Europe.

Local transmission in Turkmenistan was interrupted, and the country was officially certified by WHO as free of malaria in 2010.

Rapid mobilization of specialized and general health services immediately after recognition of outbreaks and massive scaling up of control and surveillance in the affected areas were essential for containing the outbreaks. A rapid response and good coverage were achieved by assigning temporary mobile teams consisting of epidemiologists, parasitologists, entomologists, clinicians and laboratory technicians to the affected areas to conduct urgent control measures.

This integrated approach resulted in prompt containment of the outbreaks and clearing up of foci by eliminating the sources of infection, reducing the mosquito population by evidence-based (i.e. guided by focus investigations) integrated vector control and prevention activities in the foci.

High political commitment to malaria elimination and broad Government support played important roles in malaria elimination in Turkmenistan. The Government provided sufficient funding (US\$ 10 411 154 from the State budget for 2005–2008) for the interventions in the national strategy and plan of action for malaria elimination, and the country benefited from WHO support in preparing strategies, policies, strategic plans and guidelines and in capacity building.

Prevention of reintroduction of malaria

Since the interruption of local transmission of malaria, activities have been directed to preventing its reintroduction. The plan of action has been implemented, and the activities are funded by the Government. Epidemiological surveillance of malaria is maintained at a satisfactory level to ensure prompt detection and treatment of cases and a timely response to any emergency.

Outlook

Generally, the malaria potential in Turkmenistan is low, although the epidemiological risk remains higher in areas bordering Afghanistan. The risk that imported cases will cause a resurgence in local transmission is currently minimal, and no imported cases have been registered since 2009. The risk might, however, increase in the future, for instance due to increased population migration, as in many other countries in the Region. The exploitation of water resources is continuing, and the surface areas of reservoirs may increase in some regions.

Prompt responses to changes in the receptivity and vulnerability of the country, maintaining a high level of vigilance, timely detection of any malaria case and a suitable response should be assured in the future.

Uzbekistan

Malaria was eliminated in Uzbekistan in 1961, and only one indigenous *Plasmodium vivax* case occurred up to 1999, when local *P. vivax* transmission was re-established. It was interrupted again in 2011, and the country is now in the “prevention of malaria reintroduction” phase.

The main malaria vectors are *Anopheles superpictus* (the most efficient vector), *An. pulcherrimus*, *An. maculipennis*, *An. hyrcanus* and *An. claviger*.

Short history of malaria and malaria control

Malaria was formerly widespread in Uzbekistan. An elimination programme was launched in 1946, and local transmission had ceased by 1961. Nevertheless, the borders with Afghanistan and Tajikistan remained vulnerable to resumption of transmission, and sporadic cases of *P. vivax* and two outbreaks (1966 and 1967) were reported in the Baysun district and surrounding areas and in Surkhan-Darya in subsequent years. The situation changed dramatically in 1994, when a large-scale epidemic occurred in neighbouring Tajikistan.

The number of imported malaria cases increased sharply in Uzbekistan in 1998–2000, almost all in the

