

ISLAMIC DEVELOPMENT BANK

**HEALTH MILLENNIUM DEVELOPMENT GOALS:
REVERSING THE INCIDENCE OF MALARIA
IN IDB MEMBER COUNTRIES**

**Proceedings of The Fifteenth
IDB Annual Symposium
Tehran, Islamic Republic of Iran
29 Rajab, 1425H (14 September, 2004)**



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The views expressed in this document are those of the authors/speakers and do not necessarily reflect those of the Islamic Development Bank or its member countries.

ISLAMIC DEVELOPMENT BANK

Establishment

The Islamic Development Bank is an international financial institution established in pursuance of the Declaration of Intent issued by the Conference of Finance Ministers of Muslim Countries held in Jeddah in Dhul Q'adah, 1393H, corresponding to December 1973. The Inaugural Meeting of the Board of Governors took place in Rajab, 1395H, corresponding to July 1975, and the Bank was formally opened on 15 Shawwal, 1395H, corresponding to 20 October, 1975.

Purpose

The purpose of the Bank is to foster the economic development and social progress of its member countries and Muslim communities in non-member countries individually as well as jointly in accordance with the principles of Shari'ah i.e., the Islamic Law.

Functions

The functions of the Bank are to participate in equity capital and to grant loans for productive projects and enterprises besides providing financial assistance to member countries in other forms for economic and social development. The Bank is also required to establish and operate special funds for specific purposes, including a fund for assistance to Muslim communities in non-member countries, in addition to setting up trust funds.

The Bank is authorised to accept deposits and to mobilise financial resources through Shari'ah compatible modes. It is also charged with the responsibility of assisting in the promotion of foreign trade, especially in capital goods among member countries; providing technical assistance to member countries, and extending training facilities for personnel engaged in development activities in member countries to conform to the Shari'ah.

Membership

The present membership of the Bank consists of 55 countries. The main conditions for membership is that the prospective member country should be a member of the Organization of the Islamic Conference (OIC), pay its contribution to the share capital of the Bank and be willing to accept such terms and conditions as may be decided by the IDB Board of Governors.

Capital

Up to the end of 1412H (June 1992), the authorized capital of the Bank was two billion Islamic Dinars (ID). (The value of the Islamic Dinar, which is the accounting unit in the Bank, is equivalent to one SDR -Special Drawing Rights- of the International Monetary Fund). Since Muharram 1413H (July 1992) in accordance with a Resolution of the Board of Governors, it became 6 billion Islamic Dinars, divided into 600,000 shares, having a par value of 10,000 Islamic Dinars each. Its subscribed capital also became ID 4 billion payable according to specific schedules and in freely convertible currency acceptable to the Bank. In 1422H, the Board of Governors in its Annual Meeting held in Algeria decided to increase the authorized capital of the Bank from ID 6 billion to ID 15 billion and the subscribed capital from ID 4.1 billion to ID 8.1 billion.

Head Office and Regional Offices

The Bank's principal office is located in Jeddah, Kingdom of Saudi Arabia. Two regional offices were opened in 1994; one in Rabat, Morocco, and the other in Kuala Lumpur, Malaysia. In July 1996, the Board of Executive Directors also approved the establishment of a regional office at Almaty, Kazakhstan to serve as a link between IDB member countries and Central Asian Republics. The office became operational in July 1997 and is now a full fledged regional office. The Bank also has field representatives in eleven member countries which are: Indonesia, Iran, Kazakhstan, Libya, Pakistan, Senegal, Sudan, Gambia, Guinea Bissau, Mauritania and Algeria.

Financial Year

The Bank's financial year is the lunar Hijrah Year (H).

Language

The official language of the Bank is Arabic, but English and French are additionally used as working languages.

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PREFACE

The 15th Annual Symposium of the Islamic Development Bank was held in conjunction with the Twenty Ninth Annual Meeting of the Board of Governors in Tehran, Iran, on 29 Rajab 1425H (14 September 2004). The topic of the Symposium was **"Health Millennium Development Goals: Reversing the Incidence of Malaria in IDB Member Countries."**

The main objective of the Symposium was to provide a forum to member countries to discuss the challenges facing the IDB member countries in controlling malaria and make concrete recommendations on the steps which need to be taken to stop the transmission of this disease. In this regard, the Symposium covered a broad range of issues and recommendations for enhancing member countries' abilities, including sharing experiences, exchanging information, supporting capacity building, creating networking opportunities, enhancing financing and co-financing and the role that can be played by the private sector, etc. to achieve this goal. At the level of the IDB Group, the Symposium discussed how the Group could help its member countries to control malaria through financial and technical assistance as well as supporting regional initiatives to achieve this goal.

The keynote speaker in the Symposium was Dr Fatoumata Nafu-Traoré, Director of the Roll Back Malaria Department of the World Health Organization in Geneva, Switzerland. She made a presentation which highlighted the seriousness of malaria as one of the main killer diseases in many of the IDB member countries, particularly in Sub-Saharan Africa as well as many Asian countries and Suriname. If severe malaria is experienced in the childhood, its neurological effects may seriously diminish learning capabilities during the rest of the life. Malaria also causes an economic burden slowing the economic growth of sub-Saharan African countries by an estimated 1.3% per year. Households spend up to US\$3.84 per capita per year to treat and prevent malaria. The death rate from malaria in these countries is also very high. This represents a substantial social impact on households and society.

Dr. Nafu also reviewed the potential for regional cooperation on fighting malaria in the IDB member countries and experience of major multilateral financing institutions and specialized international organizations, such as the WHO, in financing malaria programmes. However, she emphasised the huge funding gap for controlling malaria in the IDB member countries which is currently estimated at US\$500 million per year. This funding gap consequently poses implementation and monitoring challenges in these countries. Consequently, one of her main recommendation was that the IDB funding should prioritize institutional development for malaria control, with emphasis on district-level capabilities, community mobilization, management, and the integration of malaria control with other health programmes.

The panellists were: Dr. Hoda Atta, Regional Advisor on Malaria in the WHO East Mediterranean Region Office, Cairo, Egypt; Prof. Omar Gaye from the Faculty of Medicine, University of Cheikh Anta Diop, Dakar, Senegal; and Dr. Abdul Mannan Bangali, a National Professional Officer from the WHO office, Dhaka, Bangladesh. They delivered addresses on the subject from the perspective of the Arab, African and Asian Regions respectively. A presentation was also made by Dr. Nasrin Moazami, Head of the Biotechnology Centre of Iran Scientific and Industrial Research Organization on research and application of new locally developed methods for fighting malaria in Iran.

The panellists complemented the keynote address by covering various areas relating to their regional and country experiences in the area of malaria control. They emphasized that current morbidity and mortality rates of malaria in the countries of Africa and Asia are simply intolerable. The cost in terms of lives lost and of those, whose lives are affected is staggering. Unfortunately, although effective interventions against malaria are available, the burden persists mainly because most people at risk are unaware of the effective interventions or unable to afford them. Lack of education, information and access to effective interventions currently restrict the success of malaria control programmes, especially among the poor, and in the poorer countries in general. They also highlighted some research findings on malaria in Iran and Sudan and the potential for using locally developed methods for fighting malaria.

Since its establishment in 1395H (1975) and up to the end of 1424H (2004) the IDB has financed 158 projects in the health sector. These projects amounted to ID797 million (US\$ 1,044 million) in value terms. Of this amount, 28 percent was allocated to the Least Developed Member Countries of the Bank (LDMCs). About 94 percent of the IDB financing in this sector was in the public healthcare sector and 6 percent was allocated to the private sector. Currently, the IDB is supporting a vaccine production programme with the objective of promoting production of affordable quality vaccines and ensuring reliable supplies of such vaccine in its member countries. The IDB has already taken some measures which should contribute to the efforts to control malaria in the IDB member countries and additional concrete actions are under active consideration of the Management in order to implement the recommendations of the Symposium specifically addressed to the IDB Group.

As usual, the IDB is publishing the proceedings of the Symposium in order to disseminate the ideas developed in the various papers and the views expressed during the presentations. It is hoped that this publication will contribute to sensitizing the decision makers to the major issues relating malaria control in the member countries.

OPENING STATEMENT BY

H.E. DR. MOHAMMED KHAZAEI
DEPUTY MINISTER OF ECONOMIC AFFAIRS AND
FINANCE OF THE ISLAMIC REPUBLIC OF IRAN

**Opening Statement by :
H.E. Dr. Mohammed Khazaei
Deputy Minister of Economic Affairs and Finance
of the Islamic Republic of Iran**

(Original in English)

**Your excellencies
Distinguished Guests
Ladies and Gentlemen**

Welcome to Islamic Republic of Iran as your second home. This is a great pleasure for me to host your excellencies as a chairman of this important symposium and I hope that we could avail ourselves of this opportunity to consider the challenges confronting our vital needs in order to overcome them, especially in the field of health as a major and common concern.

Now, we are living in the era of Globalization which is defined by free movement of goods, trade, services and individuals. One of the implications resulting in this phenomenon has been removing the borders among the countries in the arena of international relations. In fact, removing the borders has transformed the meaning of security. It means that the agenda of national security has been changed and security is not regarded as just keeping the borders and territories against the military assaults. The issue of security now involves interdependency in the fields of trade, health, environment which could be categorized as a pooled or common security. Thus, it requires collective collaboration in the all-embracing issues such as health and especially contagious diseases which recognize no frontier.

Global public goods as a broad international concern require international public action in this regard. Global public goods for health are a good example because the health problems of the poor do not stop at national borders in this era of globalization. The People and information travel across borders with increasing speed and ease. This presents new risks to health, as indicated by the rapid spread of HIV/AIDS. Globalization also provides new opportunities to prevent, treat or contain disease, as many countries are working together to address common threats to health.

Health is higher on the international agenda than ever before and improvement in the health of the poor is a central issue in development. But health is also a crucially important economic asset, particularly for the poor people. Actually, in the era of globalization, we face the increasing interdependency between health and economy.

The Millennium Development Goals commit international community to an expanded vision of development which promotes human development as the key to sustaining social and economic progress in all countries. Furthermore, it should be kept in mind that the goals have been commonly accepted as a framework for measuring development progress.

As your excellencies are well aware that three of the eight Millennium Development Goals call for specific health improvements by 2015 : reducing child deaths, maternal mortality and slowing the spread of HIV, Malaria etc.

To reach the afore-mentioned aims and targets, there is no crucial alternative, but investment in health as an important means of economic development and public awareness.

In the event of investment in health, we would witness "higher labor productivity, higher rates of domestic and foreign investment, improved human capital, higher rates of national savings and demographic changes".

As international trade in health services grows and diversifies and agreements concerning services trade expand to cover healthcare, developing countries require capacity and assistance on how to assess the benefits and risks, and the implications for the regulation of health systems.

Consequently, it is hoped that given the importance of interdependency between health and security, we would witness tangible multilateral cooperation and fruitful gains as a common concern, especially among the Islamic Ummah.

Once again, I thank you all for being with us and I hope that holding these meetings will Inshaallah bring the Muslim countries closer to each other.

WELCOME ADDRESS BY
H.E. DR. AHMAD MOHAMED ALI,
PRESIDENT,
ISLAMIC DEVELOPMENT BANK

Welcome Address by :
H.E. DR. AHMAD MOHAMED ALI,
President,
Islamic Development Bank

In the name of ALLAH, The Most Beneficent, Most Merciful

*Praise be to ALLAH, Lord of the Two Worlds, and His Peace and
Blessings be upon His Final Prophet and Messenger and
upon all the Prophet's Household and Companions.*

Excellency the Chairman,
Excellencies, the Governors and Alternate Governors,
Brothers and Sisters,

Assalamu Alaikum Warahmatullah Wabarakatuhu!

It is my pleasure to welcome you all on behalf of your very own institution, the Islamic Development Bank, to this 15th Annual Symposium, which is being organized in conjunction with the 29th Annual meeting of the IDB Board of Governors.

First, I would like to express sincere thanks and appreciation, on behalf of everyone here, to H.E. Dr. Mohammed Khazaei, Deputy Minister of Economic Affairs and Finance of the Islamic Republic of Iran, Chairman of the Board Governors of the IDB Group, for chairing this Symposium.

I would also like to express special thanks to Her Excellency Dr. Fatoumata Nafou Traoré, Director of the Roll-Back Malaria Department of the World Health Organization in Switzerland, for consenting to be the keynote speaker and preparing the background paper for the Symposium.

I also feel deeply indebted to the speakers who are participating in the Symposium to address the relevant issues from the perspectives of the member countries in the Arab, African and Asian regions. These are: Dr. Hoda Atta, Advisor on Malaria in the WHO East Mediterranean Regional Office in Egypt, Prof. Omar Gaye, Professor at Sheikh Anta Diop University in Senegal and Dr. Abdul Mannan Bangali, a National Professional Officer from the WHO Office in Bangladesh. All of them are reputed experts with prominent contributions towards combating Malaria in the member countries. We are also privileged to have with us Dr. Nasrin Moazami, Head Biotechnology Centre of Iran Scientific and Industrial Research Organization, who will share with us her findings on Combating Malaria in Iran.

Distinguished Brothers and Sisters

The topic of this Symposium is **“Health Millennium Development Goals: Reversing the Incidence of Malaria in IDB Member Countries”**. The purpose of selecting this topic is to highlight the importance of combating this dangerous epidemic which is widespread in many of our member countries with extensive negative impact on their masses’ health, social and economic development.

Basically, this Symposium is meant to provide a forum for policy-makers in member countries to discuss malaria-related issues and strategies. The Symposium will also focus on the need to upgrade the health sector, strengthening of human capabilities, appropriate treatment and preventive measures that may be undertaken by the public and private sectors. This conference will also aim at establishing information systems, research, monitoring and early detection and cooperation at the OIC-level for the purpose of combating the disease through exchanging expertise and information. Another area in the discussion should cover ways and means to enhance financing from international and regional institutions to fight malaria.

Furthermore, the Symposium will discuss some practical ways to enhance IDB Group intervention in the health sector with emphasis on combating malaria. This intervention is effected through a variety of programs for assisting the member countries financially and technically, as well as through continued cooperation with other multilateral development financing institutions and specialized agencies for co-financing projects and programs in the health sector.

I am confident that the Symposium will identify the potential modes of financial and technical support that can be extended to member countries to consolidate their efforts against malaria.

We also hope that the deliberations and exchange of views in this Symposium will lead to action-oriented proposals, both at the regional and national levels, to assist the member countries in their efforts to combat the malaria epidemic.

On our part, I would like to assure that the IDB Group will pay special attention to the ideas and recommendations of this Symposium that are aimed to strengthen the Bank’s financial and technical role in this important area, in collaborations with all stakeholders.

With these words, I welcome you all once again and wish you all success in your contributions towards enriching the deliberations of the symposium.

Wassalam-o-Alaikum Warhmatullah Wabarakatuh!

BACKGROUND PAPER BY
DR. FATOUMATA NAFO TRAORÉ
DIRECTOR OF THE ROLL- BACK MALARIA DEPARTMENT
OF THE WORLD HEALTH ORGANIZATION,
GENEVA, SWITZERLAND

Background Paper by :
DR. FATOUMATA NAFO TRAORE
Director of the Roll- Back Malaria Department of the
World Health Organization, Geneva, Switzerland

(Original in English)

EXECUTIVE SUMMARY

Malaria remains one of the most important global communicable disease problems of our time. In all of the 21 member countries of the Islamic Development Bank (IDB) in Africa, south of the Sahara, malaria is the most important cause of death in young children and an important cause of lost income at household and national levels. In nine Asian countries and Suriname, malaria is a major public health problem and in most cases is closely associated with poverty in specific rural population groups. Reduction of the malaria burden in all of these countries could reduce childhood and maternal mortality and contribute to social and economic development.

From a scientific viewpoint, malaria control has made important progress over the last 10–15 years. Insecticide-treated nets (ITNs) have proven to be highly effective for reducing malaria transmission in Africa and can reduce all-cause mortality in children under five by a median of 16%. This method is being increasingly adopted in African as well as Asian countries. In areas of intense malaria transmission in Africa, intermittent preventive treatment (IPT) in pregnancy is extremely cost-effective for reducing anaemia and low birth weight. Finally, artemisinin-based combination treatments (ACTs) are highly effective and safe in treating multidrug-resistant falciparum malaria everywhere in the world.

As most countries with the highest malaria burden are poor, they had little chance of implementing malaria control at the required scale until major international funding became available. This happened in 2002, when the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) began operating. Up to now, GFATM has allocated US\$ 136 million over two years to IDB member countries. However, an estimation based on the populations at risk suggests that the cost of effective scaling up is around US\$ 500 million per year. This funding gap consequently poses implementation, monitoring and evaluation challenges in some of these countries.

International development banks such as the IDB can play an important role in supporting countries to reduce their malaria burden. Funding should be seen as supplementary to that of GFATM and should focus on resolving bottlenecks in the system, which are in most cases related to issues of human resource development. Development bank funding can also influence the relationships between specialized malaria control programmes and health systems by promoting planning based on allocative efficiency and local needs. Regional initiatives, which could also be supported by development banks, may be of great interest in some areas. Examples are the promotion of cross-border cooperation aimed at eliminating malaria transmission, pooling resources to strengthen capacity and to address the commodity component of the required services.

I. INTRODUCTION

I.1 Importance of health sector development as a means of socioeconomic development and alleviating poverty in the member countries of the Islamic Development Bank (IDB)¹

The evidence on the importance of health for development

Although health is widely understood to be both a central goal and an important outcome of development, the importance of investing in health to promote economic development and poverty reduction has been much less appreciated. It was not until the late 1980s that health began to be seen as an important factor for development in the context of international cooperation. The narrow per-capita-income-based indicators were replaced by the Human Development Index (HDI), which gives consideration to access to social services, including health care, education, hygiene and sanitation. Health has indeed become the basis for other aspirations, such as school attendance, getting a job, and acquiring wealth and happiness, while poor health has come to be recognized as one of the main causes of poverty.

Although research has provided evidence of the economic benefits of improving health, the data underpinning that research – on characteristics of countries over time or on large numbers of households within a country at a given time – rarely permit conclusive determination of cause and effect. Conclusions drawn from the literature remain, therefore, suggestive rather than definitive. Those conclusions do, nevertheless, accord with common sense: healthier people are more productive. The evidence is based on cross-country macroeconomic analyses and microeconomic comparisons across households.

Macroeconomic research reveals direct links between economic performance and health indicators such as life expectancy. Some variables such as geography and demography indirectly link health with economic growth. Geography, particularly tropical location is highly correlated with disease burden, which in turn affects economic performance.² Demography, on the other hand, is determined in part by health status and has a direct effect on economic growth through the age structure of the population, in particular the ratio of those of working age to the total population.

Health improvements also influence economic growth through their impact on demography. For example, in the 1940s, rapid improvements in health in East Asia provided a catalyst for a demographic transition. An initial decline in infant and child mortality swelled the young population and somewhat later prompted a fall in

¹ Adapted from: The world health report 1999. Chapter 1. Health and development in the 20th century. Geneva, World Health Organization, 1999; and Macroeconomics and health: investing in health for economic development. Report of the Commission on Macroeconomics and Health. Geneva, World Health Organization, 2001.

² Gallup JL, Sachs JD, Mellinger AD. Geography and economic development. Cambridge, MA, Harvard Institute for International Development, 1998.

fertility rates. After a time lag, the working-age population began growing much faster than the young dependent population, temporarily creating a disproportionately high percentage of working-age adults and thus creating an opportunity for increased economic growth. By introducing these demographic considerations into an empirical model of economic growth, analyses undertaken for the Asian Development Bank (ADB) were able to show that East Asia's changing demography can explain perhaps a third to a half of the economic "miracle" experienced between 1965 and 1990.^{3,4} The next phase for East Asia will involve less favourable dependency ratios as a result of population ageing. In contrast, both South Asia and Africa are now entering a period in which demographic factors can enhance growth prospects.

Among the interesting microeconomic studies carried out on the link between health and the income of households and individuals is an experimental investigation in Indonesia, showing that men with anaemia were 20% less productive than men without it. Those who were initially anaemic and received iron treatment increased their productivity nearly to the levels of non-anaemic workers, and the productivity gains were large when weighed against the costs of treatment. This finding is important in relation to malaria, which is an important cause of anaemia in children and adults.

A study carried out jointly by the Pan American Health Organization, the Inter-American Development Bank and the United Nations Economic Commission for Latin American and Caribbean⁵ showed that growth in GDP is statistically associated with life expectancy and that for any additional year of life expectancy there will be an additional 1% increase in GDP 15 years later. This work concluded that the relationship between health improvement variables and economic growth is sufficiently significant in the long term to justify sustained national commitment to investing in health.

There is evidence that adult health depends in part on child health, and that it itself directly influences productivity. Per capita income is defined as the level of income divided by the total population, whereas the total population clearly consists of economic dependents as well as the economically active. Improved adult health will improve the dependency ratio both by reducing mortality among the economically active and reducing premature retirement that results from illness,⁶ and this ratio changes as a result of demographic transition. In Jamaica, for example, individuals with chronic disease were found to be more likely to retire than those who were

³ *Emerging Asia*. Manila, Asian Development Bank, 1997.

⁴ Bloom DE, Williamson JG. Demographic transitions and economic miracles in emerging Asia. *World Bank Economic Review*, 1998, 12:419-455.

⁵ *The world health report 1999: making a difference*. Geneva, World Health Organization, 1999.

⁶ Dwyer DS, Mitchell OS. Health problems as determinants of retirement: are self-rated measures endogenous? *Journal of Health Economics*, 1999, 18:173-193.

healthy.⁷ Better adult health directly affects productivity by increasing work output and reducing absenteeism. Less obviously, geographically specific diseases—onchocerciasis (river blindness) in West Africa is an example—deny communities access to valuable land or productive resources. Moreover, high levels of illness in a community may weaken links to the global economy⁸—links that through the movement of ideas, goods and capital help create the conditions for more rapid growth.

Investment both in physical capital and education underpins productivity. A rapidly growing literature documents the effects of ill-health on children's enrolment, learning and attendance rates in schools. Many of the conditions affecting schoolchildren (e.g. intestinal worm infestation and micronutrient deficiencies) respond to inexpensive, but effective interventions. Recent studies in the psychological literature point to steady, long-term gains during the 20th century in the general intellectual ability of the populations of the high-income countries (where data were available to generate trends). One suggested determinant of this trend lies in improved health and nutritional status.⁹

Priority action in developing countries

Nowadays, the main causes of death in low-income countries are HIV/AIDS, malaria, tuberculosis, micronutrient deficiencies and tobacco-related illnesses. If these conditions were controlled and combined with enhanced family planning programmes, impoverished families could enjoy lives that were longer, healthier and more productive, and could invest more in the education and health of each child. The improvement in health would translate into higher incomes, economic growth and reduced population growth.

In some low-income regions, especially in Africa, south of the Sahara, the burden of disease stands as a total barrier to economic growth and must, therefore, be addressed as a priority in any comprehensive development strategy. With 650 million people, countries in south of the Sahara have lower life expectancy and higher age-adjusted mortality rates than the rest of the world (under-five mortality rates of 151 deaths per 1000 live births). In the light of this high level of mortality, control of communicable diseases and improved maternal and child health remain the highest public health priorities.

⁷ Handa S, Neitzert M. Chronic illness and retirement in Jamaica. Washington, DC, World Bank, 1998 (Living Standards Measurement Study, Working Paper No. 131).

⁸ Radelet S, Sachs J, Lee JW. Economic growth in Asia. Cambridge, MA, Harvard Institute for International Development, 1997 (Development Discussion Paper No. 609).

⁹ Neisser V, ed. The rising curve: long-term gains in IQ and related measures. Washington, DC, American Psychological Association, 1998.

Extending the coverage of crucial health services – including a relatively small number of specific interventions – to the world's poor could save at least eight million lives each year, extend lifespans and increase the productivity and economic well-being of the poor. Such an effort would require a significant scaling up of the resources currently spent in the health sector by poor countries and donors alike. It would also demand that the non-financial obstacles that have limited the capacity of poor countries to deliver health services be confronted. The additional investment in health would require a contribution from the world's rich countries of roughly one tenth of one per cent of their national annual income. Without such an investment, the Millennium Development Goals (MDGs) could not be met.

The MDGs commit countries to an expanded vision of development – one that vigorously promotes human development as the key to sustaining social and economic progress and recognizes the importance of creating a global partnership for development. During the coming few years, countries will have to reorient their activities to focus on building the institutional support needed to accelerate progress towards the MDGs, including those pertaining to health.

1.2 The relevance of malaria to the MDGs in the IDB member countries

The malaria situation in the world

Malaria causes over 300 million cases of acute illness and more than one million deaths in the world each year. Figure 1 shows estimate of world malaria burden and poverty. Around 90% of the deaths occur in Africa, south of the Sahara, and malaria is estimated to comprise 10% of the continent's overall disease burden. Malaria is the single leading cause of death in children under five years of age in Africa and accounts for about 20% of deaths in this age group. It accounts for 40% of public health expenditure, 30–50% of inpatient admissions and up to 50% of outpatient visits in areas with high malaria transmission. Pregnant women are the main adult risk group. They are more vulnerable than other adults. In highly endemic areas, malaria leads to anaemia and low birth weight, thereby contributing to infant mortality. Major malaria epidemics continue to occur in parts of Africa and elsewhere, causing substantial mortality in all age groups. The malaria situation in Africa was thoroughly reviewed in the *The Africa Malaria Report*, published by WHO and UNICEF in 2003.¹⁰

Outside Africa, malaria is a major disease problem mainly in the Indian subcontinent, south-east Asia, the south-west Pacific, the Amazon region and parts of central Asia, especially Afghanistan. In most areas outside Africa, malaria is a focal disease, strongly associated with poverty. In many cases population movements, sometimes across national borders, are important determinants of local malaria epidemiology. In some parts of the world, especially the Eastern

¹⁰ The Africa Malaria Report 2003. Geneva, World Health Organization and New York, UNICEF, 2003 (document WHO/CDS/MAL /2003.1093).

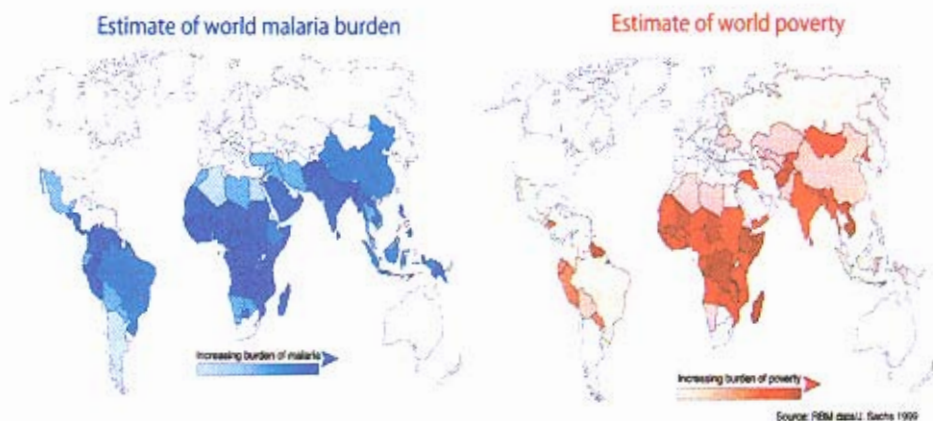
Mediterranean Region, malaria is close to elimination. Such opportunities obviously call for control strategies that are radically different from those applied where malaria transmission remains intense.

Outside Africa, and in the Horn of Africa, two main species of malaria parasite occur: *Plasmodium falciparum* and *Plasmodium vivax*. The number of cases due to each of them in the world outside Africa is approximately equal, but *P. vivax* dominates in temperate and subtropical areas; as *P. falciparum* cannot be transmitted at temperatures below 21 °C. They cause different patterns of illness and require different treatment. Severe malaria, which is often fatal, is caused by infection with *P. falciparum*. *P. vivax* infection causes an acute and debilitating, but generally not life-threatening illness. Unlike *P. falciparum*, *P. vivax* can relapse from liver stages. In Africa south of the Sahara, *P. falciparum* is the overwhelmingly important malaria parasite. Increasing levels of drug resistance are making it necessary to use relatively costly artemisinin-based combination treatment (ACT) for falciparum malaria, further increasing the burden on health systems.

In addition to causing loss of life and productivity, malaria hampers children's schooling and development through absenteeism and permanent neurological damage associated with severe episodes of the disease. The risk of malaria in endemic areas can deter investment and affect household decisions in ways that have a negative impact on economic productivity. Recent macroeconomic studies indicate that malaria costs Africa more than US\$ 12 billion annually and that, mainly by deterring investment, it has slowed economic growth in African countries by 1.3% per year. The compound effect of this is a level of gross domestic product that is now up to 32% lower than it would have been if malaria had been effectively controlled in Africa in 1960.

The situation is aggravated in "complex emergencies", which are wars or civil strife affecting large civilian populations and involving food shortages and population displacement. In such circumstances, especially in epidemic-prone countries, malaria is a major cause of mortality and morbidity.

Fig. 1. ESTIMATE OF WORLD MALARIA BURDEN AND POVERTY



Malaria control strategies and interventions

The epidemiology of malaria varies considerably, as it depends on the natural environment, the biology of the vectors, the parasites and the human hosts, as well as human ecology and health systems. In all situations, malaria control requires treatment of cases and prevention of infection or of the pathological consequences of infection. Accordingly, the main malaria control interventions, updated from the Global Malaria Control Strategy adopted in 1992,^{11,12} are based on access to prompt, effective treatment of cases; prevention through vector control and, in some specific situations, by chemotherapeutic measures; and prevention and control of epidemics (see Box 1).

¹¹ A Global Strategy for Malaria Control. Geneva, World Health Organization, 1993.

¹² WHO Expert Committee on Malaria. Twentieth report. Geneva, World Health Organization, 2000 (WHO Technical Report Series, No. 892).

Box 1. contemporary malaria control interventions

Prompt and effective treatment of malaria cases :

This apparently simple measure, which aims to prevent the development of severe malaria and mortality, is a major challenge to health systems because treatment must be given very early, generally within 24 hours of the start of symptoms. In high-transmission areas, treatment (together with knowledge on its correct use) needs to be available **in or near the home** – availability at health facilities is often insufficient. Increasing levels of **drug resistance** to chloroquine and sulfadoxine–pyrimethamine worldwide are forcing more and more countries to use artemisinin-based combination therapy (ACT), which is far more expensive than the traditional monotherapies. Also, especially in areas where transmission is not so intense, access to laboratory-based **diagnosis** (by microscopy or rapid diagnostic test) is becoming increasingly important to reduce expenditure on newer treatments, the occurrence of side-effects and drug pressure.

Prevention by measures aimed at reducing exposure to infective mosquito bites :

A broad range of anti-mosquito measures is available. Those directed at reducing mosquito breeding are relatively site-specific and require a very high level of coverage to be effective. Nevertheless, environmental management may have the advantage of sustainability and collateral benefits. In most tropical areas where malaria remains a major problem, two methods have the greatest and most universal potential: indoor residual spraying with insecticides and insecticide-treated mosquito nets and other materials. Even these are not applicable in all situations, such as where dwellings have no sprayable surfaces or, sometimes, where people are highly mobile. In the face of a risk of malaria epidemics, vector control, usually indoor residual spraying, may be the only effective option. In general, the organization of indoor residual spraying is somewhat more demanding than that of insecticide-treated nets. The latter is much more readily adopted and maintained by communities and households and is, therefore, strongly promoted by the international organizations, including WHO.

Prevention by chemotherapeutic measures :

A number of options are available, but some are already compromised by the development of resistance to antimalarials, while there is reluctance to recommend and apply others because of fears of antimalarial resistance. In contemporary malaria control, one intervention is now strongly recommended: intermittent preventive treatment (IPT) for pregnant women in areas of intense to moderate transmission of *P. falciparum*. This includes areas of stable malaria transmission in Africa, south of the Sahara. Currently, the most effective drug for IPT is sulfadoxine–pyrimethamine. The use of two doses of sulfadoxine–pyrimethamine in pregnancy is highly cost-effective in Africa, south of the Sahara, but could only be expected to be effective in a few areas outside Africa. Little is known about the efficacy of antimalarials for preventing malaria among non-immune pregnant women, and almost nothing is known about *P. vivax* in pregnancy. Both areas need further research.

Prevention and control of epidemics

Malaria epidemics can cause very high mortality rates. They occur, for example, in fringe areas of unstable transmission and when population movements bring non-immune people into areas with intense transmission. Prevention and control depend on good intersectoral surveillance (early warning and detection systems) and on the rapid deployment of a mix of curative and antivector measures suited to the particular situation.

Roll-Back Malaria

The global Roll-Back Malaria (RBM) movement, a partnership initiated in 1998, has directly and indirectly led to greatly increased efforts to control malaria. Thus, across tropical Africa, surveys carried out in 2000–2002 showed that 15% of African children slept under nets. Although only a fraction of these nets were treated with insecticide, this is a remarkable achievement given that 10 years ago this intervention, which requires a change in behaviour, was hardly known in most rural areas (Fig. 2). In 2002, the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM) began to operate, and in its first three rounds it committed US\$ 481 million to malaria control over two years, of which US\$ 136 million went to IDB member countries. Although this is far from sufficient, it can be expected that in the coming years there will be far greater investment in malaria control in Africa than ever before.

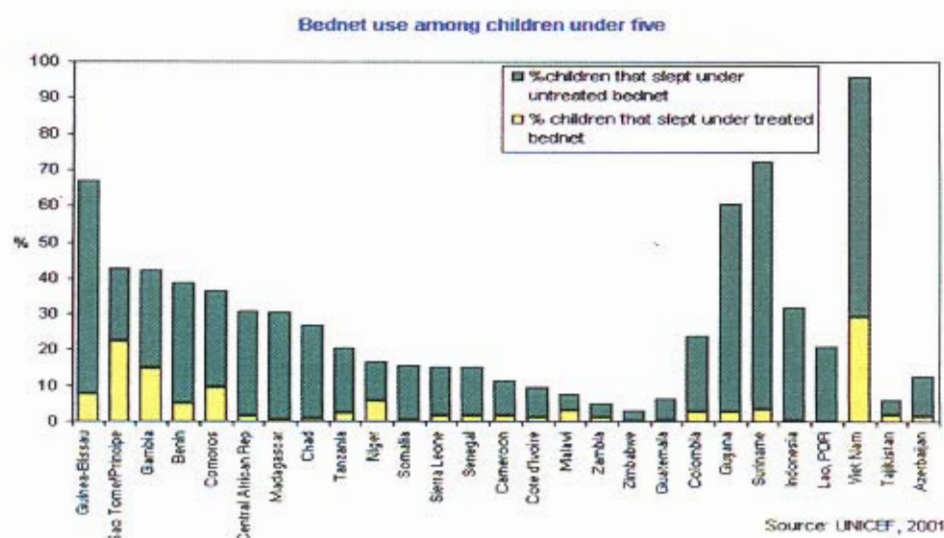
In 2001, the United Nations General Assembly declared 2001–2010 the Decade to Roll-Back Malaria in Developing Countries, particularly in Africa.¹³ Malaria figured prominently at the United Nations Millennium Summit, with world leaders pledging to meet the MDGs by the year 2015,¹⁴ and in April 2000 African Heads of State met at a historic summit in Abuja, Nigeria, to express their personal commitment to tackling malaria and establishing targets for implementing the technical strategies to Roll Back Malaria. Signatories of the Abuja Declaration include 15 IDB member countries.¹⁵

¹³ 2001–2010: *Decade to Roll Back Malaria in Developing Countries, Particularly in Africa*. New York, United Nations General Assembly, 2001 (Resolution A/RES/55/284).

¹⁴ United Nations General Assembly: United Nations Millennium Declaration, 55th Session, Agenda item 60 (b). Resolution A/RES/55/2, September 2000.

¹⁵ *The Abuja Declaration and the plan of action: an extract from the African Summit on Roll Back Malaria, Abuja, 25 April 2000*. Geneva, World Health Organization, 2003 (document WHO/CDS/RBM/2003.46).

Fig. 2. THE USE OF MOSQUITO NETS AMONG CHILDREN UNDER FIVE IN VARIOUS REGIONS IN THE ENDEMIC COUNTRIES AND THE LEVEL OF NET RETREATMENT



Malaria-related MDGs and other internationally agreed goals and objectives

The following MDGs adopted by the United Nations in 2000 pertain to malaria:

- By the same date [2015], to have reduced maternal mortality by three quarters, and under-five child mortality by two thirds of their current rates.
- To have, by then, halted, and begun to reverse the spread of HIV/AIDS, the scourge of malaria and other major diseases that afflict humanity.¹⁶

The following key indicators for malaria related to the MDGs have been agreed between WHO, UNICEF and the World Bank.

- The malaria prevalence rate in the general population (measured by number of reported cases).
- The malaria-related death rate in children under five years of age.
- The proportion of children under five in malaria risk areas who sleep under insecticide-treated nets.
- The proportion of children under five with malaria who are appropriately treated.

¹⁶ *United Nations Millenium Declaration*. New York, United Nations General Assembly, 2002 (Resolution A/RES/55/2).

The goal of the global RBM initiative is to reduce the malaria burden in the world by half by 2010 compared to that in 2000.¹⁷ The recommended global core indicators are:

- the death rate from malaria (probable and confirmed cases) among target groups (under-fives and others);
- the numbers of severe and uncomplicated malaria cases (probable and confirmed) among target groups (under-fives and others);
- the proportion of households having at least one insecticide-treated bednet;
- the percentage of patients with uncomplicated malaria getting correct treatment at health facility and community levels, according to national guidelines, within 24 hours of onset of symptoms;
- the percentage of health facilities reporting no disruption of antimalarial drug stocks (as specified in the national drug policy) for more than one week during the previous three months.¹⁸

In 2000, in Abuja, Nigeria, a meeting of African Heads of State¹⁹ resolved to initiate appropriate and sustainable action to strengthen health systems so as to ensure that by the year 2005:

- at least 60% of those suffering from malaria have prompt access to, and are able to correctly use affordable and appropriate treatment within 24 hours of the onset of symptoms;
- at least 60% of those at risk of malaria, particularly children under five years of age and pregnant women, benefit from the most suitable combination of personal and community protective measures such as insecticide-treated mosquito nets and other interventions that are accessible and affordable to prevent infection and suffering ;
- at least 60% of all pregnant women at risk of malaria, especially those in their first pregnancies, have access to chemoprophylaxis or presumptive intermittent treatment.

The importance of malaria in relation to MDGs in general

In Africa, where malaria causes about 20% of all deaths in children under five years of age, reducing the under-five child mortality by two thirds is hardly conceivable without a substantial reduction in malaria mortality (Fig. 3). Even in a global perspective, malaria accounts for as much as 10% of all deaths in childhood. The number of maternal deaths in the world in 2000 has been estimated by UNICEF, UNFPA and WHO at 529,000. It is difficult to ascertain the contribution of malaria.

¹⁷ Roll Back Malaria (www.rbm.who.int, accessed 4 August 2004).

¹⁸ Roll Back Malaria. Framework for monitoring progress and evaluating outcomes and impact. Geneva, World Health Organization 2000 (document WHO/CDS/RBM/2000.25).

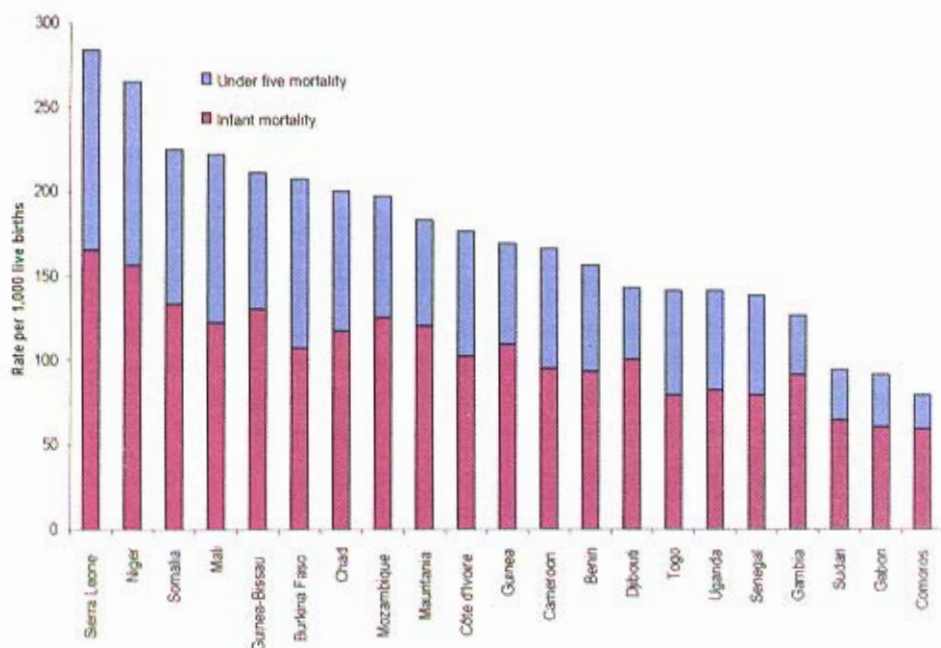
¹⁹ The African Summit on Roll Back Malaria, Abuja, 25 April 2000. Geneva, World Health Organization, 2000 (document WHO/CDS/RBM/2000.17).

The risk of contracting severe malaria is 2–3 times higher in pregnant women than in other women in areas of unstable malaria transmission, while in areas of stable transmission the main effect of malaria on the pregnant women is anaemia. Severe maternal anaemia increases the risk of maternal death, and malaria-related anaemia is estimated to cause as many as 10,000 maternal deaths each year in Africa. Preventing malaria in pregnancy is, thus, likely to have a major impact on maternal mortality as well as on the risk of low birth weight, which contributes to infant mortality.

From a more general viewpoint, a reduction in the malaria burden will contribute to all eight MDGs and most of them will contribute to reducing malaria.

- Reduction of malaria will contribute to greater investment in endemic areas and to increasing the productivity of the people living there. It will, thus, contribute to eradicating extreme poverty and hunger (MDG 1).
- Reduction of malaria will reduce absenteeism due to disease and thereby contribute to achieving universal primary education (MDG 2).
- Reduction of malaria has to include empowerment of women and will contribute to gender equality through the improvement of maternal health (MDGs 3 and 5).
- Malaria control will reduce child mortality (MDG 4).
- Malaria, together with HIV/AIDS, is the object of MDG 6, and the two diseases interact to increase risk and vulnerability.
- Malaria control can contribute to environmental sustainability (MDG 7).
- Roll-Back Malaria is one of the important global partnerships of our time (MDG 8).

**Fig. 3. INFANT AND UNDER-FIVE ALL-CAUSE MORTALITY RATES
IN IDB MEMBER COUNTRIES
IN AFRICA, SOUTH OF THE SAHARA, 2002**



Source: UNICEF.²⁰

Note: The under-five mortality rate is expressed as the probability of dying between birth and exactly five years of age, expressed per 1000 live births. The infant mortality rate is expressed as the probability of dying between birth and exactly one year of age, expressed per 1000 live births.

The situation in member countries

The 55 IDB member countries can be broadly classified into two categories:

- Countries in which malaria is steadily decreasing or has been eliminated. In these 27 countries, previous efforts have been successful and malaria has been eliminated (in 12) or largely brought under control (in 15).
- Countries with a continuing high malaria burden, where the incidence of malaria is of major relevance to achieving the MDGs. Of these 28 countries, 21 are located in Africa, south of the Sahara and 7 are outside Africa. Eight of these countries (6 in Africa and 2 in Asia) are affected by complex emergencies, making the challenges even greater. Twenty of these 28

²⁰ The state of the world's children 2004. New York, UNICEF, 2004.

countries are benefiting from GFATM support, but huge funding gaps (also for these 20 countries) remain.

As indicated above, malaria is among the main determinants of the low income levels of most of the African countries. In most of the Asian countries (and Suriname), where malaria remains an important public health problem, its distribution is intimately associated with remote rural localization, social instability and societal marginalization.²¹ Thus, while reduction of the malaria burden is a national development concern in African countries, it is an essential part of poverty reduction in specific, underprivileged population groups in most of the Asian countries.

II. MALARIA CONTROL PROGRAMMES IN IDB MEMBER COUNTRIES

II.1 Current trends, achievements and problems

Fourteen (14) IDB members have reported having no malaria transmission in recent years. The remaining 41 members suffering from transmission of malaria have active malaria control programmes. Among these countries, the malaria burden ranges from "focal and local" to seasonal transmission in parts of northern Africa, the Middle East and Asia, and to widespread endemic transmission in countries in Africa, south of the Sahara. To understand the relative burden of malaria, one should consider the type of malaria present – *P. falciparum* vs *P. vivax*, the relative proportion of the burden that is imported from other areas, and the ability of the health system to meet the needs for malaria diagnosis, treatment and prevention.

The situation of malaria and its control is examined below by category of country according to the magnitude of the malaria problem (Table 1).

Malaria-free countries or territories and countries or territories with very small foci aiming for elimination

In several IDB member countries, malaria has been eliminated and a good system for maintaining the malaria-free status is in place. These members are: **Albania, Bahrain, Brunei Darussalam, Jordan, Kuwait** (which was never endemic), **Kazakhstan, Lebanon, Maldives, Qatar, Tunisia and United Arab Emirates**. Similar considerations also apply to Palestine. In addition, the **Libyan-Arab Jamahiriya** is considered malaria-free, even though sporadic cases may still occur. These countries and territories still confront imported malaria, and the bulk of malaria control efforts are focused on either active surveillance in areas of past transmission or heightened vigilance for cases that are coming in from travellers and immigrants.

²¹ Casman E, Dowlatabadi H. The contextual determinants of malaria. Part 2. Regional assessments. Washington, DC, RFF Press, 2002.

In three countries (**Egypt, Morocco and Oman**), malaria is now firmly under control and very few or no indigenous cases have been reported in recent years. These countries are working towards elimination through a combination of vector control and intensive surveillance.

Countries with limited malaria burdens and only vivax malaria

In eight countries, malaria transmission is limited to *P. vivax*, thus reducing the public health impact of the disease. These countries are **Algeria, Azerbaijan, Iraq, Kyrgyzstan, the Syrian Arab Republic, Turkey, Turkmenistan and Uzbekistan**. Of these countries, Algeria reports only one small focus in Ihrir, but it is at continuous risk of importation of *P. falciparum* from West Africa on the trans-Saharan route. So, high vigilance and rapid intervention with case management and vector control are required. Malaria had previously been eradicated from Azerbaijan, Kyrgyzstan, Turkmenistan and Uzbekistan, but returned after the collapse of the Union of Soviet Socialist Republics and the ensuing reduction in control activities. The malaria situations in Iraq, the Syrian Arab Republic and Turkey are closely interlinked. The Syrian Arab Republic is considered to be able to achieve elimination in the foreseeable future with sufficient inputs.

The malaria situation in some of these countries has the potential to deteriorate (including the reintroduction of *P. falciparum*) if control efforts are not maintained or intensified.

Table 1. Islamic Development Bank members by magnitude of the malaria problem (with WHO regional office designation)

Malaria-free countries or territories and countries or territories with very small foci aiming for elimination			
Albania (EURO)	Lebanon (EMRO)		
Bahrain (EMRO)	Libyan Arab Jamahiriya (EMRO)		
Brunei Darussalam	Maldives (SEARO)		
Egypt (EMRO)	Palestine (EMRO)		
Jordan (EMRO)	Qatar (EMRO)		
Kazakhstan (EURO)	Tunisia (EMRO)		
Kuwait (EMRO)	United Arab Emirates (EMRO)		
Morocco (EMRO)	Oman (EMRO)		
Countries with limited malaria burden and only vivax malaria			
Algeria (AFRO)	Syrian Arab Republic (EMRO)		
Azerbaijan (EURO)	Turkey (EURO)		
Iraq (EMRO)	Turkmenistan (EURO)		
Kyrgyzstan (EURO)	Uzbekistan (EURO)		
Countries with some malaria burden and well developed, effective control programmes			
Iran (EMRO)	Saudi Arabia (EMRO)		
Malaysia (WPRO)			
Countries outside Africa where malaria is one of the most important public health problems			
Afghanistan (EMRO)	Suriname (AMRO)		
Bangladesh (SEARO)	Tajikistan (EURO)		
Indonesia (SEARO)	Yemen (EMRO)		
Pakistan (EMRO)			
Countries in Africa where malaria is a major health problem			
Benin (AFRO)	Mali (AFRO)		
Burkina Faso (AFRO)	Mauritania (AFRO)		
Cameroon (AFRO)	Mozambique (AFRO)		
Chad (AFRO)	Niger (AFRO)		
Comoros (AFRO)	Senegal (AFRO)		
Côte d'Ivoire (AFRO)	Sierra Leone (AFRO)		
Djibouti (EMRO)	Somalia (EMRO)		
Gabon (AFRO)	Sudan (EMRO)		
Gambia (AFRO)	Togo (AFRO)		
Guinea (AFRO)	Uganda (AFRO)		
Guinea-Bissau (AFRO)			

Countries with some malaria burden and well developed, effective control programmes

Countries with moderate *P. vivax* and *P. falciparum* endemicity and relatively well-established control programmes are the **Islamic Republic of Iran, Malaysia and Saudi Arabia**. In these countries the focus should be on consolidating the gains. Elimination may be possible in Saudi Arabia provided malaria in Yemen can be effectively controlled, particularly in areas bordering Saudi Arabia.