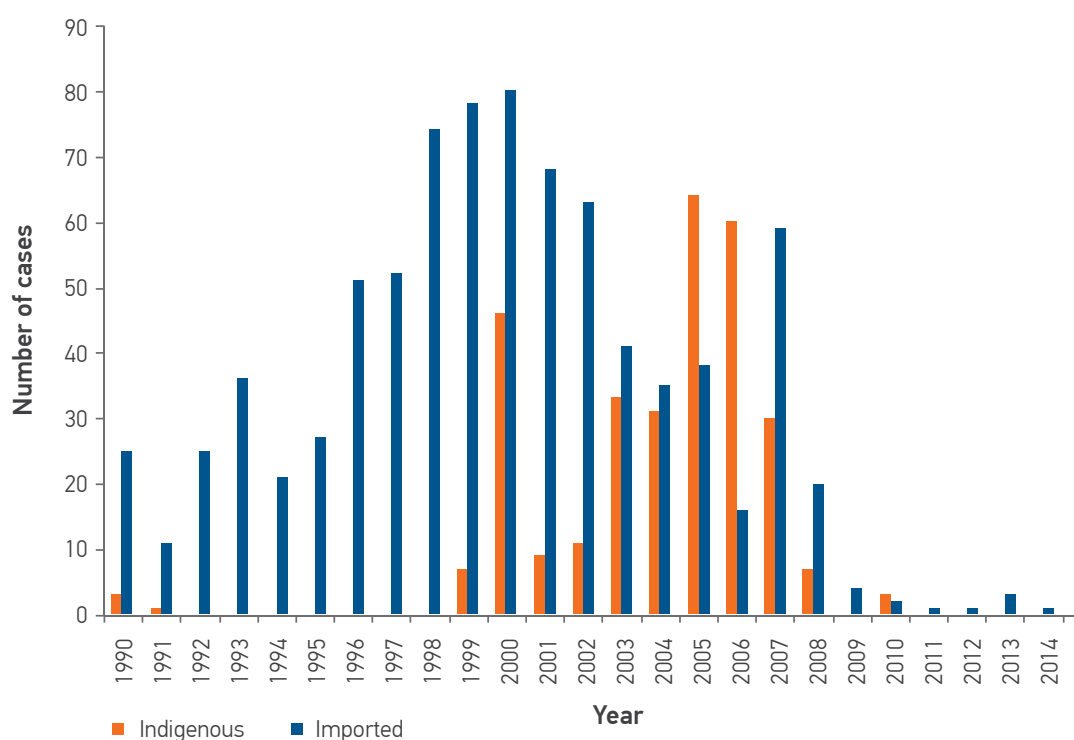
region of Surkhan-Darya in the south of the country, resulting in the occurrence of indigenous cases of *P. vivax* after 1999 (Fig. 17).

Malaria situation between 2000 and the present

The number of cases increased to 126 in 2000, of which 46 were indigenous *P. vivax* cases occurring in the Surkhan-Darya region bordering Afghanistan and Tajikistan. Reinforced control and surveillance resulted in a gradual drop in both indigenous and imported cases from 2001 (Fig. 17); however, a rise in the number of indigenous cases was seen in 2003–2006, with 33, 31, 64 and 60 cases, respectively. Thereafter, the number of cases in Surkhan-Darya Province was reduced from 81 cases in 2007 (29 indigenous cases; incidence, 3.1 per 100 000 population) to zero in 2011–2014. The last three indigenous *P. vivax* cases were detected in 2010. The total number of cases over the period dropped from 77 in 2001 to one (imported) in 2014.

In 2000–2014, 432 cases were imported from endemic areas, with a predominance of *P. vivax* infections (97.92%, 423 cases) and nine cases of *P. falciparum* (imported from Africa and Asia). This finding raises concern, as it is known that *P. vivax* readily adapts to local malaria vectors. No local transmission of *P. falciparum* has occurred so far.

Fig. 17. Officially registered malaria cases in Uzbekistan, 1990–2014



Sources: Centralized Information System for Infectious Diseases. Copenhagen: WHO Regional Office for Europe WHO (24,25).

Strategies, policies and interventions

In 2000, the Ministry of Health set up a national programme for malaria surveillance and control to reduce malaria transmission and limit its distribution. A variety of interventions resulted in a steady, dramatic decrease in the malaria burden. The main interventions included:

- vector control and entomological monitoring, with indoor residual spraying, larval control (*Gambusia affinis*) in 6500 *Anopheles* habitats and water reservoirs covering 20 000 ha and environmental management;
- scaled-up surveillance with active and passive case detection, improved laboratory support, free radical treatment of malaria, comprehensive, prompt investigation of cases and foci, recording and timely reporting;
- mass drug administration in active malaria foci;
- capacity building and deployment of mobile teams to provinces bordering Tajikistan; and
- health education.