Vector control has been the backbone of malaria control/elimination in these countries since the start of the global malaria eradication campaign in the 1950s. In Malaysia, indoor residual spraying has been the main method, but this is increasingly being replaced by insecticide-treated nets. The numbers of malaria cases and deaths in Malaysia have been steadily decreasing since the 1980s. The general health services are well organized, with good access to medical care for nearly all population groups. The malaria control programme needs to maintain a high level of activity, as it needs to contend with three problems: importation of cases, especially from Indonesia; intense levels of transmission among the forest-dwelling Orang Asli tribes in central peninsular Malaysia; and the high density of efficient forest vectors in Sabah. Against this background, the elimination of malaria in Malaysia is not likely to be possible with current technologies. In the Islamic Republic of Iran and Saudi Arabia, chemical and biological larviciding is used as a supplementary vector control method. In all three countries, surveillance, early detection of cases and effective treatment are well carried out, contributing to the control of transmission and keeping malaria mortality very low. In both the Islamic Republic of Iran and Saudi Arabia, elimination of malaria is conceivable provided it is brought firmly under control in neighbouring countries. In the Islamic Republic of Iran, local methods and technology are being developed to kill malaria-carrying mosquitoes in water courses and sewerage systems.

Countries outside Africa where malaria is one of the most important public health problems

These countries comprise a heterogeneous group. In **Afghanistan** and **Tajikistan**, the malaria situation has been deteriorating over the years as conflict and instability continue. While the number of reported cases in Tajikistan has now probably stabilized, and the situation is now under control, but it is very difficult to obtain reliable estimates for Afghanistan, where both vivax and falciparum malaria are a risk in most of its rural areas. In the past, Afghanistan had a large-scale, successful indoor residual spraying programme. This has now largely been replaced by insecticide-treated nets, which are provided through commercial channels, social marketing and public sector distribution. The effectiveness of insecticide-treated nets and other items such as *chaddors* has been solidly documented in a series of studies in refugee camps in Pakistan.

Countries with serious malaria problems in parts of their territories are **Bangladesh**, **Indonesia**,²² **Pakistan**, **Suriname** and **Yemen**. In these countries, even though incidence is lower than in Africa, the number of malaria cases is still very high. Details on the situation of malaria and its control in Bangladesh and Indonesia are provided in Annex 1.

²² The situations of Bangladesh and Indonesia are described in more detail in Annex 1 to exemplify the variability and commonalities of malaria problems in Asia.

Of these countries, Afghanistan, Suriname and Yemen report the greatest numbers of cases relative to population. Malaria notifications in these countries are usually based on parasitological confirmation, and underreporting is a serious problem. In Suriname, the number of cases reported in 2002 actually represents a 23% reduction over that in 2001, but there were a number of outbreaks of *P. falciparum*, affecting indigenous communities in the south of the country and near Afobaka Lake. Malaria is widespread in Afghanistan, with an estimated 7% of the population infected with malarial parasites, accounting for approximately 10% of febrile illness.²³ In Yemen, annual malaria cases are estimated to be between 1.5 and 3 million.

In general, control programmes in the Asian countries include indoor residual spraying, which is gradually and to a variable extent being replaced by insecticide-treated nets, especially in Bangladesh. Malaria cases are treated in the general health services, and most of these countries are in the process of introducing ACTs. As illustrated by the examples of Bangladesh and Indonesia, the main determinants of the malaria trends in these countries are social and economic: Instability and crises lead to migration and environmental degradation. On the other hand, economic stability has the opposite effects and allows development of basic health services. However, countries vary in their commitment to providing basic health services, especially for the poor sections of society. In some cases, malaria control programmes are supported by weak epidemiological services, making it impossible to target prevention to those most at risk. In other cases, sheer conservatism can make a programme maintain indoor residual spraying operations when the human ecology warrants other interventions. Finally, many programmes have recently clung to chloroquine as the first-line treatment for falciparum malaria despite ample evidence of its lack of efficacy.

Countries in Africa where malaria is a major health problem

The IDB member countries affected are **Benin, Burkina Faso, Cameroon, Chad, Comoros, Côte d'Ivoire, Djibouti, Gabon, Gambia, Guinea, Guinea-Bissau, Mali, Mauritania, Mozambique, Niger, Senegal, Sierra Leone, Somalia, Sudan, Togo and Uganda**. The malaria situation in these countries presents a more homogeneous picture than that of the Asian countries, as most of the populations are at high perennial risk, albeit often with seasonal variations. The malaria burden is concentrated in young children and pregnant women,²⁴ although it should be mentioned that in cities, where transmission is more variable and less intense, young

²³ National malaria prevalence survey: Afghanistan. October–November 2002. Preliminary report. Kabul, Ministry of Health of Afghanistan, 2003.

²⁴ The Africa Malaria Report 2003. Geneva, World Health Organization and New York, UNICEF, 2003 (document WHO/CDS/MAL/2003.1093).

adults are also affected (with consequences for productivity) and that urbanization of Africa is growing rapidly.²⁵

Accurate statistics on malaria are difficult to collect because of the enormity of the disease problem, the general weakness of health information systems and the fact that treatment of most malaria cases, as well as many deaths from the disease occurs outside the health services. Reported malaria cases or inpatient and outpatient records are not sufficient to evaluate the impact of efforts to control malaria or to examine trends. To paint a more accurate picture of current malaria burden and any reductions in malaria burden over time, it is necessary to use a combination of methodologies: routine information system reports of malaria cases and deaths; household surveys for assessing malaria prevalence, infant and child mortality, and coverage of malaria interventions; and demographic surveillance systems. The primary measure for monitoring impact recommended by RBM in these countries is all-cause, under-5 mortality as measured by household surveys.²⁶ Measuring malaria-specific mortality is not useful because symptoms and signs (such as anaemia) are not specific and sensitive.

Fig. 3 presents the current status of infant and under-five mortality in IDB member countries in Africa south of the Sahara. There is evidence that malaria mortality increased in some parts of Africa, especially eastern and southern Africa between 1990 and 1998. The main reason for this is most likely increasing resistance to the main first-line antimalarial, chloroquine.²⁷ Indicator data collected since 1998 do not provide any consistent trend. Given the increased attention to malaria and the fact that most of the countries most severely affected by chloroquine resistance have adopted an alternative treatment since 1998. It is likely that the malaria burden has not increased since 1998, but the final verdict must await further collection and analysis of data.

Malaria control in the African countries and Suriname was, until a few years ago, based mainly on treating fever cases with chloroquine in the general health services. The aim has been to prevent death and to reduce morbidity based on early recognition of signs and symptoms and treatment of malaria cases.

²⁵ Snow RW et al. The public health burden of *Plasmodium falciparum* malaria in Africa. Deriving the numbers. Bethesda, MD, National Institutes of Health, 2003 (Disease Control Priorities Project, Working Paper No. 11).

²⁶ Second Meeting of the RBM Partnership. Monitoring and Evaluation Reference Group (MERG)

(http://mosquito.who.int/partnership/wg/wg_monitoring/docs/MERG_Nov03minutes270104final.doc, accessed 4 August 2004).

²⁷ Korenromp EL et al. Measurement of trends in childhood malaria mortality in Africa: an assessment of progress toward targets based on verbal autopsy. *Lancet Infectious Diseases*, 2003, 3:349-358.

II.2 National strategies and policies for achieving the malaria-related MDGs

Several issues arise while considering the malaria MDG targets in relation to IDB member countries: (a) whether the indicators and related baselines reliably express the situation of these countries, the targets to be achieved and the gaps that must be covered; (b) the support tools needed to follow up on those indicators (household surveys and administrative registers); (c) the required support instruments (technical cooperation, grants and loans); and (d) whether all IDB member countries will need to take part in evaluating the malaria-related MDG targets. Gaps in capacity development are recognized as a major concern in achieving the MDGs. It is worth mentioning here that the phrasology "To have ... halted, and begun to reverse ..." is not clear. The Millennium Project Task Force 5 on HIV/AIDS, Tuberculosis, Malaria and Access to Essential Medicines is currently working on an interpretation that will be universally acceptable. In the mean time, most countries are working towards the RBM goal of halving the malaria burden by 2010 compared to 2000. This is clearer but, as indicated above, it has measurement problems that must be addressed.

In some of the countries where malaria is not a major problem, or where there is steady progress in malaria control, these considerations are of minor importance (Table 2). Nevertheless, in most of the countries where malaria is an important public health problem, most of the strategic attention is currently focused on obtaining international funding for reducing the malaria burden.

Table 2. Specific malaria mortality rates per 100 000 population in IDB member countries, 2000–2002, latest official reports or WHO estimates

Niger	329	Suriname	2
Sierra Leone	321	Iran (Islamic Republic of)	1
Mozambique	263	Tajikistan	1
Mali	260	Malaysia	0.2
Chad	232	Albania	0
Burkina Faso	223	Azerbaijan	0
Guinea	206	Bahrain	0
Benin	190	Brunei Darussalam	0
Uganda	151	Egypt	0
Guinea Bissau	139	Iraq	0
Côte d'Ivoire	118	Jordan	0
Cameroon	116	Kazakhstan	0
Djibouti	114	Kuwait	0
Mauritania	103	Kyrgyzstan	0
Somalia	82	Lebanon	0
Gabon	74	Libya	0
Senegal	71	Maldives	0
Sudan	70	Qatar	0
Comoros	65	Syrian Arab Republic	0
Gambia	58	Tunisia	0
Togo	46	Turkey	0
Afghanistan	10	Turkmenistan	0
Bangladesh	9	United Arab Emirates	0
Pakistan	9	Uzbekistan	0
Yemen	8	Algeria	—
Indonesia	4	Morocco	—
Saudi Arabia	4	Oman	—

In addition, the malaria mortality rate per 100,000 people in the Palestine is zero.

III. CONSTRAINTS ON REDUCING THE BURDEN OF MALARIA IN IDB MEMBER COUNTRIES

III.1 Major gaps in efforts to achieve the malaria MDG targets

Scientific advances in recent years and the experience of remarkably rapid progress in countries as diverse as Eritrea, Malaysia, Oman and Vietnam, allow optimism for malaria control that has not been possible at any time since the days of the global eradication campaign in the 1950s and 1960s. The tools for controlling the disease are now more diverse and there is better knowledge about how to use them. In the most problematic and intense transmission areas in Africa, malaria control needs no

longer to be based on local assessments of a multitude of determinants. The evidence permits one to concentrate on a few understandable and acceptable interventions, which is a prerequisite for successful, large-scale public health action.

It is important to appreciate the constraints and gaps in this perspective. The control of malaria is feasible; therefore, the following gaps should be addressed.

- Social instability is the main threat to malaria control. It increases malaria risk, hampers educational efforts and makes the distribution of essential commodities perilous. In areas of continuous social instability, it is essential to do what one can to reduce the malaria burden, but excellent results should not be expected except in areas where the disease is already close to elimination.
- Funding needs to be of sufficient volume and continuity. The relationship between poverty and malaria makes international funding unavoidable in most high-burden countries. An estimate based on the need for US\$ 2 per person at risk per year to cover the cost of commodities for prevention and treatment provides a very rough estimate of likely funding gap. This estimated gap indeed does not include investment, personnel and delivery costs, which to a variable degree would be covered by national systems. A very important factor in this context is sustainability of funding. Lack of confidence on the part of governments of endemic countries has been one of the main factors in making them decide to apply for grants to cover only a fraction of the populations at risk or to avoid taking decisions to introduce relatively costly treatments such as ACTs.
- The most important gap is now that of human resources and institutional capacity. This is particularly so for many African countries, whose national malaria control programmes have in the past been restricted to doing operational research and education. They are now – rightly – being challenged by GFATM to “spend and prove” and need rapidly to build up human resources for a multitude of tasks at central and other levels. In Asian countries, the challenge is often to rebuild programmes that have deteriorated through inadequate funding or ineffective decentralization, or to reorient programmes that are to focus on eradication practices.
- Despite the improvement in the situation described above, there is still, in many countries, a lack of commitment from the highest level of government. Such commitment is essential for success, because the control of malaria is intersectoral as well as being part of development and poverty reduction. Especially in countries where malaria is concentrated in disenfranchised population groups, governments commitment to improving the lives of these people is essential to ensure that resources and efforts are correctly targeted.
- Despite the currently favourable conditions for our best control tools, technical issues such as resistance of parasites (*P. falciparum* and *P. vivax*) to antimalarials and vector resistance to insecticides need to be considered

ever-present risks. These issues can be adequately addressed by appropriate field research and by continued international investment in new biocides, as well as vaccine development and other innovations.

III.2 Institutional and human resource constraints

Capacity development

With increasing financial resources, there is now an urgent need to develop the capacity for scaling up RBM. The allocation of increased budgets for malaria control has in some countries contributed to meeting the requirements for human resource development, for example through the establishment of national centres for malaria training and research or collaboration with existing institutions. Often, the immediate priority will be to build national cadres of trainers in different aspects of malaria prevention and control.

Capacity building in the countries includes the training of new cadres and retraining of existing ones. There is a need to intensify human resources development, as this will improve the functioning of programmes in all countries. Needs assessment in human resources development will be required in countries in order to revitalize national centres for malaria training and research.

In countries where the ministries of health have allocated sufficient financial and human resources for malaria control, partnership development has been limited. Nevertheless, there is a need in all countries with a high burden of malaria to strengthen partnerships in order to bring more support to malaria control activities at the country level. Partnerships are needed in the health sector and beyond it, and include the formal and informal private sectors, as well as international stakeholders. Partnerships with research institutions may be particularly important for monitoring and evaluation.

Broad staff training is required to ensure competency in malaria control activities. In many instances, for example, knowledge of disease vectors and treatment of malaria are far from satisfactory because physicians at the primary care level and in some hospitals are confused about treatment regimens in use. Also, because of a lack of adequate training in management of medicines, health facilities often run out of antimalarials, even in main towns and cities. In general, malaria control programmes must be able to apply a health systems approach and to work through sector-wide mechanisms wherever needed. They must build a broad, central-level managerial capacity together with HIV/AIDS and tuberculosis programmes and initiatives, building or strengthening synergies with such programmes as Integrated Management of Childhood Illness, Making Pregnancy Safer and the Expanded Programme on Immunization for the delivery of curative and preventive services.

Health sector policies for human resources

Policies for capacity development need to be part of those for human resource development and must be created country by country. Problems in the development and maintenance of human resources are recognized as the most important constraint in health sector development. They are beginning to be addressed multisectorally by some initiatives related to MDGs. The immense challenge of the three diseases – malaria, tuberculosis and AIDS – as well as the special funding opportunities for them makes it natural to examine specific possibilities related to these three disease control programmes. Such policies need to confront brain drain issues head-on. Far too many human resource development efforts are currently in vain because those who are trained seek employment in countries where the conditions appear more favourable.

There are major differences in the distribution of health care facilities and human resources between regions, provinces and states, the highest densities being in more developed areas (towns and cities). Efforts to bring health services closer to communities in more remote areas are often thwarted by the multitude of pressures that ministries of health are under. Malaria takes its greatest toll among poor communities in remote villages, since health facilities are almost nonexistent and, if present, are poorly equipped and understaffed. Human resources policies need to address requirements over the whole spectrum, from the national level to the village. Providing quality services in remote areas is possible only with continued investment and support for the people involved whether paid staff or volunteers.

III.3 Financial constraints in controlling malaria in IDB member countries

Inadequate financial support in high-burden, high-transmission IDB member countries has been an impediment to the effective control of malaria. There are too many health priorities chasing too few resources, human as well as financial. One of the risks associated with increasing the international funding for the control of communicable diseases is that any national funding already allocated to such programmes will be taken away and used for other purposes. This problem can be addressed only through the establishment of solid and sincere cooperation between governments and their partners.

Cost sharing has been introduced in some countries. In poor areas, this may delay or even inhibit the utilization of public sector diagnostic and treatment facilities, leading to greater morbidity and mortality and incomplete treatment favouring the development of drug resistance.

Most IDB member countries receive their funding from their national budgets, with RBM partners providing some extra funding. Since 2002, GFATM has become a major source of additional funding. WHO's Roll Back Malaria Department is supporting countries in developing proposals for submission to GFATM, and in planning the implementation and monitoring of successful proposals.

Of the 28 high-burden IDB member countries, 20 received funding from GFATM in the first three rounds, amounting to a total of US\$ 136 million over two years. More countries are expected to receive funding in the fourth round. For these countries, effective implementation and reporting may pose critical challenges in view of the funding gap, as well as ensuring continuation of support. Even though GFATM funding is of an unprecedented scale, the funding gap is still huge at almost US\$ 500 million per year for these 20 countries alone. Also, GFATM funds specific proposals and not all country proposals cover the required range of RBM interventions.

IV. FINANCING PROGRAMMES AND ENHANCING COOPERATION TO REDUCE THE BURDEN OF MALARIA IN IDB MEMBER COUNTRIES

IV.1 Financing requirements of programmes

Effective malaria control requires funds to cover:

- supplies, equipment and logistics for case management and prevention;
- human resource development, including technical support, training and supervision;
- service delivery, especially for preventive services (for curative services, service delivery for most populations should be handled by existing public and private systems);
- engagement of the private sector and nongovernmental organizations for service delivery, communication and other purposes; and
- contracting with scientific institutions for monitoring and evaluation and for operational research.

It is difficult to measure, globally, the financial requirements for the control of malaria, given the breadth of what could be considered to be "malaria control financing". The RBM Partnership and WHO are currently working on refined estimates of the resources needed for global malaria control, including the above-mentioned types of expenditure. Until these become available, some rough estimates can give an indication of the needs. For the approximately 650 million people at risk in tropical Africa, the costs of full coverage with effective malaria control interventions would at current prices be around US\$ 2 billion per year, 50% being for prevention (insecticide-treated bednets and intermittent preventive treatment in pregnancy) and 50% for treatment with ACTs (which have not yet been adopted as policy in all African countries, but should soon be). Given the high variability in the level of risk and the relatively high level of existing coverage by control measures, it is more difficult to prepare a global needs estimate for the approximately 2 billion people at risk outside Africa; nevertheless, an amount of US\$ 1 billion per year as additional international investment would be a conservative estimate.

Separate mention of countries in tropical Africa is warranted because in most of them 90–100% of the population is at high risk of contracting malaria. Most families in these countries experience several malaria episodes per year and require preventive measures such as insecticide-treated nets. In endemic countries at the northern and southern fringes of tropical Africa and outside Africa, on the other hand, only 5–20% of the population is usually at risk of contracting malaria each year. In these countries, even if GDP is low, the possibility of financing malaria control from domestic resources is obviously much greater. Furthermore, it is not meaningful to provide vector control coverage for some of the population at very low risk, because early detection and effective treatment of cases and good surveillance may be more effective and cost-effective in such settings.

IV.2 Cost-effectiveness and prioritization

Ideally, prioritization in public funding should be based on analyses of cost-effectiveness and allocative efficiency. In fact, several analyses of malaria prevention and treatment have demonstrated that malaria control interventions are among the most cost-effective known in public health.²⁸ The inadequate funding of malaria control from national budgets is related to the fact that decisions are not generally made on the basis of allocative efficiency, and that without external support health systems need considerable time to adjust their priorities on the basis of evidence. Finally, the health sector is generally underfunded in most developing countries, because its importance for economic development is not yet sufficiently understood.

IV.3 Public and private payments

At present, many countries provide treatment for malaria patients, mainly with inexpensive antimalarials, through public and private delivery systems and largely rely on the consumer to pay out-of-pocket for the medicines. Although the requirement to pay even for inexpensive antimalarials can be an obstacle to access for the poorest populations, the system has worked for most people provided the treatments are effective. Increasing parasite resistance to antimalarials is causing many countries to reconsider their malaria treatment policies and to switch to more effective but more expensive ACTs in line with WHO recommendations. At US\$ 1.5–2.4 per adult treated, ACTs are 10–20 times as expensive as chloroquine. Substantial subsidies of such new treatments are needed during the introduction phase to make them available to consumers at no or an affordable cost. The deployment of such new treatments in the public sector will increase the utilization of the services; however, neglecting the private sector is likely to result in leakage of the new expensive treatments. In most countries, it will, therefore, be necessary to subsidize antimalarial treatments simultaneously in the public sector and in the

²⁸ Hanson K et al. The economics of malaria control interventions. Geneva, Global Forum for Health Research/World Health Organization, 2004.

private sector through social marketing schemes and/or other mechanisms. Public investment should, among other things, encourage the private sector to play a more active role in providing appropriate treatment and prevention at a subsidy to the consumer.

It has always been accepted that countries should provide indoor residual spraying free of charge to the public in the same way as immunization, yet insecticide-treated nets have been considered a commodity that people should pay for. Increased use of mosquito nets can be achieved by commercial and social marketing, as well as cost-recovery schemes, but high retreatment rates are very difficult to achieve or maintain by such approaches. Experience from, for example, Eritrea and Vietnam shows that the steepest increases in coverage rates have been achieved in countries where (a) the nets were already owned by the population and retreatment was offered as a free public service or (b) where nets and retreatment were provided free of charge.

High coverage rates with insecticide-treated nets, also of the poorest populations, reduce the disease burden and the economic burden associated with treatment. On the basis of experience over the last 10 years, there is now increasing acceptance that, in the short to medium term, nets and their retreatment should be provided free or heavily subsidized, especially to poor rural populations, and should target the most vulnerable groups (usually young children and pregnant women). Since mosquito nets are considered a basic commodity by certain societies, despite a very limited household economy, there are often good reasons to stimulate demand for and commercialization of nets as a way of promoting sustainability and self-reliance.

IV.4 External and domestic financial resources

Securing sustainable health sector financing by mobilizing adequate levels of resources will be essential for any meaningful malaria control programme in the short to medium term. Appropriate strategies for reducing inefficiencies and inadequacies in health service provision will also be essential. In many countries, rationalization of budgeting and expenditure with equity concerns and clear sectoral priorities such as malaria control would probably result in a dramatic increase in malaria control expenditure and a greater push toward achieving high coverage levels to achieve impact. Giving priority to cost-effective interventions is all the more important as new funds become available to the health sector. In its first three funding rounds, GFATM has allocated US\$ 120 million to IDB countries in Africa for malaria control (out of a total of US\$ 136.5 million to all IDB members). Care must be taken to ensure that external funding is additional to, and not a substitute for, domestic financing and that it does not lead to (further) fragmentation of the national health system. There is a need for complementarity between short-term scaling-up resources and medium-term support, for example from development banks.

New funds remove only one of the obstacles to the provision of equitable, universal health care. Institutions receiving increased funds, whether governmental or

nongovernmental, must improve programme implementation. Trained staff, information systems, audit mechanisms and financial controls among others must be strengthened to handle the increased financial flow.

There are good reasons to seek to decentralize major public health activities. Involving local communities and civil society organizations in decisions on resource allocation, appropriate pricing, service delivery strategies and performance monitoring can make the health care system client-focused and improve performance. Malaria is strongly associated with poverty. However, the practical result of decentralization in countries, which recently had highly centralized malaria control programmes, has been a drastic reduction in resource allocation. Decentralization of malaria control should be carefully planned. It should also take place over a number of years. The central level should not be neglected in the push towards decentralization, as resources are needed to oversee implementation at district level and for monitoring and evaluation. Furthermore, it should be accompanied by earmarked supplementary funding from central government, targeted at poor areas.

IV.5 Investments in product development and technology transfer

Especially from an international viewpoint, there is also considerable scope for public-private cooperation in countries for developing new products such as new combination treatments, diagnostics or long-lasting insecticidal nets (LLINs). In the United Republic of Tanzania, a private company is now producing quality LLINs after successful transfer of the technology from a Japanese company, thereby improving the local availability of these essential commodities. Some endemic countries have begun growing *Artemisia annua*, the plant that produces artemisinin, the active ingredient of ACTs, and investment in such production could well increase competition and lower the prices of quality products in this particular market.

IV.6 Experience of major multilateral financing institutions and specialized international organizations such as WHO in financing malaria programmes

To date, donors have generally opted either to directly finance earmarked malaria control activities or to support the health system as a whole so as to improve service delivery. GFATM, for example, has provided substantial grants earmarked for malaria control such as for the procurement of insecticide-treated nets and antimalarials.

The World Bank has concentrated primarily on supporting health systems through a sector-wide approach (such as in Mali and Senegal), which allows countries to determine spending priorities. This approach has generally resulted in a broader strengthening of the health systems rather than control of disease. There are exceptions to this trend, however, such as specific malaria control projects in Eritrea and India supported by the World Bank have had remarkable success in malaria

control in particular. In the past, countries outside Africa obtained major World Bank loans specifically for malaria control.

Health system factors (human resources, supply chain management, community insurance schemes, etc.) are critical for scaling up coverage of malaria control interventions. Efforts to scale up malaria control by addressing these are just beginning (in Ghana, Kenya and Senegal, among others) and preliminary results are not yet conclusive. Solutions must be found to the bottlenecks – in human resources and other areas – that make it difficult to translate extra money into better health outcomes. One promising approach is the Marginal Budgeting for Bottlenecks approach developed by WHO, UNICEF and the World Bank based on work in a number of West African countries. It helps align spending with priorities. As ministries of health develop their medium-term expenditure plans, system bottlenecks need to be clearly identified and costings made of strategies for removing them. The approach has produced encouraging results in Benin, Mali and Mauritania, among others.²⁹

Bilateral agencies, such as the United Kingdom's Department for International Development often support malaria control through both approaches in the same country, providing financing for particular malaria-related activities while supporting health sector-wide financing (and/or budget support) as well.

Thanks to expanding fiscal space linked to debt relief and commitments from donors through sector-wide approaches and budget support, resources for health have increased significantly in some countries. The challenge now is to translate increases in resources into activities that produce health gains. Without focused, country-specific efforts to link malaria control with increased fiscal space, control programmes will grow increasingly dependant on project-specific external resources.

IV.7 Potential for regional cooperation on fighting malaria

As is the case with all communicable diseases, malaria is not confined by national boundaries. Contrary to popular belief, the behaviour of anophelines, whose flight range rarely exceeds 1.5 km, is of little relevance in this respect. The crossing of borders by humans is much more important. This is particularly so in south-east Asia, where malaria is often concentrated in hilly areas along international borders that may be straddled by poor communities. Regional opportunities for cooperation include sharing of experiences, exchange of information, capacity building, surveillance and prevention of epidemics.

²⁹ Soucat A, Van Lerberghe W, Knippenberg R. Buying results, budgeting for bottlenecks: the new performance frontier. Washington, DC, World Bank, 2002. Cited in: The world health report 2003 – shaping the future. Chapter 7. Health systems: principled integrated care. Geneva, World Health Organization, 2002, Ref. 50.

Over the years, there have been numerous examples of cooperation/projects in malaria control at regional and subregional levels. Some examples are:

- the project to contain chloroquine-resistant falciparum malaria in the South-East Asia Region of WHO through antimalarial resistance surveillance and spraying;
- the Pacific Roll-Back Malaria Cooperation among Papua New Guinea, Solomon Islands and Vanuatu in the south-west Pacific together with Australia and New Zealand;
- the Egypt-Sudan *Anopheles gambiae* project (in operation for 20 years);
- the Mekong Roll-Back Malaria Initiative, involving Cambodia, China, the Lao People's Democratic Republic, Myanmar, Thailand and Vietnam and covering surveillance, geographical information system, antimalarial resistance, treatment policy, technical exchange, training and quality assurance of medicines;
- the Asian Collaborative Training Network for Malaria (ACTMalaria), including the Mekong countries, Bangladesh, Indonesia, Malaysia and the Philippines.
- Roll Back Malaria Sahel (Mauritania, Mali, Niger, Burkina Faso and Chad): surveillance and response to epidemics;
- several networks at subregional level in Africa, the newest being the Horn of Africa network on monitoring antimalarial treatment (HANMAT) covering antimalarial resistance and treatment policy
- Southern Africa Malaria Control (Angola, Botswana, Comoros Islands, Madagascar, Malawi, Mozambique, Namibia, South Africa, Swaziland, the United Republic of Tanzania, Zambia and Zimbabwe): partner coordination, technical exchange and surveillance; and
- an interesting new initiative on eliminating malaria from the Arabian Peninsula, involving Oman, Saudi Arabia and Yemen.³⁰

When considering new cooperative initiatives, consideration should be given for placing malaria control operations in national systems, where the political power is rather than regional organizations. Cooperation is not an end in itself. Planning should be specific and target-oriented, and one should guard against regional initiatives being reduced to an unending series of more-or-less ritual meetings. Nowadays, modern communication technologies allow easy communication between district health offices across national borders, and should make cooperation and regional support much less costly than in the past.

³⁰ See Annex 1.

V. REVIEW OF THE ROLE OF THE IDB IN THE HEALTH SECTOR IN MEMBER COUNTRIES

Since its establishment in 1396H and up to the end of 1424H, the IDB has financed 158 projects in the health sector to a total of ID 797 million (US\$ 1044 million). Of this amount, 28% was allocated to the least developed members. The Palestinian Authority had the largest share of the funding to this group. Most of the IDB financing has been in the public health care sector (94%), with only 6% going to the private health care sector.

IDB financing in the health sector has substantially increased over the past several years. For example, the last five years alone (i.e. 1420H–1424H) have accounted for 50% of the sector's cumulative funding. Some 20% of IDB financing in the health sector is for projects of a preventive nature, while curative care accounts for nearly 80%. Currently, the IDB is also supporting a vaccine production programme with the aim of promoting the production of affordable quality vaccines and ensuring reliable supplies of such vaccines in its member countries.

VI. CONCLUSIONS AND RECOMMENDATIONS

VI.1 Conclusions on achieving malaria MDG targets in IDB member countries

1. Most of the IDB member countries will be able to achieve the MDGs related to malaria. The main determinants of success are:
 - sustained and sufficient financing
 - human resource development
 - practical integration with general health system planning
 - national government commitment and leadership.
2. The international funding required in the medium term to supplement current GFATM inputs for all the low-income IDB member countries is in the order of US\$ 500 million per year.
3. The MDG that mentions reversing the incidence of malaria needs to be better defined. An international effort to this end is likely to incorporate the RBM goal of reducing the malaria burden (mortality) by at least 50% by 2010 compared to 2000.
4. In some countries with only sporadic malaria problems, there is scope for progress. However, the MDGs have no bearing on these malaria situations and the countries in question have the financial and technical capacity to address them. Nevertheless, in many cases control can be reinforced by cross-border cooperation.
5. In countries affected by complex emergencies, it may not be realistically possible to attain the MDGs. Nonetheless, for humanitarian as well as developmental reasons, malaria should be addressed in these countries to curb at least the mortality burden and part of the morbidity burden.

6. In the foreseeable future, most of the funding for commodities for malaria control in low-income countries is likely to come from GFATM. Development banks and partners should be prepared to supplement in specific cases, but in general planning will be easier and economy of scale more likely if GFATM is considered the principal source for this purpose.

VI.2 Recommendations at national, regional and IDB group levels for reducing the malaria burden in IDB member countries

1. The IDB should recognize the control of malaria as a developmental and humanitarian priority, essential for attaining all of the MDGs and for reducing poverty among certain marginalized groups in a large number of member countries.
2. Funding from the IDB should be seen as much as possible as supplementary to commodity funding from GFATM.
3. IDB funding should give priority to capacity development and human resource policy development in the public health sector. It should also prioritize institutional development for malaria control, with emphasis on district-level capabilities, community mobilization, management, and the integration of malaria control with other health programmes.
4. Support should be provided through government institutions for engaging the private sector (for example in social marketing schemes) and civil society (for example for service delivery) when this is warranted by a situation analysis at national level.
5. As with other development banks, support from the IDB should be sought to facilitate the inclusion of malaria control in sector-wide approaches. It should also promote decentralized and prioritized planning towards clear service targets consistent with the MDGs.
6. Regional cooperation should be supported when it is likely to lead to better malaria control. It is likely to be particularly rewarding for capacity development among geographically close countries with a common official language.

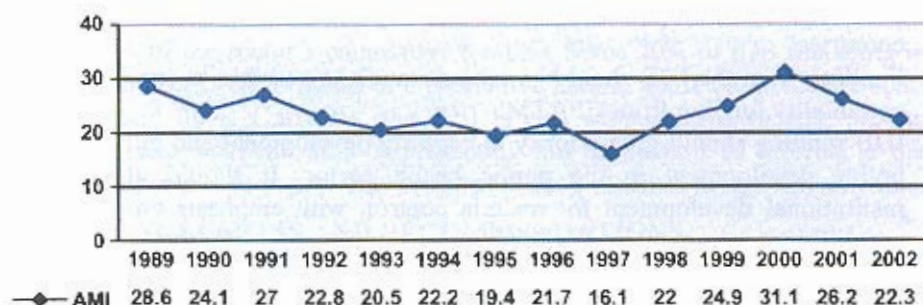
ANNEX 1

Malaria and its control in selected countries and subregions

INDONESIA

Current malaria situation

The incidence of malaria in Indonesia was on a long-term downward trend until 1997, when economic crisis hit the Asian region. Malaria incidence increased between 1998 and 2000, but has now returned to a downward trend.



The economic crisis had three important consequences for malaria transmission:

- people in such occupations as tree felling, mining and plantation work lost their jobs, resulting in large population movements from highly malarious rural areas back to home villages in less malarious areas (which still had a competent vector population). In addition, many of the highly malarious areas had antimalarial-resistant malaria and the new outbreaks were, therefore, not responsive to first-line medicines;
- resources for malaria control were reduced (staff reductions, no new recruitment, limited procurement) leading to inadequate outbreak response and interventions; and
- the economic crisis led to lower morale and demotivation among health workers.

The population of Indonesia was 215 million in 2002, of which 76 million was at risk of malaria. Some 15 million cases of the disease are estimated to occur each year, with some 30 000 deaths (based on the National Health Household Survey, 1995). In 2002, Indonesia reported 220 000 confirmed cases of malaria in 1.3 million blood films examined, and 3.3 million patients with clinically suspected malaria were examined and treated.

Malaria is largely under control in Java-Bali after successful control interventions since the 1950s. Receptive areas in central Java such as the Menoreh Hills require continued surveillance and intervention owing to persistent exophagic vector

species. By contrast, outer island provinces have problems of endemic malaria, where budget constraints result in treatment based on clinical diagnosis and limited vector control. Using GFATM funding, expansion and strengthening of early diagnosis and prompt treatment, together with targeted vector control, have begun in four eastern provinces (Papua, Maluku, North Maluku and East Nusa Tenggara).

Current control activities

- Emphasis on reducing malaria transmission in development areas to prevent death and to reduce morbidity in general
- Improvement of early detection system and surveillance for identification of malaria transmission and potential breeding places
- Expansion of antimalarial delivery through primary health care to ensure access in endemic areas, particularly for children under five and schoolchildren, with prophylaxis for pregnant women and other patients with clinical malaria
- Selective application of house spraying, larviciding and insecticide-treated nets
- Strengthening of intersectoral coordination for better environmental management
- Regular supervision and routine evaluation for better planning
- Manpower development for better programme management
- Decentralization of planning and programme implementation
- Prevention and control of malaria epidemics

Achievements

- Reversal of 3-year upward trend in malaria incidence
- Reduction of mortality rate in selected provinces
- Improved detection and treatment through village malaria field workers and village health posts
- Antimalarial resistance monitoring and evidence-based change in treatment policy

Problems

- Decentralization to districts, with resulting confusion of responsibilities, budget and funding
- Resource constraints on effective interventions for malaria control
- Antimalarial-resistant malaria (both *P. falciparum* and *P. vivax*) causing uncontrolled outbreaks and higher morbidity, and requiring costly new treatment protocols
- Over 20 vector species causing transmission in a wide variety of ecological habitats
- Movements of people causing constant reintroduction of malaria, especially antimalarial-resistant strains

- Social disturbances and conflicts leading to curtailed malaria control interventions and increased risk of transmission
- Uncontrolled environmental modifications leading to new man-made vector breeding sites, extending the range of malaria risk

National strategies and policies for achieving the malaria-related MDGs

The general objective is to reduce morbidity and mortality rates by at least 25% by 2005 compared to 2002 through:

- regular and complete situation analysis of malaria risk at district level, leading to stratification for effective and appropriate malaria interventions;
- increased use of microscope and rapid diagnostics to confirm the diagnosis of malaria;
- increased access to effective treatment through the strengthening of community treatment posts and village health workers;
- availability of alternative antimalarials in areas of resistant malaria; and
- increased use of insecticide-treated nets through promotion, social marketing and subsidy schemes

Institutional and human resource constraints

- Continuing confusion associated with the national policy of decentralization to district level for all government implementation
- Too many priorities in health chasing too few resources
- Lack of integration of health into other ministerial and economic priorities (e.g. extractive resources such as mining and timber and renewable resources such as aquatic farming and plantations)
- Chronic inadequate funding of malaria control activities to effectively reduce malaria transmission on a nationwide basis

BANGLADESH

Current malaria situation

Malaria is a major public health problem in Bangladesh, with some 88% of the 130 million people at risk of contracting the disease. The majority of malaria cases are reported from 13 of the total of 64 districts in the country. These 13 districts have a total population of 26.2 million who are at high risk. The epidemiological data for 1998–2003 is given in Table A1 and Fig. A1.

Table A1. Epidemiological data on malaria, 1998–2003

Year	Population under surveillance (millions)	Clinical cases	Blood slides examined	Positive cases (percentage <i>P. falciparum</i>)	Annual parasite incidence	Deaths
1998	111	377 905	437 928	60 023 (70)	0.54	507
1999	113	322 430	386 168	63 738 (70)	0.56	551
2000	114	383 615	328 748	41 502 (65)	0.36	448
2001	115	265 794	360 300	55 599 (71)	0.49	502
2002	117	251 590	361 586	55 646 (71)	0.47	588
2003	117	350 271	350 271	55 909 (74)	0.48	577

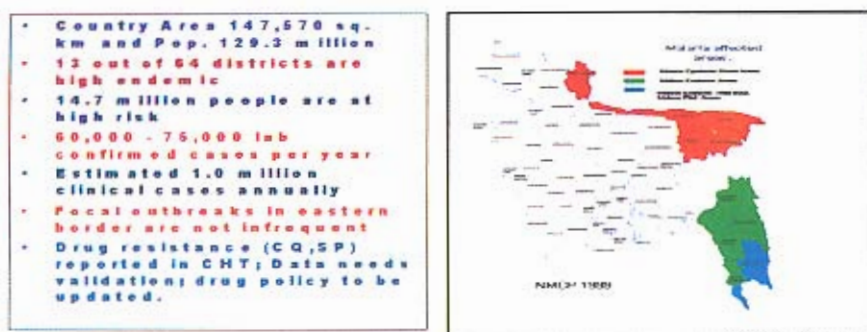
About 7.5 million people living in 8 districts are in epidemic-prone areas. The capacity to predict, detect, alert and respond early to malaria outbreaks is inadequate. Focal outbreaks occur every year. The majority of the country's population live in rural plains areas where only *P. vivax* malaria is reported in foci of low intensity. Five major epidemiological types of malaria have been defined: (a) malaria of forested hills, (b) malaria of the forest fringe, (c) malaria of plains border belt areas, (d) malaria of rural plains areas and (e) malaria of urban areas.

Of the 34 *Anopheles* species recorded in Bangladesh, 7 have been incriminated as malaria vectors: *An. aconitus*, *An. annularis*, *An. dirus*, *An. minimus*, *An. philippinensis*, *An. sundaicus* and *An. vagus*. From recent entomological observations, the *An. maculatus* group is suspected to be a new vector in certain areas of northern border districts. DDT was used over 30 years for residual indoor spraying until 1991. Its use in the control of malaria is now banned and, since 1994, Malathion 57% EC for indoor residual spraying and deltamethrin 2.5% EC and 1% SC for treating nets have been used instead.

The degree of resistance of *P. falciparum* to chloroquine increased from 10% in 1979 to 45% in 1987 and 57% in 1992 (RII + RIII). The situation is gradually worsening. The second-line regimen (Q3+SP) for treatment failure cases also showed a clinical failure rate of 21% in a recent study. The malaria control programme has begun changing treatment policy and introducing artemether-lumefantrine (Coartem®) as soon as possible.

The annual parasite incidence is 4.2 in highly endemic districts (2002). An estimated one million clinical cases are treated each year. During 2002 and 2003, 61 495 and 55 909 laboratory-confirmed cases were reported, with 598 and 577 deaths, respectively. *P. falciparum* is the predominant infection (70%) and *An. dirus* the principal vector. The programme envisages achieving a 50% reduction of the incidence of cases and deaths due to malaria by 2015.

Fig. A1. Malaria-affected areas, Bangladesh



Malaria control

The Malaria and Parasitic Disease Control (M&PDC) unit is responsible for the malaria and other vector borne diseases control under the Directorate of Health. The programme runs under the supervision of Director Primary Health Care (PHC) and activities are implemented through the District Health System by the network of health infrastructures and the field workers at the grass root levels.

Objectives

- To reduce, by the year 2010, the malaria mortality rate by 50% compared to 2000
- To provide early diagnosis and prompt treatment
- To plan and implement selective and sustainable vector control measures, including insecticide-treated nets and indoor residual spraying
- To develop and strengthen epidemiological surveillance to provide adequate information for planning malaria control activities at various levels

Strategies

- Adoption of the three malaria clinical case definitions of uncomplicated malaria (UM), severe malaria (SM) and treatment failure malaria (TFM) for early diagnosis and prompt treatment
- The adoption of revised reporting forms for epidemiological surveillance that allow for the reporting of deaths from malaria
- Promotion of community participation in the implementation of insecticide-treated net interventions in partnership with nongovernmental organizations and other sectors
- Monitoring trends in TFM, strengthening laboratory services, and monitoring the therapeutic efficacy of standard antimalarial regimens

- Increasing epidemic preparedness and response capacity at the national, district and subdistrict (*upazila*) levels

The malaria control programme currently receives funding from domestic government sources, Health, Nutrition and Population Sector Programme (HNPS), WHO (as a component of the biennial Plan of Action) and, to some extent, from extrabudgetary sources (and sometimes an insignificant amount from other bilateral donors). Under the pool fund of the donor consortium led by the World Bank, HNPS provides funds for an Essential Service Package, from which the malaria control programme receives a proportion to implement activities in the Annual Operation Plan. Problems in the release and utilization of funds are not infrequent. WHO programmes are implemented through government collaboration and the rate of utilization is satisfactory. An application has been submitted to GFATM for inclusion in the fourth funding round for malaria and HIV/AIDS activities.

Achievements and problems

The programme has made substantial progress in expanding early diagnosis and prompt treatment and in promoting insecticide-treated nets in the highly endemic areas. Community participation in insecticide-treated net interventions in partnership with nongovernmental and civil society organizations is encouraging. Field workers, doctors, nurses, village doctors and volunteers have been trained in early diagnosis and treatment. Laboratory services have been expanded and, wherever feasible, dipsticks are being used.

The programme faces financial constraints on the expansion of its activities, particularly in the highly endemic hill and border areas. In remote hill districts, accessibility to treatment and coverage by insecticide-treated nets are low. The marginally poor families cannot afford to buy mosquito nets, even though they need them most. The introduction of Coartem® will greatly increase the cost of treatment. The programme also needs to build a national capacity for epidemic control and effective surveillance.

Selected national strategies and policies for achieving the malaria-related MDGs

- Scaling up of early diagnosis and prompt treatment:
 - expansion of microscopy for malaria diagnosis and rapid diagnostic tests in inaccessible areas;
 - drug supply and logistics;
 - training of all health staff and volunteers; and
 - improving the management of severe malaria in hospitals
- Detection and control of malaria epidemics and deployment of Rapid Response Teams in districts

- Reducing the risk of transmission by promoting insecticide-treated nets through community involvement and partnership with nongovernmental organizations
- Intensive IEC (information, education, communication) for mass awareness building

Institutional and human resource constraints

- Lack of trained personnel
- Inadequate institutional support from any centre of excellence in the country
- Rapid turnover of trained staff (especially in remote, highly endemic areas).
- Lack of coordination with private sector for their contribution in malaria control
- No comprehensive strategic plan as yet for achieving the malaria-related MDGs
- Inadequate linkages with other sectors (health institutions and teaching hospitals at various levels)
- Current surveillance systems do not provide/generate data sufficient for reporting on MDG targets
- Weak national capacity in such areas as health management information systems, computerized data management and geographical information systems for mapping
- Financial constraints (inadequate government budget)
- Except in rare cases, nonparticipation of the private sector

ARABIAN PENINSULA

Current malaria situation

The Arabian Peninsula comprises seven countries, four of which (Bahrain, Kuwait, Qatar and the United Arab Emirates) have been freed from malaria. Nevertheless, these countries are still receptive owing to the continued existence of malaria vectors. Moreover, vulnerability is high due to the massive influx of labour from malaria-endemic countries, mainly from the Indian subcontinent, as well as from some other countries in the Peninsula. The malaria situation in the other three countries is as follows.

OMAN

Oman is embarking on malaria eradication, and the last indigenous case was recorded in 1999. Between 2000 and 2002, only a few (2–6) introduced cases occurred annually in addition to a large number of imported cases (590 in 2002).

Ensuring that local malaria transmission does not return to Oman is not easy, as there is constant illegal entry into the country of the people from endemic countries. The number of cases of people entering illegally from Afghanistan, Bangladesh, the Islamic Republic of Iran and Pakistan en route to the United Arab Emirates has

doubled since 1999. Strengthening epidemiological and entomological surveillance and intensifying vector control in valleys and villages along the routes potentially used by these people are the most feasible intervention.

The malaria eradication programme in Oman was evaluated in 2002 by a team of WHO experts and it proved to be cost-effective.

SAUDI ARABIA

Malaria transmission was interrupted in the eastern, central and northern parts of the country at the beginning of the 1970s, but is still endemic in the south-western part at altitudes below 2000 metres. Its existence is perpetuated there by continuous importation of the disease from Yemen. 10% of the total 21.7 million population of live in malarious areas, half of them is in areas with continuous transmission. The situation has nevertheless, improved considerably over the last 3 years (see Table A2). In 2002, only 1226 autochthonous cases occurred, the majority of which were from Jazan (72%) with a few from Mekka (12%), Aseer (10%) and Jeddah (3%). In addition, 1386 imported cases occurred, 56% of which were from Yemen and 21% from Sudan.

Table A2. Malaria cases in Saudi Arabia, 1998–2002

Year	Total cases	Autochthonous	Imported
1998	40 796	36 139	4 657
1999	13 166	10 099	3 067
2000	6 608	4 736	1 872
2001	3 074	1 614	1 460
2002	2 612	1 226	1 386

YEMEN

Some 60% of the Yemeni population (19.7 million) are estimated to be at high risk of contracting malaria. An estimated three million cases occur annually, mainly due to *P. falciparum*, but only 172 482 cases were reported in 2002 owing to the weakness of the surveillance system. The malaria control programme has been strengthened under RBM support since 1999. An RBM evaluation conducted in 2002 reported that the programme was making a positive impact and that there were promising results in certain areas, mainly Tihama and Scotora Island. Coordination of activities at the border with Saudi Arabia began in 2001, albeit on a limited scale. Yemen's application to the GFATM second round was approved, providing a total of US\$11.8 million over five years, of which US\$ 0.8 million will be delivered in the first year.

Rationale behind freeing the Peninsula from malaria

The eradication programme is cost-effective. The resources to be used on this time-limited activity will be more than offset in the future in terms of a healthy population, a more productive workforce and the resulting positive effect on economic growth in the country. This is in addition to the savings made on diagnosing and treating malaria.

Tremendous population movements are common to almost all countries in the Peninsula, owing to pilgrimage and *Omrah*, as well as business and trade. Thus, eradicating malaria will contribute to future aspirations in terms of industry, trade and tourism.