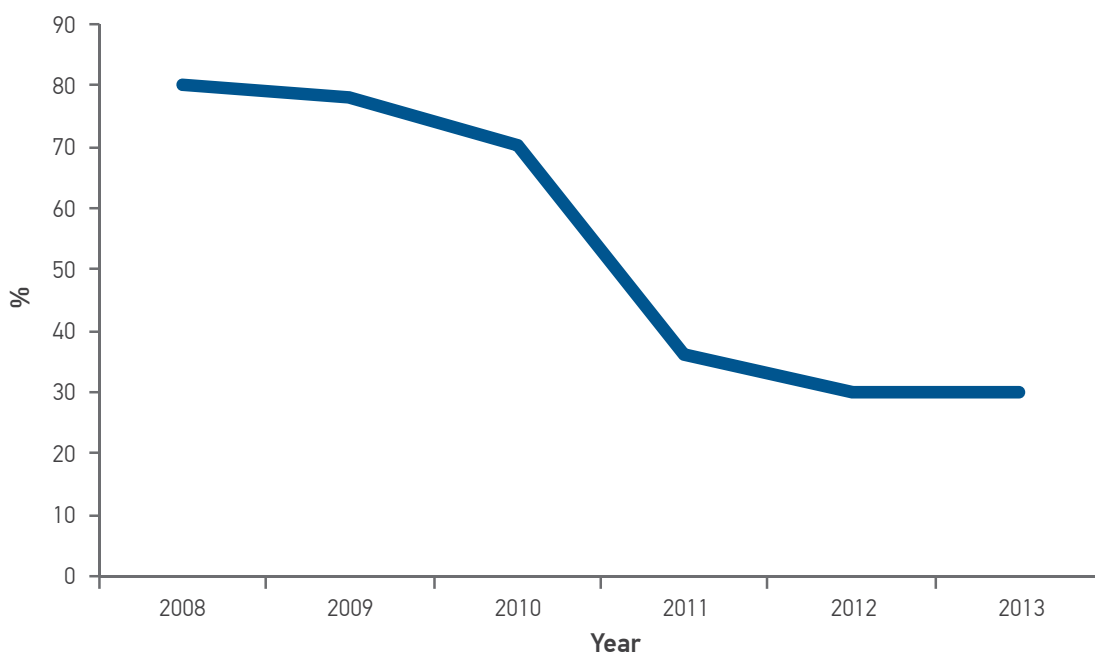
The National Public Health Service and the Malaria Programme benefited from technical and financial support from the WHO Regional Office for Europe. Support from the Global Fund in rounds 4 and 8 was of key importance.

The positive results in malaria control encouraged the country to undertake a programme for malaria elimination. Uzbekistan endorsed the Tashkent Declaration in 2005 and prepared a national strategy and plan of action for malaria elimination in accordance with WHO recommendations, which was endorsed by the Ministry of Health in 2011.

The goal of the elimination programme was to interrupt local transmission countrywide, clear up malaria foci and reduce the number of locally acquired cases to zero. Uzbekistan acted to prevent onward transmission from existing cases by:

- reducing human–vector contact and the vectorial capacity of local *Anopheles* mosquito populations in active foci by effective vector control, personal protection and environmental management;
- identifying and treating all malaria cases with antimalarial medicines effective against liver-stage and blood-stage parasites, including gametocytes;
- strengthening passive and active case detection (Fig. 18);
- quality-assured laboratory diagnosis;
- prompt, effective, free treatment of positive cases;
- case investigation and follow-up;
- epidemiological investigation of foci to determine their origin, extent and classification;
- entomological surveys by district surveillance

Fig. 18. Annual blood examination rates (ABERs), Uzbekistan, 2008–2013



Sources: WHO (24,26,27); Ministry of Health (28).

- teams;
- awareness-raising of communities and populations;
 - meteorological monitoring and analyses of weather conditions and climatic trends;
 - improving and maintaining malaria expertise;
 - health promotion;
 - cross-border cooperation; and
 - operational research.

An action plan for prevention of malaria reintroduction was prepared and approved by the Ministry of Health. The main aspects of the programme are: maintenance of malaria surveillance at a satisfactory level in order to detect malaria cases rapidly and take the necessary action; monitoring persisting levels of receptivity and vulnerability; early case detection, with special attention to identifying imported cases by vigilant surveillance, a competent general health service and strong support from quality assurance laboratories; and a strong information system, with obligatory notification and reporting of malaria and timely epidemiological investigation of each case and focus.

Prevention of reintroduction of malaria

Outlook

Once malaria has been eliminated, a well-organized surveillance system and maintenance of activities at a satisfactory level are crucial for preventing reintroduction of malaria transmission. Any weakness will obviate a prompt response of the system to changes in receptivity and vulnerability, which could lead to epidemic outbreaks.

Experience during the period of malaria control and elimination shows that, while Uzbekistan is free of malaria, the activities and financial allocations to malaria should be maintained, and the activities outlined in the plan for prevention of malaria reintroduction should be continued.

Uzbekistan is highly committed to applying for WHO certification as a country free of malaria in the coming years.

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