Other vector-borne diseases such as leishmaniasis, filariasis, Rift Valley fever and dengue can be prevented through the control of adult mosquitoes.

Strengthening the malaria eradication programme will strengthen the health system and ensure a high coverage by primary health care services, good quality laboratories and a quality assurance system, and a strong surveillance system.

As part of preparedness and response to epidemics, epidemiological data on malaria are combined with geographical reconnaissance to give a picture of risk areas. The geographical information system used for malaria will be shared with other disease control programmes in a multisectoral effort.

Freeing the Peninsula from malaria would be an example of collaboration on activities to reach a specific result, and would strengthen capacities in dealing with health matters.

Challenges

- Weak support to the malaria control programmes in Yemen and the endemic areas in Saudi Arabia
- Limited coordination of activities between Yemen and the border areas in Saudi Arabia
- Limited human resources for planning and evaluation of malaria control activities
- Lack of proper collaboration with other relevant sectors, including agriculture, education and the private sector

The way forward

The Arabian Peninsula should be free from malaria. This can be achieved by (a) preventing the re-establishment of malaria transmission in areas freed from it; and (b) interrupting transmission in endemic areas in Saudi Arabia and Yemen. Interruption of transmission would require strong financial and technical support to the programme in Yemen and the endemic areas in Saudi Arabia, as well as coordination of activities in border areas. Preventing the re-establishment of malaria transmission will require epidemiological and entomological surveillance networks and coordinated preventive activities.

PAPERS BY PANELISTS

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INTRODUCTION

Malaria is recognized as one of the major health problems in the world. According to the WHO estimates of 2003, malaria results in the death of 1.2 million people annually. In other words, it is one of the top killers among the infectious diseases, along with lower respiratory infections (3.7 million), AIDS (2.8 million), tuberculosis (1.6 million), and diarrhoeal diseases (1.7 million) .

The number of clinical cases is estimated to be from 300 to 500 million annually. Malaria causes innumerable economic loss. It is one of the major factors of underdevelopment, due to its very wide distribution, debilitating character of acute infection, ability to affect the same person many times during the life span.

In terms of mortality, the main victims of malaria are young children, in terms of morbidity, adolescents and young adults. Malaria in pregnancy seriously harms the unborn baby. If severe malaria is experienced in the childhood, its neurological effect may seriously diminish learning capabilities during the rest of the life. Malaria also causes an economic burden slowing the economic growth of sub-Saharan African countries by an estimated 1.3% per year. Households spend up to US\$ 3.84 per capita per year to treat and prevent malaria. This represents a substantial social impact on households and society.

In fact, human malaria is not a single, but a group of four diseases with very different pathology and public health meaning. About 80% of cases are caused by *Plasmodium falciparum* that is the main killer species. Next in importance is the *P. vivax* infection. Although a self-limiting and non-fatal infection, it produces high morbidity and economic loss, and may be responsible for large-scale epidemics. The importance of the other two species of malaria is, by far, less than of these two.

Malaria is currently confined mostly to the equatorial and tropical zones and a few areas with subtropical climate. However, not a single country in which malaria used to be endemic is immune against its re-introduction.

MALARIA BURDEN IN THE ARAB COUNTRIES

Malaria is estimated to affect 12.5 million people and to result in the deaths of 42,000 persons every year in the Arab countries. 31 % of the total estimated Arab population of 301 million (i.e. about 93.3 million people) live in areas at risk of malaria transmission.

By malaria control status, the Arab countries of the region may be classified as follows:

- Group 1: Countries freed from malaria transmission: Bahrain, Jordan, Kuwait, Lebanon, Libya, Palestine, Qatar, Tunisia and UAE
- Group 2: Countries with residual foci where elimination of malaria is feasible in the near future and sustainable if achieved: Egypt, Morocco, Oman, Syria and Algeria
- Group 3: Countries with low endemicity : Saudi Arabia and Iraq
- *Group 4: Countries with a very serious malaria problem: Djibouti, Somalia, Sudan, Yemen, Comoros and Mauritania.*

Group 1: ARAB COUNTRIES FREE FROM MALARIA

These countries have interrupted malaria transmission. This result has been sustainable and resurgences have been tackled effectively. Malaria transmission has been interrupted on various dates: Palestine: 1965, Jordan: 1970, Qatar: 1970, Libya: 1973, Bahrain: 1979, Tunisia: 1979, Kuwait: no cases since 1979, UAE: no cases since 1998. All these countries have been able to maintain continuously their malaria-free status except Libya. These countries are still receptive due to the existence of malaria vectors. Vulnerability is high particularly in the Gulf countries. It results from the massive importation of labor force coming from malaria endemic countries, mainly from the Indian subcontinent, as well as from some countries in the Arabian peninsula. For example, the United Arab Emirates receive a significant number of malaria cases imported by foreign workers from Southeast Asia, (1796 imported cases in 2003).

These countries are facing some challenges to maintain their free status including: lack of funding, awareness, and preparedness, risk of future outbreaks, insufficient surveillance and response mechanisms. As an example, Libya has recorded outbreaks of presumably locally transmitted cases in recent years. Unfortunately, the origins of these outbreaks remain unclear due to insufficient investigations. The programme is suffering from lack of funds, breakdown of the surveillance system and poor performance of laboratory services in relation to malaria diagnosis.

Priority actions for group 1:

Malaria free countries should have a strategy for prevention of malaria reintroduction including the following:

- To ensure early detection and prompt treatment of every imported case.
- To maintain vigilance and awareness among medical staff.
- To update anti-malarial measures based on latest best evidence and tools as they become available.
- To maintain entomological monitoring.
- To rationalize vector control to minimize receptivity.

- To maintain strong surveillance and vigilance systems.
- To ensure continuing education for health services personnel.
- To maintain malaria awareness among the population with special attention to travelers.
- To respond to any local transmission.

Table 1. Imported malaria cases in malaria free Arab countries

Countries	1999	2000	2001	2002	2003
Bahrain	82	58	54	45	87
Jordan	133	158	124	159	163
Kuwait	349	249	233	222	229
Lebanon	49	44	40	59	62
Libya	23	131	na	16	47
Palestine	2	3	2	1	1
Qatar	243	140	114	138	93
Tunisia	32	47	30	na	na
UAE	na	na	1322	1418	1796

Group 2: COUNTRIES WITH RESIDUAL MALARIA CASES

These countries have achieved a steady decline in malaria over the past decade and are considered to maintain firm control over the disease. These countries comprise Egypt, Morocco, Oman, Syria and Algeria.

EGYPT: Egypt has been taking action against malaria since 1903, when malaria affected one third of the population. From 1942-1946 a severe epidemic wave swept through upper (southern) Egypt, causing 180,000 deaths. By the end of 1945, however, the dangerous malaria vector that had caused this epidemic was eradicated. More recently, in 1994, Egypt experienced a considerable increase in malaria, but efforts were successfully made to improve the situation. No local case has been officially reported in Egypt since 1998. Under the Roll-Back Malaria (RBM) initiative, the absence of recorded cases in 1998 does not necessarily imply that the reservoir of malaria has been exhausted. A sero-epidemiological survey is needed. The surveillance needs improvement, concerning detection of cases imported from abroad, and monitoring the situation of malaria vectors. The notification of malaria should also be reinforced. This could be achieved only if all governmental and private sector health institutions are capable of correctly diagnosing and treating malaria, but this capacity is unfortunately limited. The country expressed political commitment to eliminate malaria, so the programme was reviewed in 2001 and plan of action was developed.

MOROCCO: Morocco nearly achieved total interruption of malaria transmission in 1978 and again from 1981 to 83. Unfortunately success could not be sustained. Since 1999 there has been a clear reduction in transmission and local cases decreased from 17 to zero in 2001. However, an outbreak of 19 local cases occurred in 2002 in one locality in Chefchaouen province. The programme was reviewed and surveillance was strengthened and the situation was brought under control in 2003. This stimulated effective collaboration among representatives from the Ministry of Health, local authorities and communities toward eliminating malaria in Morocco.

OMAN: Until 1991, when a Malaria Eradication Pilot Project was launched, malaria was one of the major health problems of the country. Oman has embarked on a malaria eradication programme where last indigenous case was recorded in 1999. In 2000, only a few introduced cases occurred as a result of importation, while there was a large number of imported cases (736) in 2003. To ensure that local malaria transmission is not re-established in Oman is not easy. As there is a constant illegal entrance of people from malaria endemic countries, the number of cases from people entering illegally from Pakistan, Afghanistan, Bangladesh and Iran – en-route to the United Arab Emirates has doubled since 1999. Strengthening epidemiological and entomological surveillance and intensifying vector control in valleys and villages along the routes potentially used by these people are the priority interventions.

SYRIA: Syria has recorded a markedly downward trend in malaria. Local transmission was interrupted from Idlib, Homs, and then Aleppo and remained only in Hassaka province. Only 6 cases were recorded in 2000. However, it has been observed that the stability of the situation in the northern and north-eastern borders is periodically threatened by epidemics in neighboring areas of Turkey and Iraq. In 2001 an outbreak of 63 local malaria cases occurred in Hassaka province. The programme intensified surveillance activity by active case detection during 2002-3. Only 2 local cases were reported in 2003. The population at risk is estimated to be 250,000, living in 116 villages in Hassaka governorate

ALGERIA: Malaria has been well controlled in Algeria and there is only focal transmission in a small area. The number of reported malaria cases decreased from 701 in 1999 to 307 in 2002. There is no reported malaria mortality in 2002. The main malaria parasite species is vivax and chloroquine is the first line drug for malaria treatment. Elimination of malaria is feasible, as the disease is only existing in a very limited focus.

Table 2: Malaria cases in group 2 countries in the last 5 years

Countries	1999		2000		2001		2002		2003	
	Total	local	Total	local	Total	local	Total	local	Total	Local
Morocco	60	17	59	3	59	0	104	19	73	4
Egypt	61	0	17	0	11	0	10	0	45	0
Oman	901	30	694	6	635	2@	590	6@	740	6
Syria	43	5	42	6	79	63	27	15	24	2

Challenges facing group 2 countries: Consolidation of efforts for malaria elimination and control malaria introduction from abroad and along the borders . The absence of records does not necessarily imply that the reservoir of malaria has been exhausted. The surveillance needs improvement concerning detection of cases imported from the abroad and, monitoring the situation of malaria vectors. Lack of cooperation with the private sector is a major challenge.

Priority actions for group 2:

- To prevent the reintroduction of malaria in malaria-free areas by early detection of cases and effective treatment.
- To mount a strong, time-limited attack on malaria to eliminate transmission whenever it occurs. To strengthen surveillance and vigilance systems.
- To maintain malaria awareness among the population with special attention to travellers.

Group 3 : LOW ENDEMIC COUNTRIES

These are characterized by low endemicity of malaria. The malaria situation is considered either stable or improving. Complete interruption of transmission does seem feasible in the foreseeable future.

IRAQ : After malaria eradication programme started in 1957, the number of cases of malaria dropped from the estimated 1 million in the 1950s to less than 4000 cases per year by the end of 1990s. *P. falciparum* was eradicated whereas transmission of *P. vivax* still continues. Risk areas include rural and urban areas in the northern governorates of Dohouk, Erbil, Sulaimaniyah Kirkuk, and Ninawa below 1,500 meters, but also the southern governorate of Basrah. Primary malaria vectors are: *An. sacharovi*, *An. superpictus* and *An. stephensi*. The breeding of mosquitoes starts in May with a peak in August to October. Iraq experienced a serious malaria outbreak due to *P. vivax* after the Gulf war, with 98,705 cases reported in the country during the peak of the epidemic in 1995. Discontinuation of spraying operations due to shortage of insecticides, disruption of health infrastructures, scarcity of properly trained staff, internal displacement of populations and lack of co-ordination between northern and central/southern governorates, all played a role in the origin and maintenance of this outbreak. Malaria incidence has decreased greatly over the past few years. In 2003, a total of 347 malaria cases were recorded, 313 (90%) occurred in the three northern

governorates (165 in Dhok, 65 in Suleimanyia, and 83 in Erbil). This has been accomplished mainly as a result of widespread indoor residual spraying with insecticides, which is the mainstay of the current malaria control programme in Iraq.

Main constraints: Co-operation between the authorities in Baghdad and those in the north-eastern governorates is insufficient. Insufficient capacities are especially in the north-east and in the field of entomology and vector control.

Priority Actions:

- Capacity-building, and strengthening the control programme, especially in the north-eastern governorates and in its entomological component
- Ensuring availability of supplies of insecticides and spraying equipment for indoor residual spraying campaigns
- Improvement of surveillance and filling the communication gap between the central government and the authorities in the north-east
- Reorientation of the information system and malaria surveillance to achieve elimination of the active foci (introduce active and passive case detection and epidemiological investigation of cases and foci and periodic update of the malariological stratification)
- Ensure quality of the microscopic diagnosis, particularly in the northern governorates
- Establish a system for epidemic preparedness including epidemic warning, early detection and rapid response to malaria epidemic

SAUDI ARABIA: Malaria transmission was interrupted in eastern, central and northern parts of the country at the beginning of the 1970s but it is still endemic in the south-western part at altitudes below 2000m. Out of the total population of 21.7 m, 10% are living in areas under malaria; half of them are in areas with continuous transmission. In 2002, only 1,226 cases occurred locally, majority of which from Jazan (72%) and few cases from Mekka (12%), Aseer (10%) and Jedda (3%). In addition to that 1,386 imported cases occurred through foreign immigrants. Further reduction of cases occurred in 2003, where only 700 local cases occurred. This stimulated the Kingdom to investigate the possibility of achieving elimination of malaria.

Recent analysis of both epidemiological and socio-economic factors related to malaria problem revealed that interaction of them could favourably contribute towards malaria elimination in the Kingdom. The implementation of the strategy necessitates revamping the present malaria control programme and strengthening of the programme in terms of duly trained personnel, other resources and logistics as well as strengthening cooperation and coordination of activities at the borders with Yemen.

Table 3: Malaria cases in group 3 countries

	1999		2000		2001		2002		2003	
	Total	local	Total	local	Total	local	Total	local	total	Local
Saudi Arabia	13166	10099	6608	4736	3074	1614	2612	1226	1724	700
Iraq	4138	most	1860	most	1265	most	952	most	347	most

GROUP 4 : HIGH MALARIA INCIDENCE COUNTRIES

SUDAN: Sudan accounts for more than the estimated 50% of all the malaria cases in the Arab countries – an estimated 7.5 million cases resulting in 35,000 deaths per year. Malaria is Sudan's major health problem and the whole country is considered endemic to varying degrees. The disease accounts for about a fifth of outpatient cases, nearly a third of in-patient cases and a fifth of all hospital deaths. Malaria case fatality rate for paediatric hospitals ranges between 5% and 15%. The whole population of Sudan is virtually at risk of malaria, albeit regionally at different degrees. Malaria in the northern, eastern and western states is mainly hypo- or mesoendemic, with predominately seasonal transmission and epidemic outbreaks. In southern Sudan, malaria is hyper- or holo-endemic, with usually perennial transmission.

Sudan has a history of malaria control activities pre-dating colonial times as far back as the beginning of the 20th century. As early as 1903 there was an aerial mapping of the then town of Khartoum with details of mosquito breeding sites. A volunteer programme of 'mosquito men' was very successful at the time and heightened environmental management, strict sanitary laws and public education on prevention led to the near elimination of malaria in most of the country except southern and central regions. With the establishment of the Blue Nile health project in 1978 (supported by WHO, WB, Kuwait, Japan and USA), malaria was successfully controlled for ten years. In this period, the prevalence of the disease reduced to less than 1% of what it had been. Unfortunately, continuous civil strife in the south associated with massive population movement, coupled with the draught and desertification in 1984–88, expansion of irrigation schemes and poor maintenance of drainage systems have combined to reverse many of Sudan's earlier advancements.

Sudan adopted RBM initiative in 1999. RBM has concentrated its support to strengthen the federal and state malaria control units especially in the priority States (Khartoum, Gezira, White Nile). Several achievements have been recorded in those states.

Sudan already formed the strategic plan for the next 10 years, bearing in mind the objective and elements of the RBM initiatives. The federal malaria control office and three state malaria control units (Khartoum, Gezira, White Nile) were established, the full staffing and functionality. A plan for scaling up use of ITNs has been developed, coupled with proper communication strategy.

Based on high failure rates to CQ and SP, the country changed the drug policy in 2003 adopting artemisinin based combination therapy. Implementation will necessitate availability of financial resources, yet to be availed .

Community mobilization and participation has been successfully stimulated, and a high degree of public awareness of malaria and its control has been achieved in the areas which are now under full operation (Khartoum, Gezira, White Nile States).

Malaria free project in Khartoum and Gezira states is under implementation with promising results so far.

The project for malaria control submitted to the second round of Global funds ATM was approved. However, no funds have been disbursed so far.

Priority Actions:

- To maintain the support to malaria control projects in the three selected states.
- To expand the support to other malaria endemic states.
- To reduce malaria mortality in ten priority states.
- To prevent epidemics in the country as a whole support malaria control in complex emergency situation territories.
- To control malaria in pregnancy by presumptive intermittent treatment.
- To protect high risk groups by insecticide treated materials.

The status of achieving the above targets was reviewed in 2003 and a big gap still exists. A plan to expedite the movement towards achieving those targets was developed for seeking resources from the international donors.

DJIBOUTI: Djibouti experiences malaria epidemics that affect all age groups. During the 1990s, these epidemics occurred almost every year. The constraints are: weak capacity of the programme, insufficient coverage by the country's malaria control programme, and a lack of regular control activities outside the city of Djibouti.

Priority Actions:

- To extend facilities for early diagnosis and prompt treatment of malaria.
- To carry out selective control of mosquito vectors.
- To enhance epidemic preparedness.
- To monitor the therapeutic effectiveness of drugs.

SOMALIA: Somalia is prone to malaria epidemics in the desert and semi-desert areas in the north, where malaria affects all age groups with high fatality during epidemics. The situation in the south varies, but often children, pregnant women and migrants there are severely affected. It is stable and meso-endemic in central and hyper- endemic in the South , severely affecting children, pregnant women and nomads. There is an estimated 2 million case per year. However, reported figures

are much lower due to lack of information system. Malaria control program exists mainly in north- western Somalia (Somaliland). Elsewhere, in some areas, malaria control is carried out through NGOs, often with WHO support, where as in other areas there are no organized control activities.

Priority Actions:

To ensure capacity of the programme in different zones, ensure early detection of epidemics and adequate responses (northern region), to protect high risk groups, namely children and women by providing insecticide treated materials (central and southern regions), to control malaria in pregnancy through intermittent preventive treatments, to improve management of cases and to establish a malaria information system.

YEMEN: Yemen successfully controlled malaria in the 1980's. However, in the 1990's, control over the disease suffered serious setbacks till 2000. Malaria is a top priority health problem in the country – out of a total population of 19 million, about 60% are at risk to malaria, and 162,164 cases were reported in year 2003. However, the estimated cases are 3 million. It is estimated that more than 1% mortality takes place mainly among children below the age of five and pregnant women. The government has demonstrated its commitment to malaria control and interest in revitalising the country's malaria control programme by taking steps to reestablish malaria control units at national and provincial levels. The malaria control programme has been strengthened under WHO support in priority areas. RBM evaluation was conducted in 2002. It found positive impact of the programme and promising results in areas under RBM preview, mainly Tihama areas and Socotra island. Coordination of the activities at the border with Saudi Arabia started in 2001. The country malaria application to the second round of the Global Fund was successfully approved. This progress stimulated the region to foresee malaria free Arabian Peninsula, if stronger support given to Yemen.

Priority Actions:

To reduce mortality and morbidity in the Tihama areas, enhance epidemic preparedness and response, eradicate malaria on Socotra Island, increase availability of insecticide treated materials to high risk populations, to strengthen malaria information systems and to ensure high access to case management.

MAURITANIA : Malaria is endemic in southern part of Mauritania and 58% of population is living in this area. Because of climatic and environmental changes (improvements in pluviometer, the development of oases, dam-building, rice cultivation, population movements) on the one hand, and the inadequacy of specific prevention measures on the other, over 80% of the general population is exposed to malaria, with a risk of epidemics in unstable transmission zones. Transmission season is from July to October and the main parasite species is *P.falciparum*. Between 12 and 36 percent of malaria cases are resistant to choloquine in selected

sentinel sites. Eco- epidemiology of malaria in this area is like the other areas of the sub Sahara in Africa. More than 167 thousand malaria cases were reported in 2002. Total reported malaria death toll is 100. 31% of them were children under five years. Malaria represents an average of 22% of the causes of morbidity and 12% of causes of death at the level of local health authorities in 9 out of the 13 endemic wilayas (provinces).

Priority Actions:

Early detection and appropriate management of malaria cases, malaria prevention in pregnant women; Promotion of use of impregnated mosquito nets in collaboration with the private sector and civil society; strengthening monitoring and evaluation system; strengthening managerial capacity; early detection and effective control of malaria epidemics; operational research on drug efficacy; insecticide resistance; population knowledge attitude and practice.

COMOROS: In 2001, 36% of 3781 reported malaria cases were children under five years. The main parasite species is *P.falciparum*.

Main challenges facing malaria prevention and control programmes in malaria endemic countries (group 4) :

- Lack of trained staff at various level of the programme, particularly for planning and management
- Weak health systems reflected in insufficient health care coverage and limited access to health care facilities, especially in rural areas, lack of laboratory facilities for proper malaria diagnosis
- Weak health information system
- Poor infrastructure and weak capacity of the national malaria control programmes
- Frequent shortages of anti-malarial drugs, especially in the rural areas in high burden countries and use of low quality, ineffective anti-malarial drugs
- Technical problems such as high failure rates to commonly used affordable anti-malarial drugs and resistance of vectors to insecticides in most countries, which necessitate networking for monitoring the susceptibility status of the parasite to drugs and vectors to insecticides
- Complex emergency situation

Table 4 : Reported and estimated Malaria Cases in Group 4 Countries

Countries	Year	Total Reported Cases	Cases confirmed	Cases estimated
Djibouti	2003	5,036	5036	80 000
Somalia	2003	23,349	7571	2 000 000
Sudan	2003	1,827,961 ¹	255,303	7 500 000
Yemen	2003	162,164	50,404	3 000 000
Mauritania	2002	>167,000		
Comoros	2001	3781		

¹ this figure includes 1,196,957 from Sudan and 631004 from Southern Sudan

Table 5: Arab population at risk of malaria

Country	Total population (000) ¹	Population at sporadic transmission risk	Population at continuous transmission risk	Total population at risk	%
Algeria	31,558	NA	NA	17,357	55%
Bahrain	709	0	0	0	0%
Comoros	751	NA	NA	751	100%
Djibouti	693		300	300	43%
Egypt	70,507	4,000	0	4,000	6%
Iraq	24510	3028	8482	11510	47%
Jordan	5,329	326	0	326	6%
Kuwait	2443	0	0	0	0%
Lebanon	3,596	0	0	0	0%
Libya ²	5445	2000	0	2000	37%
Mauritania	2,825	NA	NA	1,639	58%
Morocco	30072	541	0	541	2%
Oman ²	2,768	177	0	177	6%
Palestine	3738	2	0	2	0%
Qatar	601	0	0	0	0%
Saudi Arabia	23520	1188	1114	2302	10%
Somalia	9,480	3,250	6,000	9,250	98%
Sudan	32878	23000	8000	31000	94%
Syria	17,381	253	0	253	1%
Tunisia	9728	0	0	0	0%
UAE	2,937	0	0	0	0%
Yemen	19315	NA	NA	11589	60%
Total	300,784	37,765	23,896	92,996	31%

Roll Back Malaria (RBM) initiative in Arab countries :

In response to emerging and resurgence of malaria in Africa and other parts of the world, RBM was promulgated by the WHO Director-General in May 1998. Its novelty compared with previous efforts to fight malaria is that RBM will work not only through new tools for controlling malaria, but also by strengthening the health services to affected populations. RBM is implemented through partnerships with other

international organisations (UNDP, World Bank and UNICEF), governments in endemic and non-endemic countries, academic institutions, the private sector and non-governmental organisations. All Arab countries adopted the RBM initiative in 1999 and developed strategic plans with the following objectives and strategic directions

Objectives of RBM programme:

- To halve the malaria burden in the countries with severe malaria problem and/or with damaged health systems.
- To decrease the malaria morbidity and mortality, so that it is no longer a public health problem in countries with low/moderate endemicity.
- To eliminate malaria in countries with few residual foci.
- To prevent reintroduction of malaria in malaria-free countries.

RBM strategic directions :

- Human resource development to have competent national cadres to plan and to implement malaria control interventions the next components.
- To strengthen capacity of the programme at all levels.
- To ensure adequate management of cases.
- To provide intermittent presumptive antimalarial treatment in pregnancy where effective.
- To ensure prediction, early detection, and prompt control of malaria epidemics.
- To rationalize integrated vector control measures and scale-up the use of insecticide treated mosquito nets, ensuring that each household has at least one.
- To establish a system of monitoring the impact of interventions and operational indicators.
- To develop the capacity to plan and to implement operational field research and to utilize results in programme intervention.
- To strengthen health systems, especially for referral.
- To strengthen information systems.

POSSIBLE AREAS OF COOPERATION WITH THE ISLAMIC BANK

IDB assistance is highly required to assist its member countries in the Arab region in their efforts to fight malaria, particularly those with high incidence cases. Such assistance is needed for the following:

- Capacity building: Countries are in dire need of resources to build a national cadre of malariologists, entomologist, microscopists to be able to plan, to implement, monitor and to evaluate the malaria control interventions. This might be done through:

- Support upgrading / rehabilitation/establishment of the malaria training and research centers at national and subnational level in priority countries: Sudan, Somalia, Djibouti and Yemen.
 - Fellowships for M.Sc. and PhD students on entomology, parasitology, epidemiology and tropical medicine and focal points in specific subjects such as molecular entomology and parasitology in selected priority countries.
 - Fellowship support to trainees to attend WHO and other organizations' courses on planning and management of malaria control programmes.
 - Financial support to conduct inter-country workshops at the level of districts for selected group of neighbouring countries where language is not a problem
-
- To support the special country initiative for malaria elimination such as malaria free initiative in Khartoum and Gezira, Sudan.
 - To support sub-regional inter-country projects such as - Malaria free North Africa- Malaria free Arabian Peninsula.
 - To support priority country actions in malaria endemic countries mainly for procurement of the needed malaria supplies and equipment, including insecticides, drugs, bed nets, spraying machine, cars, microscopes.
 - To support the activities of the established inter-country network for monitoring drugs resistance and insecticide resistance. A network for the Horn of Africa countries for Monitoring Anti-malarial Treatment (HANMAT) is being established to harmonize country activities for better and more cost effective malaria treatment policy, which can be supported by the IDB. Another network for monitoring insecticide resistance has been established in EMR, which can also be supported by the IDB.

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(Original in English)

I. INTRODUCTION

With over 500 million cases and approximately 2 million deaths announced annually, of which 90% are in Sub-Saharan Africa, malaria constitutes a real public health problem that hampers the economic development of countries where it is endemic.

Malaria constitutes a heavy economic burden in Sub-Saharan Africa in terms of immediate revenue, economic growth and long-term development. Its impact has increased considerably over the last decades after unsuccessful attempts to eradicate it.

Past studies underestimated the economic burden because they failed to take into account the complexity and numerous consequences of the disease. However, the latest studies have highlighted the magnitude of the problem. The negative impact of malaria on the economy of countries in Sub-Saharan Africa (Gallup and Sachs JD, 2001) has been largely demonstrated. Annual losses are estimated at 1.3 percentage points of economic growth. If the losses are aggregated over 15 years, the GNP in the 15th year will decrease by nearly 1/5 (20%) and the losses will increase with the passage of time.

For instance, Sachs estimates malaria related accumulated losses in Senegal from 1980 to 1995 at 2426 million US dollars (in PPP adjusted \$1987). Per capita losses over the same period are estimated at 286 US dollars (in PPP adjusted \$1995). The losses were ultimately estimated at 18% of Senegal's revenue based on the 1995 revenue.

For Sub-Saharan Africa, the losses are estimated at 10% of the 1995 revenues in general.

**Table 1 : Malaria-related estimated economic losses from 1980-1995
in sub-Saharan Africa that are members of the
Islamic Development Bank**

Country	Accumulated losses (in millions of dollars PPP adjusted in comparison to 1987)	Per capita losses in US dollar	Losses in terms of % of 1995 revenue
Benin	1172	214	18%
Burkina Faso	1684	162	18%
Cameroon	4227	318	18%
Chad	995	154	17%
Côte d'Ivoire	4107	294	18%
Gabon	1389	1290	17%
Gambia	251	226	18%
Guinee Bissau	152	142	14%
Mali	1222	125	17%
Mauritania	611	269	15%
Niger	1457	161	17%
Senegal	2426	286	18%
Sierra Leone	366	87	17%
Togo	1166	285	18%
Nigeria	17315	156	17%

Source : Gallup et Sachs (2000)

In the face of this heavy economic burden, cost-effective solutions have been developed over the past few years: effectively taking care of cases with the recent development of therapeutic concoctions based on artemisinin (ACT), Intermittent Preventive Treatment (IPT) for pregnant women, fight against transmission with special emphasis on Insecticide Impregnated Mosquito Nets

The advantage of such measures is that they ensure substantial gain in terms of improved health condition per every dollar spent. It should also be noted that while such measures are implemented, the capacities of stakeholders and training and research institutions must also be strengthened.

IDB member countries in Sub-Saharan Africa are, according to World Bank classification, low-income countries except Gabon. Their capacity to mobilize short-term resources is very limited. So, it is of utmost importance that international institutions assist them in mobilizing required resources so as to effectively combat malaria.

The latest efforts of the international community such as the 1992 Amsterdam resolutions, the 1997 MIM, the launch of the 1998 RBM project, the 2000 Abuja Summit, and the setting up of the Global Fund indicate that the international community is committed to fighting malaria more effectively.

As part of the Millennium Development Goals (MDGs), the malaria burden is expected to diminish by 75% by 2015. The Abuja objectives should be achieved by the end of 2005, i.e. half way of the RBM objectives for 2010, the date set to reduce malaria-related morbidity and mortality by 50%.

II. EPIDEMIOLOGY

The epidemiology of malaria in Sub-Saharan Africa is very heterogeneous. *Plasmodium falciparum*, the most fearful of the parasites that cause malaria, is the most common pathogen. The other major carriers belong to the *Anopheles gambiae* and *Anopheles funestus*.

Malaria is endemic in all the countries and becomes virulent in the height of the season. Various transmission parameters, endemic level and paludal morbidity help to distinguish three major epidemiological facies:

- 1) a Sahelian facies of weaker transmission level during 2 to 3 months in the north of Senegal, Mali, Niger, Chad and Mauritania
- 2) a tropical facies of larger seasonal transmission of 6 months, which is found in the south of Senegal, Mali, Niger, Chad, Benin, Cameroon and Togo, and
- 3) an equatorial facies of all year transmission, which is found in Gabon and Cameroon

In regions with these major facies, secondary facies are found related to geographical particularities or anthropic modifications of an area (urban areas, hydro-agricultural development areas, etc.).

Potentially, endemic areas are those that are subject to major variations of transmission depending on the season of the year (urban and flooded areas, water pools, irrigation).

III. ENVIRONMENTAL ASPECTS

Many factors help the carriers to proliferate, especially climatic conditions and greater rainfall. Stagnant water, floods, hazardous living conditions, hydro-agricultural developments, etc. add to these factors.

IV. THE FIGHT AGAINST MALARIA IN SUB-SAHARAN AFRICA

IV.1 Eradication campaign

During the period (1955-1968), strategies to eradicate malaria were devised to impede the parasite's transmission. One can recall the unsuccessful house-to-house spraying exercises in the 1950s.

When the DDT was invented in 1940s and was used to combat the carrier, most African countries at first launched a large-scale fight against malaria based on the above strategy throughout "pilot zones" between 1953 and 1961. The trend was to

follow the global strategy to fight malaria, which was geared toward its eradication. Because of the failure of such attempts, it was decided to control it, which in the beginning combined the fight against the carrier with massive use of preventive anti-malarial drugs at the national level through a network of ministries other than the ministry of health. Many activities were carried out from 1963 to early 1970s.

After the Alma Ata Declaration on Primary Health Care (PHC) was adopted in 1978, the fight against malaria was incorporated into the PHC system and became a major activity at both the levels of health teams and communities together with a vast dissemination of chloroquine during the rainy season.

Until the late 1980s, the regional committee of the WHO and the World Health Assembly used to adopt resolutions after resolutions. New resolutions were also adopted in the nineties but with greater commitment. Greater interest was also shown in search of solutions to the malaria problem. So new strategies were devised to fight it.

In 1991, the Brazzaville Inter-Regional Conference on the Fight against Malaria ended on a salient note: it proposed a new regional strategy to fight malaria, which was adopted by the Regional Committee in 1992.

IV.2 The Amsterdam Conference and the African Initiative to Fight Malaria

During the world ministerial conference on malaria held in Amsterdam in October 1992, African countries requested the international community to redouble their efforts to address the challenges posed by malaria. The conference adopted the Anti-Malaria Global Strategy, which was adopted by the World Health Assembly.

In 1994, the UN General Assembly adopted a resolution on the preventive action and the intensified fight against malaria in Africa. Two major actions were taken in 1996: resolution WGA49/11 on the prevention and fight against malaria by the World Health Assembly and the inclusion of the anti-malaria campaign in the health components of the UN Special Initiative for Africa.

In a bid to boost the community's role in the fight against malaria, the Regional Committee adopted in 1995 a resolution (AFRC45/R4) on dedicating national days to social awareness about the fight against malaria as it happened in those countries where malaria was endemic. The Committee also requested member countries to ensure that health professionals and communities carry out more actively two major measures to fight malaria, namely to handle cases and to provide individual protection by using insecticide impregnated materials. In addition, the Committee recommended that community-based actions against malaria be taken.

At the regional level, the WHO Africa Office has bolstered its technical support for countries, especially in terms of staff training, planning, implementation, follow-up and appraisal of anti-malaria activities.

The Africa Malaria Initiative for the 21st century (AIM), launched by the Regional Office, is meant to boost collaboration among various stakeholders in the fight against malaria. Its strategies are based, among other things, on strong advocacy for resource mobilization, which is so far inadequate in the fight against malaria in Africa.

In June 1997, during the 33rd ordinary session of the Organisation of African Unity (OAU) held in Harare, the heads of states and governments present on the occasion expressed their firm commitment to the Africa Anti-Malaria Action Plan.

In 1992 and 2000, African countries introduced the Bamako Initiative (BI) as part of the implementation of primary health care policies. The initiative helped to standardize the handling of malaria cases by using flow charts and monitoring activities. Over the same period, the countries concerned worked out National Anti-Malaria Programmes, whose activities were incorporated into national health and social development plans.

IV.3 The accelerated implementation of the anti-malaria campaign and the RBM initiative

In 1997, 21 other African countries benefited from WHO funding to implement an accelerated anti-malaria programme, which was carried out in test health districts. The project was assessed in 1998 and extended to other districts of the countries concerned.

Following the accelerated implementation of the 1997-98 anti-malaria campaign, most countries of the region analysed the situation with a view to introducing the Roll Back Malaria Initiative, jointly launched by the WHO, the World Bank, UNICEF and the UNDP in 1998. The Assembly of heads of states and governments that took place on 25 April 2000 in Abuja was an opportunity for the authorities of various countries to reaffirm their resolve to fight malaria. In order to fight the scourge, five-year strategic plans were drawn up together with the major players of the Roll Back Malaria Initiative.

The Abuja Declaration, signed in April 2000 at the end of the conference, approved a concerted anti-malaria strategy in the whole of Africa. Countries undertook to take the right measures to enhance health systems and set medium-term objectives for 2005. The objectives are to ensure access to treatment and protection for mainly children aged below 5 years and pregnant women.

The specific objectives are to:

- reduce by 30% malaria related mortality among the people in general and among children below 5 years in particular.
- reduce by 50% serious cases of malaria among pregnant women.

The results expected are as follows:

- in accordance with the national policy, at least 60% of potential or confirmed cases of malaria must have access to prompt, adequate and affordable treatment within 24 hours after the appearance of symptoms.
- at least 60% of people at risk, especially pregnant women and children below 5 years, can benefit from the most suitable combination of individual and community protection measures such as insecticide-impregnated mosquito nets and other affordable measures that prevent infection and pain.
- at least 60% of pregnant women, particularly primigravidae, must have access to chemoprophylaxis or to intermittent preventive treatment.

V. PROGRAMME IMPLEMENTATION

Early and adequate handling of cases

Early diagnosis and prompt treatment are the major components of any comprehensive strategy designed to reduce malaria-related mortality. Resistance to malaria treatment, diagnosis-related difficulties and referral problems are major handicaps to a proper handling of cases. Because of increasing resistance to chloroquine in Sub-Saharan Africa, it is important to use other therapeutic strategies. In this regard, the use of concoctions with artemisinin derivatives is the best alternative that can help to reduce promptly and durably the effects of malaria among African peoples. We believe that the peoples should have an effective anti-malaria medicine and that malaria-endemic countries would willingly accept effective treatments if financial resources are available.

Other technical support measures to the policy on malaria cases are:

- supply of medicines and essential kits
- capacity building (training, supervision, management)
- epidemiological observation
- operational research
- community-based measures

Prevention

Malaria prevention is based on chemoprophylaxis for pregnant women and individual and collective protection measures against insect bites.

The parasite's resistance to anti-malaria drugs reduces the effectiveness of chloroquine chemoprophylaxis. Thus, the chemo-prevention approach through intermittent presumptive treatment (IPT) with Sulfadoxine - Pyrimethamin (SP) for pregnant women during prenatal consultations (PNC) is being promoted in many African countries.

Promoting the use of insecticide-impregnated items and all other measures to reduce man-carrier contacts, such a better environment form the basis of the fight against malaria carriers in Africa. The cost of mosquito nets and impregnated products is the major factor that hampers the peoples' access to such items. On the other hand, changing the environment to fight the carrier generally requires huge and expensive civil engineering operations.

Greater access to effective treatment, adequate supply of impregnated mosquito nets and chemo-prevention for pregnant women would have a real impact on reducing the transmission of malaria among the population.

Epidemics control

The anti-malaria national programmes have devised a set of mechanisms to forecast, prevent and to fight malaria epidemics. They include surveillance of river banks warning systems, rainfall and temperature data collection by weather forecast departments. Poor access and deaths are also monitored and announced weekly by peripheral centres situated in high-risk areas.

Follow-up appraisal

The implementation of strategies to fight malaria is assessed through various methods: the classical monitoring system at health facilities and activities and investigations conducted regularly. Data collected shed light on how programmes perform and help to reformulate strategies if the need arises.

Institutional support

The implementation of anti-malaria national programmes is supported by regional and sub-regional networks for (1) manage the anti-malaria campaign, (2) treatment, (3) malaria prevention during pregnancy, (4) monitoring of carrier resistance to insecticides and (5) alert reaction to malaria epidemics in the Sahel.

The networks set up to manage the anti-malaria campaign in West and Central Africa bring together the various partners of the Roll Back Malaria initiative (RBM).

The West African Networks for Malaria Treatment Monitoring (WANMTN 1 and 2) were set up in Dakar in 2002 and Ouagadougou in 2003 respectively and that of Central Africa (CANMTN) in 2002 in Cameroon, Chad and Gabon. Research conducted by various network teams has helped to monitor regularly the effectiveness of anti-malaria medicines and measures and to propose actions that would reduce resistance and find alternative solutions. 8 countries have already reviewed therapy policy, while the others have started the process.

The West African Sub-regional Network for Malaria Prevention during Pregnancy (WANMPP), which is composed of Anti-Malaria National Programmes, reproductive health services, research institutes and partners was set up in 2003. The network encouraged the studies on the effectiveness and tolerance of Sulfadoxine-

Pyrimethamin in Intermittent Preventive Treatment and promoted the strategy in the country.

The network for monitoring carrier resistance to insecticides, which was set up in 2000, brings together all research institutions in the African region. It is divided into smaller networks in each epidemiological bloc (West Africa, Central Africa, East Africa, the Great Lakes Region and Southern Africa). The network updated the sensitivity card of the carriers to insecticides, draw up generic directives of how to manage resistance and to provide support for national capacity building to monitor resistance.

Malaria Alert and Reaction to Epidemics (MARES) brings together 8 Sahelian countries. It coordinates the monitoring of risk factors and capacity building to fight malaria epidemics.

The various networks serve as places where information is exchanged between countries to standardize drug policies, handling of malaria cases, chemo-prevention, managing the use of insecticides and epidemics risks. They also coordinate and strengthen collaboration with teams from the North in terms of research. Because of national consensus meetings, new policies were adopted through therapy combinations and IPT for prevention during pregnancy. The WHO, the Malaria Consortium, the Gates Malaria Partnership, the USAID, UNICEF and other NGOs support the networks at various levels.

Operational research

Operational research is a major component of the strategies devised to fight malaria. National programmes collaborate with research centres in the various countries. The findings of research papers have helped many countries to update their malaria therapy and prevention policy.

Issues such as those related to pharmacovigilance, diagnosis capacity building, quality control, conduct of clinical tests and vaccine research will be taken into account by research centres. There are malaria research and training centres in Mali, the Gambia and Burkina Faso. Senegal, as coordinator of one of the malaria treatment monitoring networks, plans to establish a research and training centre at Dakar University. Ph.D training programmes on malaria have already started and the various countries of the sub-region can make use of the centre's facilities.

CONCLUSIONS

- In Sub-Saharan Africa, the main cause of death among children below 5 years is malaria; pregnant women and other vulnerable groups are greatly affected.
- Malaria epidemiology went through significant changes in recent years due to environmental factors that have made the campaign against it more

complex. The resistance of the parasites and the carriers are some of the many challenges that the countries concerned have to face.

- Attempts have been made at both national and international levels, but in order to attain the malaria-related Millennium Development Goals (MDGs), measures have to be taken rapidly.
- The lack of funding for the efforts to attain the set goals is a major constraint. So, global actions must be taken in favour of Sub-Saharan Africa, the most affected region and where malaria increases poverty.
- Countries have made requests to the Global Fund for the Fight against HIV/AIDS, tuberculosis and malaria, and consequently some of them have received funding.
- Since short-term resource mobilization capacity is limited, it is very important that international institutions help countries in Sub-Saharan Africa to mobilize substantial resources that would have a huge impact on malaria.

Table 2 : Estimation of Drug Needs of The Child Target Group of Below 5 Years Old

Statistical Data Population Data		Number of cases expected among children below five years			Cost of treatment with ACTs
		Population children < 5 ans	Malaria cases	Number of treatments	1, 2 US\$ per treatment
Pays	Total Pop. (in 2002)	20% total pop	3 weak episodes/ year		
Benin	6 752 569	1 350 514	4 051 542	4 051 542	4 861 850
Burkina Faso	12 251 743	2 450 349	7 351 047	7 351 047	8 821 256
Cameroon	15 589 000	3 117 800	9 353 400	9 353 400	11 224 080
Comoros	749 000	149 800	449 400	449 400	539 280
Côte d'Ivoire	16 761 345	3 352 269	10 056 807	10 056 807	12 068 168
Gabon	1 291 764	258 353	775 059	775 059	930 071
The Gambia	1 372 172	274 434	823 302	823 302	987 962
Guinea	8 436 910	1 687 382	5 062 146	5 062 146	6 074 575
Guinea Bissau	1 257 488	251 498	754 494	754 494	905 393
Mali	12 021 240	2 404 248	7 212 744	7 212 744	8 655 293
Mauritania	2 825 103	565 021	1 695 063	1 695 063	2 034 076
Niger	11 632 676	2 326 535	6 979 605	6 979 605	8 375 526
Senegal	9 946 280	1 989 256	5 967 768	5 967 768	7 161 322
Sierra Leone	4 814 053	962 811	2 888 433	2 888 433	3 466 120
Chad	8 376 571	1 675 314	5 025 942	5 025 942	6 031 130
Togo	4 780 339	956 068	2 868 204	2 868 204	3 441 845
Total	101 792 457	23 771 652	71 314 956	71 314 956	85 577 947USD

NB : On average there are three weak episodes per child per year

**Table 3 : Estimations of the Number of Tests That can be Conducted
Rapidly Depending on the Number of Cases Assumed**

Country	Number of cases and tests to schedule		
	Total number of cases assumed	Number of tests	0.5 US\$ per test/ episodes
Benin	4 051 542	4 051 542	2.025.771
Burkina Faso	7 351 047	7 351 047	3.675 523,5
Cameroon	9 353 400	9 353 400	4.676.700
Comoros	449 400	449 400	224 700
Côte d'Ivoire	10 056 807	10 056 807	5 028 403,5
Gabon	775 059	775 059	387 529, 5
The Gambia	823 302	823 302	411 651
Guinea	5 062 146	5 062 146	2 531 073
Guinea Bissau	754 494	754 494	377 247
Mali	7 212 744	7 212 744	3 606 372
Mauritania	1 695 063	1 695 063	847 531,5
Niger	6 979 605	6 979 605	3 489 802,5
Senegal	5 967 768	5 967 768	2 983 884
Sierra Leone	2 888 433	2 888 433	1 444 216,5
Chad	5 025 942	5 025 942	2 512 971
Togo	2 868 204	2 868 204	1 434 102
Total	71 314 956	71 314 956	35 657 478 USD

**Table 4 : Insecticide Impregnated Mosquito Nets Needed for Children Below
Five Years Old and Pregnant Women**

country	Number			Mosquito net coverage		Besoins		
	Population	< 5 years (20%)	P.W. (5%)	< 5 years (%)	P. W. (%)	< 5 years	P.W.	Total
Benin	6.752.569	1.350.513	337.628	23	37	1.040.000	210.000	1.250.000
Burkina Faso	12.251.743	2.450.348	612.587	22	22	1.911.000	478.000	2.389.000
Cameroon	15.589.000	3.117.800	779.450	40	40	1.871.000	2.339.000	4.210.000
Chad	8.376.571	1.675.314	418.828	57	53	721.000	197.000	918.000
Comoros	749.000	149.800	37.450	50	57	75.000	16.000	91.000
Côte d'Ivoire	16.761.345	3.352.269	830.067	17	24	2.783.000	631.000	3.414.000
Gabon	1.291.764	258.352	64.588	20	20	207.000	52.000	259.000
The Gambia	1.372.172	274.434	68.608	62	61	105.000	27.000	132.000
Guinea	8.436.910	1.687.382	421.845	27	25	1.232.000	317.000	1.549.000
Guinea Bissau	1.257.488	251.497	62.874	57	61	108.400	24.600	133.000
Mali	12.021.240	2.405.648	601.062	53	50	1.131.000	301.000	1.432.000
Mauritania	2.825.103	565.020	141.255	41	52	334.000	68.000	402.000
Niger	11.632.676	2.326.535	581.634	67	61	768.000	227.000	995.000
Senegal	9.946.280	1.989.256	497.314	30	30	1.393.000	349.000	1.742.000
Sierra Leone	4.814.053	962.810	240.702	20	20	771.000	193.000	964.000
Togo	4.780.339	956.067	239.003	23	26	737.000	177.000	914.000
Total	118.858.253	23.773.045	5.934.895					

Table 5 : Estimation of Sulfadoxine – Pyriméthamine (SP) Needed for TPI

Country	Population	Pregnant Women (5%)	Tablets needed de SP for 1 year*
Benin	6.752.569	337.628	2.026.000
Burkina Faso	12.251.743	612.587	3.676.000
Cameroon	15.589.000	779.450	4.677.000
Chad	8.376.571	418.828	2.513.000
Comoros	749.000	37.450	225.000
Côte d'Ivoire	16.761.345	830.067	4.981.000
Gabon	1.291.764	64.588	387.600
The Gambia	1.372.172	68.608	412.000
Guinea	8.436.910	421.845	2.540.000
Guinea Bissau	1.257.488	62.874	378.000
Mali	12.021.240	601.062	3.607.000
Mauritanie	2.825.103	141.255	848.000
Niger	11.632.676	581.634	3.490.000
Senegal	9.946.280	497.314	2.984.000
Sierra Leone	4.814.053	240.702	1.445.000
Togo	4.780.339	239.003	1.435.000
Total	118.858.253	5.934.895	31.141.000

3 tablets of SP per dose of TPI and 2 doses per P.W. i.e. 6 tablets of SP at the price of 0.0182 \$ / tablet, the total cost of SP for TPI is 566.766.2 US \$.

Table 6 : Estimation of SP needed for TPI and for Insecticide Impregnated Mosquito Nets

Country	Population	< 5 years	Pregnant women (P.W.)	Mosquito net coverage*		Needs	
				< 5 years	P. W.	Mil	Tablets of SP for 1 year*
Benin	6.752.569	1.350.513	337.628	310.600	124.900	1.250.000	2.026.000
Burkina Faso	12.251.743	2.450.348	612.587	539.076	134.769	2.389.000	3.676.000
Cameroon	15.589.000	3.117.800	779.450	1.871.000	468.000	4.210.000	4.677.000
Chad	8.376.571	1.675.314	418.828	954.929	221.979	918.000	2.513.000
Comoros	749.000	149.800	37.450	74.900	21.345	91.000	225.000
Côte d'Ivoire	16.761.345	3.352.269	830.067	569.885	199.216	3.414.000	4.981.000
Gabon	1.291.764	258.352	64.588	206.682	51.671	259.000	387.600
The Gambia	1.372.172	274.434	68.608	170.150	41.850	132.000	412.000
Guinea	8.436.910	1.687.382	421.845	455.593	105.461	1.549.000	2.540.000
Guinea Bissau	1.257.488	251.497	62.874	143.353	38.353	133.000	378.000
Mali	12.021.240	2.405.648	601.062	1.274.993	300.531	1.432.000	3.607.000
Mauritania	2.825.103	565.020	141.255	231.658	73.452	402.000	848.000
Niger	11.632.676	2.326.535	581.634	1.558.778	354.796	995.000	3.490.000
Senegal	9.946.280	1.989.256	497.314	1.392.680	348.120	1.742.000	2.984.000
Sierra Leone	4.814.053	962.810	240.702	770.248	192.562	963.000	1.445.000
Togo	4.780.339	956.067	239.003	219.805	62.140	964.000	1.435.000
Total	118.858.253	23.773.045	5.934.895	10.744.330	2.739.145	20.843.000	35.624.600

Approximately 13 500 000 mosquito nets are currently used by children below 5 years and pregnant women.

At least (2) USD on average for two impregnations of each mosquito net per annum i.e. 27000 000 USD.

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(Original in English)

1. INTRODUCTION

People of the world's poor communities face many threats to their health and well-being. About 40% of the world's population is at risk of malaria and the disease is a particular burden for the poorest countries. There are as many as 500 million cases of malaria in the world each year and around one million deaths- one child dying every 30 seconds. The risk of malaria is a threat to the economic development of the communities and nations. Malaria predominantly affects children, women and population who belong to the lower socio-economic groups. Communities inhabiting closer to forests, dams, irrigation channels and water bodies and those living in mosquito infested urban areas have higher risk of malaria. Malaria has been increasing also due to increased mosquitogenic conditions produced by the developmental projects. In many parts of the world, it has now emerged as one of the most important public health challenges that calls for effective, comprehensive and integrated multisectoral action for control.

There are a number of issues and challenges responsible for the persistence of the problem of malaria in many countries, most of them are related to: weaknesses of existing health care delivery system; technical shortcomings in the control efforts; inadequate advocacy and commitment; shortage of drugs, diagnostics and logistical supplies; financial constraints and prevailing socio-economic conditions. A lot of malaria cases are out of reach by health services due to the poor capacity of the health system with poor access to diagnosis and treatment. Consequently, a large proportion of suspected cases are treated by the private sector or NGOs having little or no training and are not covered by existing information system. Even though the health systems are established, the responsiveness of the health system is poor. Community participation and mobilization are inadequate. The technical know-how has not been demystified to bring the program to the communities. Even though multi-drug resistance is emerging as a major concern in many countries, and monitoring of therapeutic efficacy of antimalarials has been established, the information is not used to review the national drug policies. Spurious, counterfeit and substandard drugs are common. This problem is exaggerated in the border areas. Also, the way drugs are packaged and dispensed leads to poor compliance. Unplanned developmental projects and unprecedented urban migration, and cross-border spread are common. Natural disasters and emergencies with breakdown of health infrastructure are not infrequent. Moreover, conflict and civil unrest has exacerbated malaria in many countries due to displacement of population in large

numbers and in many situations, health services are scarce for people who need it most, particularly those who live in remote and border areas.

However, it is heartening to note that recent efforts to combat malaria has gained momentum through i) allocation of US\$ 20 million by WHO for accelerated malaria control in 34 African countries (1997-98); ii) Declaration on malaria by the heads of states of the organization of African Unity and the establishment of African Initiative for Malaria Control in 1997; iii) mobilization of the research community in the Multilateral Initiative on Malaria; iv) the G-8 summit in 1998 in Birmingham asking for higher commitment for malaria control, particularly in Africa and v) the Roll Back Malaria of WHO in 1998. The World Health Assembly in 1990 expressed concern for the resurgence of malaria and based on this the Ministerial Conference in Amsterdam, the Netherlands formulated the Global Malaria Control Strategy (GMCS) in 1992 which has now been adopted in many countries for benefit.

The Islamic Development Bank till the end of 1424H has financed 158 projects in the health sector. These projects amounted to ID 797 million (US\$ 1,044 million). Of this amount, 28% was allocated to the least developed member countries of the Bank (LDMCs) and most of the IDB financing has been in public healthcare sector (94%). IDB financing in the health sector witnessed substantial increase over the past several years. For example, the last 5 years alone (ie.1420H-1424H) have accounted for 50% of the sector's cumulative funding. A total of 20% of the IDB financing in the health sector is for projects of preventive nature, while curative care accounted for nearly 80%. Currently, the IDB is also supporting a vaccine production programme with the objective of promoting production of affordable quality vaccines and ensuring reliable supplies of such vaccine in its member countries. The bank puts emphasis on providing support to the member countries and keeping them in attaining the Health Millennium Development Goals (MDG).

2. INCIDENCE OF MALARIA IN THE ASIAN (NON-ARAB) IDB MEMBER COUNTRIES

During the last 10 years there has been no perceptible decline in the problem of malaria in the countries of Asian region. The disease is a major cause of poverty due to decreasing productivity and high treatment costs. The problem of *P. falciparum* malaria is expanding and many countries are now becoming an epicenter for spread of multi-drug resistance. There are focal epidemics of malaria as a result of ecological changes and population migration. Transmission potentials are increased largely due to increased population movement resulting from enhanced trade and easier and faster travel. The resources to combat malaria are inadequate and, hence, efforts to control malaria are often fragmented and achievements gained cannot be sustained. The capacity at the country level is limited and in many cases, the existing malaria control efforts have not been mainstreamed, so that community participation

is ensured and the private sector can play their pivotal role. The table below gives an overview of malaria cases in the listed IDB member countries (during 2000-2002).

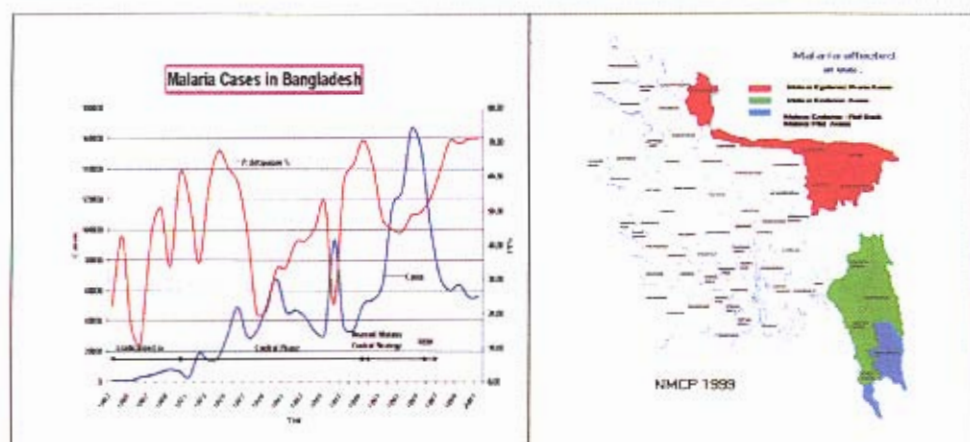
Malaria cases (2000-2002) from IDB Member Countries- Asian Region

Sl. #	Country	Population (000)	Pop. at Risk (000)	Malaria cases 2000	2001	2002
Countries with no malaria transmission but imported cases and countries with small foci (aiming elimination)						
1.	Brunei Darussalam	350	0	-	-	-
2.	Maldives	270	0	0	0	19
3.	Kazakhstan	14,800		37	31	20
Countries with low malaria incidence (and <i>P. vivax</i> infections only)						
4.	Azerbaijan	8,100		1525	1057	505
5.	Kyrgyz Republic	5,000		12	28	2743
6.	Turkey	66,200		11432	10812	10224
7.	Turkmenistan	5,300		24	8	15
Countries with moderate malaria incidence						
8.	Iran	64,700		13,419	12,294	9,122
9.	Malaysia	23,800	6,180	12,705	12,000	11,053
Countries with heavy burden of malaria						
10.	Bangladesh	133,400	111,638	55,599	55,546	55,646
11.	Indonesia	213,600	149,720	101,185	200,544	64,708
12.	Pakistan	141,500		82,526	79,437	101,761
13.	Tajikistan	6,200		19064	11387	6160

2.1. Azerbaijan: Malaria was endemic over vast portion of the country's territory until 1960s. During malaria eradication, a number of cases came down to as low as just three indigenous cases were reported in 1967. Resurgence started through two reported epidemics in 1970s and 1980s and situation deteriorated during 1990s. Number of reported malaria cases increased up to 13,135 in 1996. Main reasons were worsening of socio-economic conditions, population migration and displacement of large population due to armed conflicts. From 1997 onward, as a result of large-scale epidemic control interventions, the country was able to curb down transmission and just 505 autochthonous cases were reported in 2002. The principal malaria vectors are: *An. Sacharovi*, *An. Maculopennis*, and *An. Subalpinus*. Only *P. vivax* is transmitted.

2.2 Bangladesh: The country has a population of 130 million. 111.6 million of them are at malaria risk and 14.7 million people live in the 13 high endemic districts (of total 64 districts in the country). These 13 districts contribute 95% of the total annual cases of malaria. The Annual Parasitic Incidence (API) is 4.2 (2002) in the high endemic districts. An estimated 1.0 million clinical cases are treated every year while 55,646 laboratory-confirmed cases were reported during 2002. During 2002 and 2003, a total of 598 and 577 deaths were reported respectively. *P. falciparum* is the predominant infection (70%) and *An. dirus* is the principal vector. The program envisages achieving a 50% reduction of incidence of cases and deaths

due to malaria by the year 2015. Expansion of EDPT to increase access to treatment, and scaling up ITN to achieve good coverage in high-risk population in the remote areas remain a big challenge. To meet the drug resistance problem for *P. falciparum* malaria, the control programme is trying to introduce Artemisinin Combination Therapy (ACT) as early as possible.



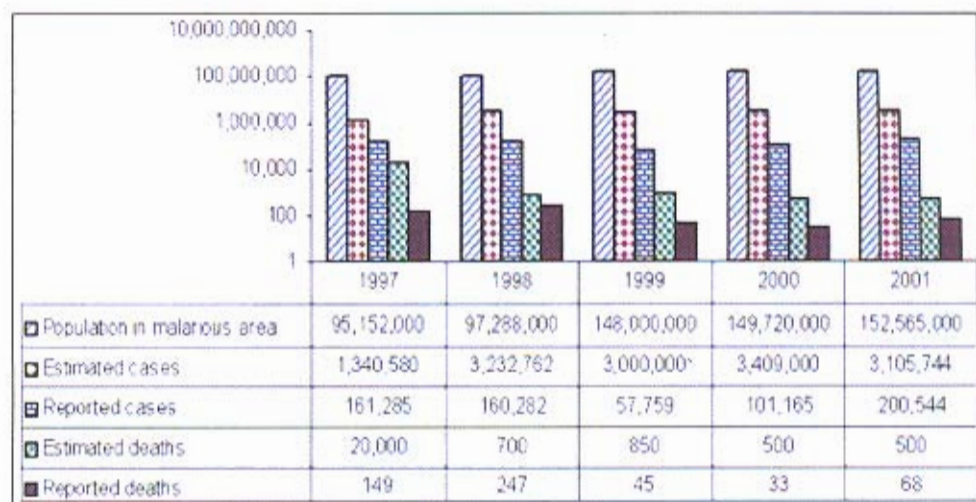
Malaria cases in Bangladesh

Malaria High Endemic Districts

2.3. Brunei Darussalam: The country is free from almost all communicable diseases. Malaria is not a problem except that of imported cases if any. But the surveillance for imported cases need to be strengthened and continued to keep the country free from malaria.

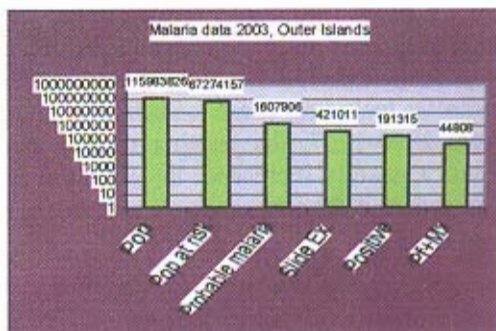
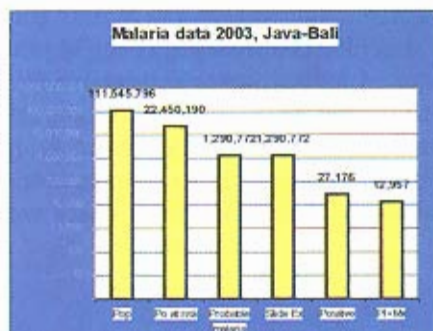
2.4. Indonesia: Malaria incidence has been increasing for the last five years. Around 3.5 million malaria cases have been reported through the national health information system and there is considerable underreporting in the country. Based on the estimation of National Household Survey 2000, about 20 million clinical cases, with 35,000 deaths, occur annually. More than 15% of *P. falciparum* cases are children under five years old. Five provinces, including Papua, North Maluku, Maluku and East Nusatenggara are the most endemic areas. The deteriorating situation may be due to the increasing mobile population, widespread drug resistance, neglect of environmental management during development in the rural areas, a diminishing awareness of malaria in the communities, and/or lack of resources due to the economic crisis in the country. The country adopted Roll Back Malaria strategy in 2000, aiming to cut malaria morbidity by 50% by 2005. The national malaria control programme is intensifying its malaria control by strengthening district level management and through building linkages and partnerships.

In 1998, there were malaria outbreaks in the highlands of Irian Jaya, and resurgence in Central Java.



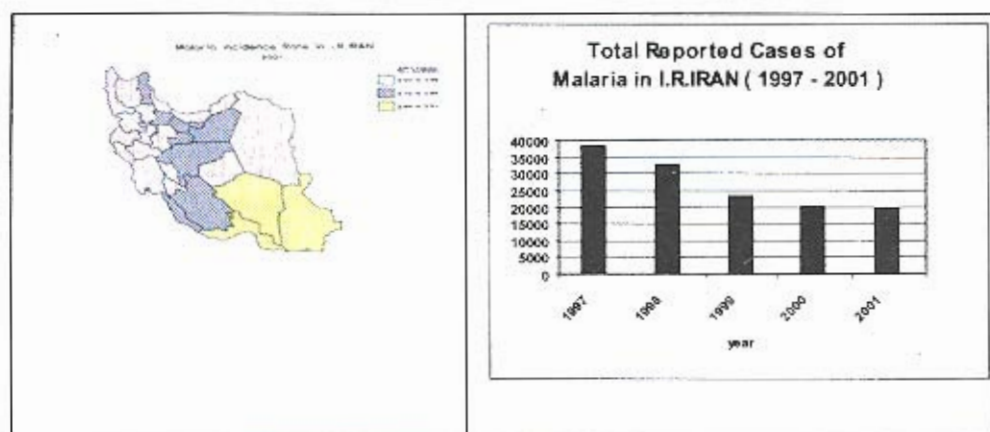
Three pilot districts have been selected for the implementation of RBM i.e. Cilacap (Central Jawa Province), West Lombok (West Nusa Tenggara Province) and Bintan Island (Riau Province).. The criteria used were: high case incidence and preponderance of *P.falciparum*. RBM has been given name "Gebrak" in Indonesia.

Malaria in 2003 in the Java –Bali and Outer islands are shown in the charts below



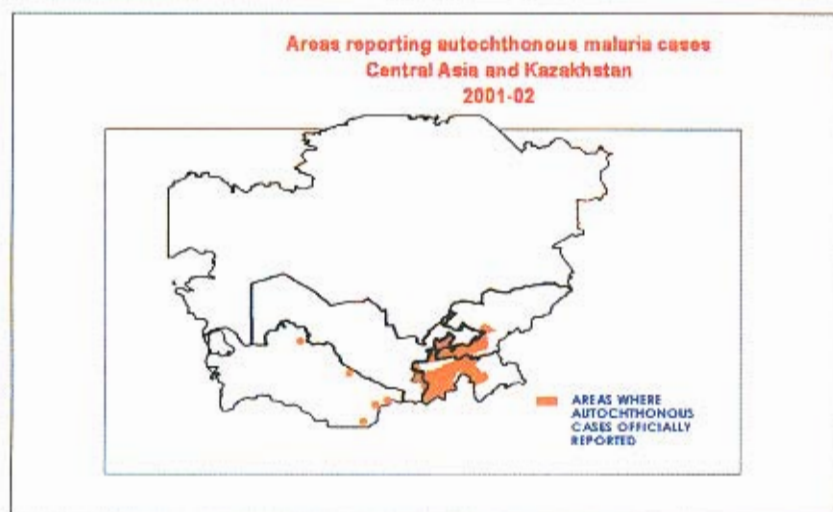
2.5. Islamic Republic of Iran: A total of 19,303 cases were reported in 2001 in Iran. The ratio of Iranian vs. non-Iranian of the malaria-affected population was 44:56. The *P. vivax* infection is about 90% as against 10% of *P.falciparum* infection. The highest number of cases is from south-eastern provinces, including Sistan & Baluchistan, Hormozgan and Kerman. During 2001, out of 19,303 cases, a total of

12,557 cases were imported. Area distribution as per API and Case Incidence of malaria are shown in map and chart below:



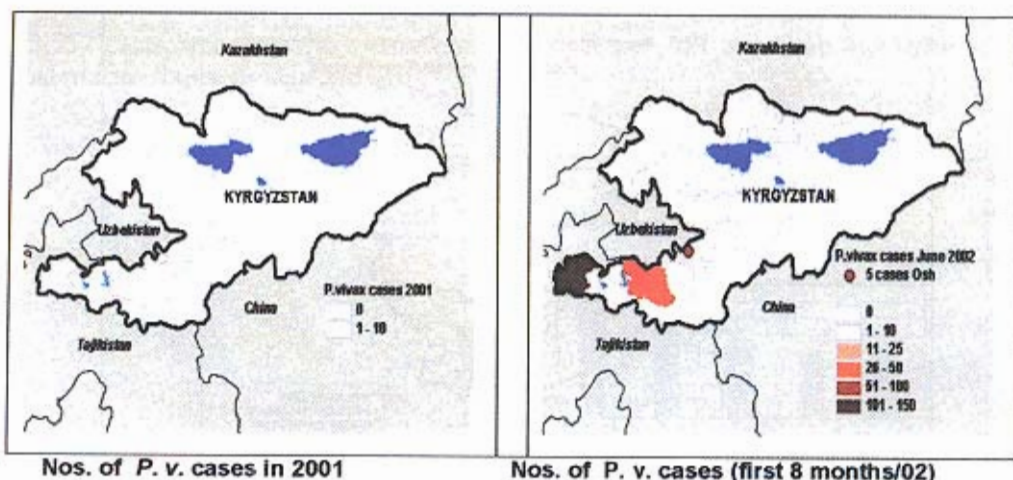
National Strategic Plan on Malaria Control has commenced since December 2001, using a new planning approach and through evidence-based decisions and use of multiple prevention approach. Major activities include: Rapid/early detection of cases and immediate and complete treatment; updating the knowledge and skill of malaria staff and raising their motivation through an incentive scheme; malaria vector control; health education campaign for community awareness and attention to population movement (especially the immigrants).

2.6. Kazakhstan: Malaria was eradicated in Kazakhstan in 1967, and only imported cases were reported in the country in 1968. The situation changed at the beginning of the 1990s, when Kazakhstan acquired independence and international contacts, including those with malaria endemic countries, expanded considerably. From 1990-1997, the number of imported malaria cases to be registered in the country steadily increased. In 1992, the first case of malaria by local transmission was reported. The number of such cases peaked in 2000, when seven cases were registered.



In 2001, two malaria cases were acquired through local transmission, while in 2002, no such cases were reported in the country. Despite these positive trends, the ecological and climatic conditions within most regions of the country lead to a high risk towards the resurgence of malaria transmission following its importation, and surveillance is an essential component of maintaining the present-day situation.

2.7. Kyrgyz Republic: Malaria was eradicated in Kyrgyz Republic in 1959; however, from 1986 onwards, as a result of the importation of malaria by military personnel returning from Afghanistan, a few local cases were registered annually. In 1986 and 1987, 14 and 10 autochthonous malaria cases were respectively detected. In 1988, total 21 cases due to local transmission were registered. Of these, 11 cases occurred in the Batken district, an area bordering Tajikistan and Uzbekistan. In 2002, the malaria situation deteriorated sharply when an outbreak of malaria occurred in the southwestern area of the country bordering Uzbekistan, and a total of 2267 autochthonous malaria (*P. vivax*) cases were registered. In 2001, the total number of cases reported was 15.



There was an outbreak of malaria occurred in Kyrgyz Republic in 2002. Total 22 cases were reported and just one district was affected. The epidemic assumed greater proportions, as it spread across the western part of the country, and the number had increased to 311 (number of affected districts were 5). One month later, the number had increased to 910, and malaria cases were reported from 13 districts and 2 towns. By the end of September, a total of 2,267 cases of *P. vivax* had been reported, affecting 14 districts and 6 towns. The explosive resumption of malaria transmission in Kyrgyz Republic is a result of immigration of a number of infected people from Tajikistan into the Batken district (an area bordering Tajikistan). Malaria is currently resurging in areas bordering with Uzbekistan, and a further spread of malaria across the country is anticipated. The government of Kyrgyz Republic has committed itself to tackle the present malaria situation, and has asked foreign missions in the country to support the national malaria control programme to tackle the explosive epidemic. The WHO Regional Office for Europe, the United States Agency for International Development (USAID), Centers for Disease Control and Prevention (CDC), and the government of Turkey have provided technical and financial assistance in order to contain further spread of malaria.

2.8. Malaysia: During the 1950s, the government supported a malaria control project that quickly evolved into a large-scale eradication programme. Its successful implementation resulted in the disappearance of the disease from most of Peninsular Malaysia, with the exception of ethnic minority groups in the central thinly populated forested areas. During the 1970s, the programme reverted to an emphasis on control. Malaria remains an important public health issue in remote areas of Malaysia. Approximately 70% of cases occur in Sabah, where chloroquine resistance is emerging as a major problem. In the peninsula, infection rates are the highest among the aboriginal *Orang Asli* minority group and soldiers. Illegal land

scheme workers, often foreigners, also exhibit higher infection rates. At highest risk are forest workers (loggers, rattan collectors and forest product gatherers), followed by plantation workers and other aboriginal communities.

An. Maculates, *An. leucosphyrus* and *An. Donaldi* are main vectors. Malaria programmes actively promote community participation, with insecticide-treated nets being the tool of choice for prevention. Volunteer workers in Sabah have been trained to take blood films, to dispense antimalarial drugs, and to promote ITN use; this has been associated with an improvement in the situation in recent years. Chloroquine-resistance was reported in peninsular Malaysia as early as in 1963. It is of great interest that malaria mortality remains low in Malaysia despite high levels of resistance, the maintenance of a conservative treatment policy, and the strict regulation of the private sector, making it very difficult to obtain alternative treatment. What sets Malaysia apart from many other countries is the quality and coverage of the basic health services.

Summary of 2002 Reported Malaria Data: Malaysia

Indicator	2002 Data
Population at risk for malaria	6 180 939
Confirmed malaria cases	11 053
Incidence rate per 1000 population	0.5
<i>P. falciparum</i> cases	5 461
Malaria deaths	38
Probable malaria cases	293
Severe malaria cases	2 364
Proportion of risk population protected by ITNs	7%

There has been a decrease in confirmed cases since 1996, from 51,900 in 1996 to 26,600 in 1997 and to 13,500 in 1998 (bar chart below). There were 12,705 confirmed cases in 2000. Malaria deaths have remained relatively stable over the 1992-2000 period (23 - 40 deaths annually).

**Confirmed Cases in Malaysia,
1992 to 2002**

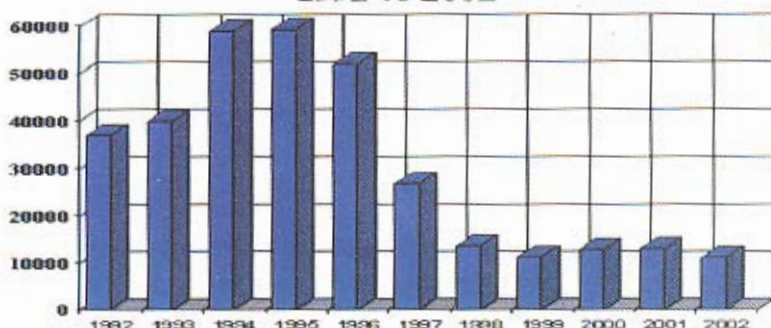
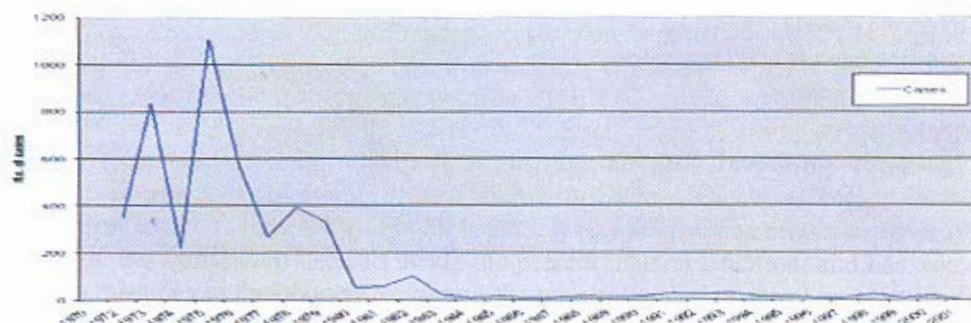
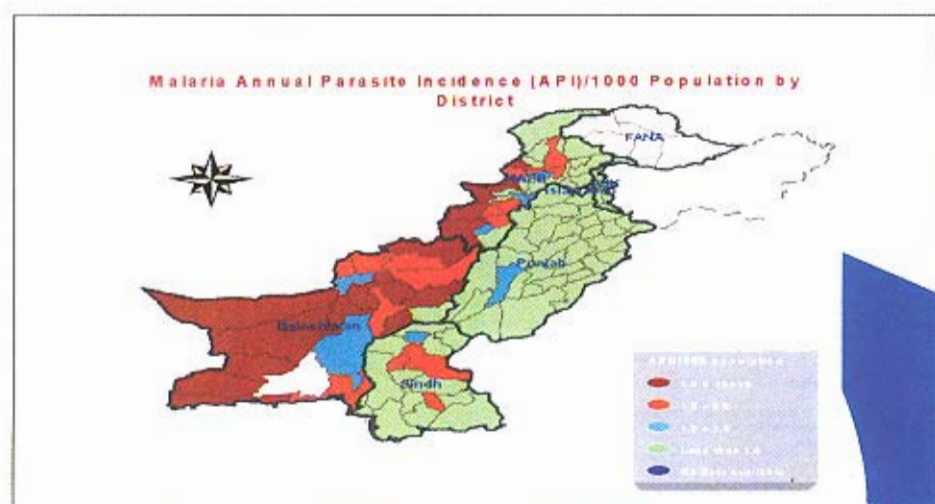


Figure 1

2.9. Maldives: There has been no cases reported since 1984 and there is no indigenous transmission. However, 10-25 imported cases are detected every year. The Maldives has a strong surveillance in all airport, seaports and entry points. Also, entomological search are carried out routinely for vector surveillance.

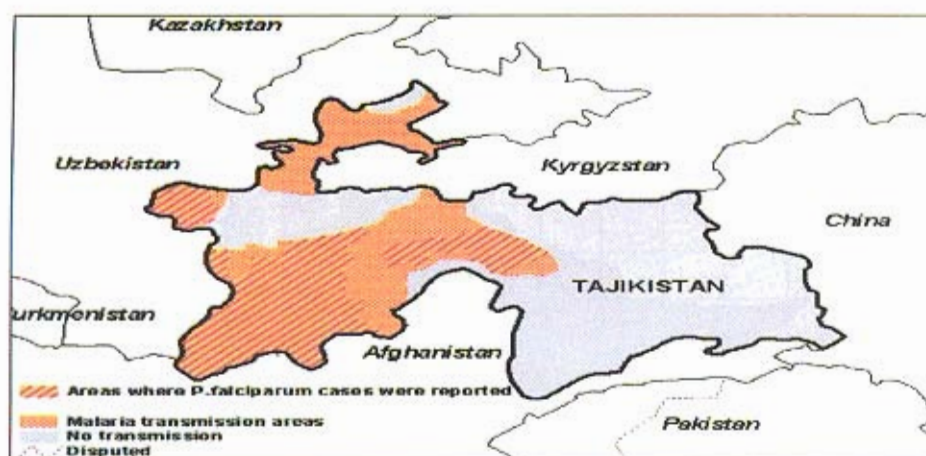


2.10. Pakistan: Malaria has been a major public health problem in Pakistan and the disease still threatens millions of people due to poor conditions conducive to the spread throughout the country. Malaria in Pakistan is typically unstable. Epidemics in the past have occurred at six to ten year's interval; the last one occurring in 1972-73. Both *Plasmodium falciparum* and *Plasmodium vivax* are widely distributed in Pakistan. Major transmission period is post monsoon i.e. from July-November, but a short spring transmission during April and May is also evident. Development of irrigation network coupled with unprecedented population growth and haphazard urbanisation together with the deteriorating sanitary conditions has increased the malarigenic potential of the country in both urban and rural areas.



During 2000, a total of 82,526 cases were reported as against 79,437 cases in 2001. A total of 101,761 cases were reported in 2002. The country map shows areas of endemicity of malaria. Two species, *Anopheles culicifacies* and *An. stephensi* are the primary malaria vectors. *Anopheles culicifacies* is considered to be the most important vector in the rural areas (Covell, 1931; Hick & Majid, 1937; Mchmood et al. 1984; Pervez & Shah, 1989), and *Anopheles stephensi* in the urban areas (Rehman and Mutalib, 1967). Apart from the above two species *Anopheles purcherrimus* and *Anopheles fluviatilis* are also considered to be the suspected vectors, especially in the mountains and foot hill areas of northern districts of NWFP and Punjab (Suleman et al. 1993).

2.11. Tajikistan: Malaria situation in the country remained relatively stable until 1994, when the incidence of malaria quadrupled from the previous year. The number of malaria cases reported in Tajikistan peaked in 1997, when nearly 30,000 cases were registered. Despite an 80% reduction in reported case numbers since this time, the malaria situation in the country remains serious. The resumption of *P. falciparum* cases and the expansion of the territory in which this type of malaria is spread is a matter of particular concern. Endemic malaria has now returned to the southern part of Tajikistan. The deterioration of the malaria situation in Tajikistan in the 1990s was linked to armed conflict, mass population movement across zones of intensive transmission of malaria, particularly Afghanistan, where malaria is endemic, and the disruption of public health care services and vector control activities. Marked changes in agricultural practices, particularly the increase in the cultivation of rice, have led to an increase in vector breeding grounds.

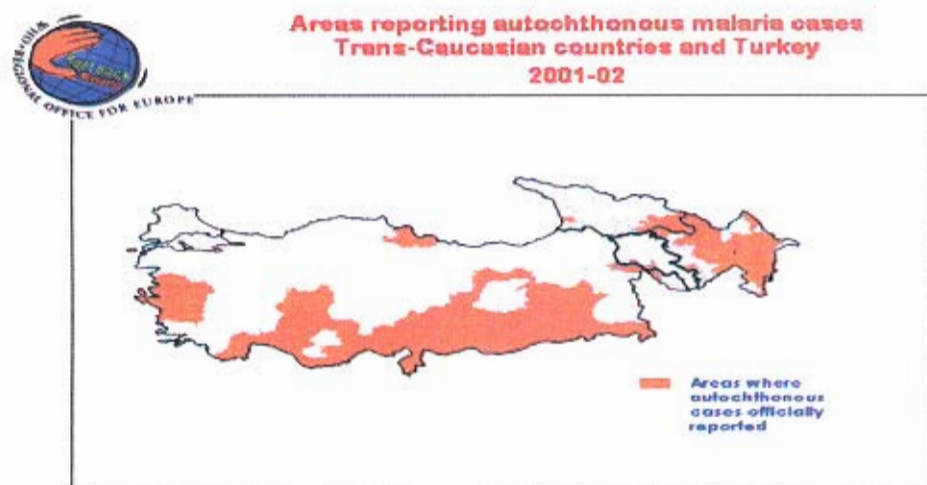


The risk of malaria exists throughout the country, with the exception of areas above 2500 m. The residents of the Khatlon Region, an area bordering Afghanistan, bear the highest burden of malaria in the WHO European Region. A survey carried out in this region in 2001 indicated that more than 10% of the study population was asymptomatic parasite carriers of *P. vivax* and *P. falciparum*. Within the Khatlon Region, which is home to 2.2 million people, the number of malaria cases may be as high as 150,000 to 250,000. The total number of malaria cases within the country, including both symptomatic and asymptomatic cases, is estimated to reach up to 300,000-400,000. WHO studies indicate that within the Khatlon Region, 25% of all infections are due to *P. falciparum*. Resistance of *P. vivax* to chloroquine is suspected.

2.12. Turkey: In 1957, a national malaria eradication programme was established, and by 1968, the disease was to a large extent under control. Prior to the introduction of control activities, *Plasmodium falciparum* was the predominant species, but since 1970s, only *Plasmodium vivax* cases have been reported. From 1971 onwards, the number of malaria cases in the Cukurova and Amikova plains began to increase, reaching epidemic proportions in 1976 and 1977, when 37,320 and 115,512 cases were reported respectively. Many factors contributed to the deterioration of the malaria situation, including a sharp increase in the density of *An. sacharovi* and the internal migration of workers from areas of Turkey where malaria at that time was more prevalent. By 1979, the reported number of malaria cases had dropped to 29,324, and the epidemic was contained.

From 1990 to 1996, the malaria situation remained critical. The highest case numbers to be registered in this decade were seen in 1994, when a total of 84,321 cases were registered. Only in 1997 did the situation begin to improve, when case numbers were halved from the previous year. The increase in the incidence of

malaria was particularly significant in areas where the GAP project (The South-eastern Anatolia Irrigation Project in south-eastern Turkey) was being implemented. However, outbreaks cannot be attributed solely to the impact of the expansion of the irrigation network, inasmuch as they have occurred in areas where construction has not yet begun. A rise in the number of malaria cases reported in other regions was most likely a result of importation of malaria by migrant workers.



The transmission of malaria is seasonal lasting from March to October. Malaria risk exists mainly in the southeastern part of the country, and in Amikova and Çukorova Plain. There is no malaria risk in the main tourist areas in the west and southwest of the country. Turkey demonstrates strong political commitment to the RBM movement. Malaria control activities carried out from 2002-2003 have included capacity building, disease management and prevention, operational research, drug-efficacy monitoring, malaria surveillance, health education and community participation. At present, the Ministry of Health and other governmental entities, WHO, United Nations Children's Fund (UNICEF) and the administration of the Southeast Anatolia Project collaborate in malaria control activities in the region of Southeast Anatolia.

2.13. Turkmenistan: Although endemic malaria was eradicated in Turkmenistan in 1960, sporadic cases were occasionally reported in the country. An outbreak of malaria was witnessed in 1998, when 115 cases were recorded in an area along the Afghan-Turkmenistan border. Sporadic cases of autochthonous malaria are reported every year, with 15 such cases recorded in 2002. At present, the malaria situation remains unstable, particularly in areas bordering Afghanistan and Uzbekistan, where cross-border movement, including that of infected people, takes place and favorable conditions for malaria transmission persist. At present, RBM-related activities

include disease management and prevention, training, surveillance, epidemic control and community involvement.

3. NATIONAL EFFORTS TO CURB THE DISEASE

In the Asian region, particularly among the IDB member countries, some have successful control of malaria and they need to maintain the status. These include countries with no indigenous transmission (Brunei Darussalam, the Maldives and Kazakhstan). Others, of course, having moderate to heavy burden of malaria faces many-fold problems in implementing control programmes. Countries, having long experiences since the Eradication era, by now have only limited capacity to control malaria due to the shortage of manpower, inadequate technical and financial supports and other factors related to programme operations at the field level. However, many countries have taken efforts to implement the Global Malaria Control Strategy, of which the four technical elements are:

- to provide Early Diagnosis and Prompt Treatment (EDPT) of malaria;
- to plan and to implement selective and sustainable preventive measures including vector control;
- to detect early, to contain or to prevent epidemics;
- to strengthen local capacities in basic and applied research to permit and to promote regular assessment of country's malaria situation, in particular the ecological, social and economic determinants of the disease.

Community based programmes bring health care directly to the homes of those, most affected. They help prevent suffering and deaths by providing timely care and support. Some countries have success in programme implementation and contributed to reducing the incidence of malaria through dissemination of information, the provision of appropriate drugs from local vendors and by the creation of financial mechanisms to provide interventions. Evidence shows, in many countries that, the RBM community based programmes are already very effective.

4. PROBLEMS ENCOUNTERED

Current morbidity and mortality rates of malaria in the countries of Africa and Asia are simply intolerable. The cost in terms of lives lost and of those, whose lives are affected is staggering. Unfortunately, though effective interventions against malaria are available, yet the burden persist largely due to three reasons: i) most people at risk are unaware of the effective interventions; ii) they are unable to afford them; and iii) the interventions are inaccessible to large proportion of the risk population. A lack of education, information and access to effective interventions currently restricts the success of malaria control programmes, especially among the poor, and in poorer countries in general.

Major problems that are faced by the on-going malaria control programmes in many countries may be listed as follows:

- **Capacity Building and Human Resources:** Many countries do not have adequate trained manpower to run control programmes effectively and do not have enough expertise in various essential areas of interest. While malaria needs to be mainstreamed in the general health services for integrated control strategies within the sector wide approach. In many countries, national capacity to determine the goals, strategies, clear policy directions and effective interventions remain as a matter of paramount importance. Human resources development initiative and opportunities are inadequate in general in many countries.
- **Access to EDPT and population coverage by ITN:** Reaching the remote and inaccessible areas and the population at high risk of malaria remain as one of the big challenges in many countries. On the contrary, the poorer segment of the population is not able to afford the cost of treatment. In many situations, government facilities are scarce and not adequate to provide the services, the NGO's and private sector involvement yet to be instituted. The MDG, thus, focuses on "the proportion of population in malaria risk areas using effective malaria prevention and treatment measures" as a yardstick of achievement of goal of MDG. Though ITN has been a proven tool to reduce malaria transmission, it is difficult to obtain adequate coverage and promotion of sustained use by the population at risk. In many communities, there are socio-anthropological determinants that decide successful introduction and use continued use of ITN to derive the expected benefit. Cost of ITN or LLN remain a great threat for the poor households who cannot but afford to pay for this. An effective mechanism yet to be developed in many countries for promotion of ITN-LLN.
- **Emerging Drug Resistance:** The control programmes need continuous Assessment and Monitoring of Antimalarial Drug Efficacy for Treatment of Malaria and many countries have limited capacity to do this. The World Health Organization supports countries in this area and help countries updating drug policy when necessary. The emerging drug resistance is a problem that warrants introduction of new drugs and the cost consideration remains as a big question for the poor countries.
- **Weak surveillance and HMIS:** Many countries do not have enough capacity for establishing a strong surveillance and therefore malaria data are not often maintained as required due to lack of technology (e.g. GIS and Remote Sensing etc.) and expertise needed. Private sector information is not gathered and thus leads to underreporting of the actual problem. Particularly, vector surveillance is poor and decisions for appropriate vector control are not taken based on reliable evidences in most cases.

5. RESULTS ACHIEVED

Many countries have already developed and others are underway for preparation of National Strategic Plans for long-term interventions aiming at achieving malaria related Millennium Development Goals and/or Roll Back Malaria targets. There are success stories in many cases, in reducing autochthonous transmission and prevention of imported cases, using effective interventions. Countries are also adopting multiple preventive methods: raising awareness; scaling up of ITN/LLN; integrated vector control; epidemic preparedness and response; and strengthening epidemiological surveillance. Technical support from World Health Organization; Roll Back Malaria and its partners; and additionally the Global Fund to fight HIV/AIDS, TB and Malaria (GFATM) have created opportunities for reinforced efforts in malaria control. But countries with high burden of malaria are yet to go a long way for successful control of the disease and need all out support from technical organizations, donor community and centers of excellence in areas of their unmet demand.

6. FUTURE PROSPECTS

In the backdrop of existing scenario, malaria control in the member countries of the Islamic Development Bank (Asian Region) needs to reinforce their malaria control programme with a view to bringing tangible success in curbing down the problem. Although necessary technologies are mostly at reach, there are still serious financial constraints for replication of interventions to achieve universal population coverage. Quite often, it is difficult to meet those who are underserved, with essential drugs, diagnosis and treatment that are affordable. It is essential that countries should consider the "5 -A keys to success" e.g. Advocacy; Accessibility; Availability; Affordability and Assessment.

Five “A” that spell success

- **Advocacy:** Evidence based advocacy for sustained political will and commitment at the highest level; national policy, consensus and determination for malaria control; efforts for mobilizing people's support.
- **Accessibility:** access to treatment of the poor and marginalized segment of population; raising community awareness; motivating health workers; ensuring accountability.
- **Availability:** Essential drugs, diagnostics; lab. support facilities; promoting ITN and LLNs through donor's support, NGO and private sector involvement.
- **Affordability:** Tools and strategies that have been proved to be cost-effective; large-scale replication; wider coverage of population; bulk production/purchase; low priced and tax waiver etc.
- **Assessment:** evidence based information; useful feedback and corrective measures during programme implementation; measure success/ output.

Five “As” that spell success

- **Advocacy**
- **Accessibility**
- **Availability**
- **Affordability**
- **Assessment**

In many countries, strategies for improved malaria control have been in place to curb down the incidence and deaths due to malaria in the community. Many programmes have focused on: i) access to prompt treatment and management at the community level; ii) special attention to pregnant mothers and children; iii) multiple prevention measures (personal protection-ITN-LLN, biological control and IRS); iv) adoption of malaria in IMCI; v) strengthening surveillance, epidemic preparedness and response and vi) fostering community participation, NGO's and the private sector involvement for multisectoral action. Thus, countries with burden of malaria and having established linkages and collaboration with IMCI and RBM will contribute to a more effective impact on malaria mortality and ensure more efficient use of human and financial resources.

7. RECOMMENDATIONS (IDB CONTRIBUTIONS)

The persistent high burden of malaria significantly affects both the communities and countries. Evidences illustrate significant damage that malaria does, in economic terms alone, by retarding the national development. In personal terms, the effects on families and communities are devastating. It is thus of paramount importance that countries should be able to establish an effective and responsive control programme to tackle their malaria problem and the Islamic Development Bank may provide adequate financial and technical support for their member countries. Major areas of interest where IDB support may play an important role are:

- i) Noting the fact that “...even when an economy is poor, major health improvements can be achieved through using the available resources in socially productive ways” the IDB should focus on how to significantly improve the health of the vulnerable groups of population. Unless the health

status of the vulnerable groups is significantly improved, health for all would remain as a distant dream, and the potentials for contribution of health towards socio-economic growth and poverty alleviation would not be realized.

- ii) IDB along with other partners should consider to provide technical and financial support to countries for malaria control in order to addresses core issues, to review and to monitor the state of the art, and to act as channels of information on the following issues:
 - Increasing access to treatment and provision of drugs;
 - Drug resistance monitoring and drug policy;
 - Transmission risk reduction;
 - Epidemic containment and improving surveillance; and
 - Advocacy for policy and promotion of effective control strategies.
- iii) Many countries have identical problem of malaria along the international border(s) they share and in such cases cross-border collaboration is useful. IDB may take initiatives with countries to synchronize malaria control interventions among countries.
- iv) As the Millennium Development Goal (Goal 6, Target 8) refers to "Have halted by 2015 and begun to reverse the incidence of malaria other major diseases", the Islamic Development may extend support to member countries to achieve these targets through ensuring necessary technical and financial support for strengthening existing health care delivery system in this context.
- v) Because financial constraint is a cross-cutting issue, IDB may consider establishing and mobilizing fund through alternative and sustainable ways for public financing of health care services and cost sharing, wherever possible, for the poor countries.

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(Original in English)

THE ROLE OF BACILLUS THURINGIENSIS IN MALARIA CONTROL

Malaria

- Malaria is a serious health problem in many developing countries, infecting between 300 and 500 million people annually, and the disease is a leading cause of infant mortality in sub-Saharan Africa (WHO 1995).
- It is also a highly complex disease caused by four different pathogens and vectored by many different mosquito species.
- Adult females of many mosquito species will bite humans, using the blood meals for egg production. However, only about 60 species of the genus *Anopheles* can transmit malaria.
- Although malaria is transmitted exclusively by Anophelines, only certain species are important vectors of the disease.

Trends in Insecticide Resistance

- Wide-spread dieldrin resistance developed in the 1960s, and is still present in many anopheline populations.
- The mosquito resistance mechanism confers some cross-resistance to phenyl-pyrazoles, a newly developed class of insecticides.
- Unlike dieldrin resistance, DDT resistance in malaria vectors was generally induced by a DDT specific resistance mechanism (glutathion S-transferases).
- Pyrethroid resistance has already been found in some important malaria vectors such as *An. gambiae* s.s. in west Africa, *An.albimanus* in Central America, *An.sacharovi* in Turkey and *An.stephensi* in India, Pakistan and parts of the Arabian Peninsula.

Bacillus thuringiensis

- Biological methods consist of the utilization of natural enemies of targeted mosquitoes and of biological toxins to achieve effective vector management.
- *Bacillus thuringiensis* (Bt) is a naturally occurring, soil borne organism that has gained recent popularity for its ability to control certain pests in a natural, environmentally friendly manner.

- *Bacillus thuringiensis* was first discovered in 1911 in the province of Thuringia, Germany. It was first used as a commercial insecticide in France (1938), and then in USA in the 1950s.
- However, these early products were replaced by more effective ones in the 1960s, when various highly pathogenic strains were discovered with particular activity against different types of insects.
- For many years, Bt was available only for control of Lepidoptera. Further screening of a large number of other Bt strains revealed some that are active against larvae of coleoptera (beetles) or diptera (small flies, mosquitoes).
- Most of these strains have the same basic toxin structure, but differ in insect host range, because of different degrees of binding affinity to the toxin receptors in the insect gut.
- Over 50 of the genes that encode the Cry toxins have now been sequenced and enable the toxins to be assigned to more than 15 groups on the basis of sequence similarities.

Bacillus thuringiensis M-H-14

- The *Bacillus thuringiensis* M-H-14 was isolated from *Anophele stephensis* larvae, discovered in 1986 in Iran. *Anopheles stephensis* is most important Malaria Vector in the Mediterranean region with high level insecticide resistance.
- The *Bacillus thuringiensis* M-H-14 has a high toxicity effect of 18730 I.U. to the mosquitoes.
- High larviciding efficacy has approved against *Anophele stephensis*, other *Anopheles* and *Culex* species (eg. *Anophele arabiensis*).

Background

For the past 9 years, the Biotechnology Division of IROST has conducted a series of research on Biological Insecticide Production.

- In the year 1989, this product started on the basis of a joint agreement between UNESCO, IROST and UNDP. (IRA/89/035).
- In 1986 from dead *Anophele stephensi* larvae in a larval habitat was located in the Lorestan province of Iran. Moazami isolated a sporulated bacterium that demonstrates rapid and high larvicidal power against the mosquito such as *Anopheles* and *Culex* species. Bioassay performed indicated that different species of *Anopheles* and *Culex* were sensitive.

Patents

- This bacterium was identified to be in genus of *Bacillus*.
- Further typing confirmed the isolated strain to be *Bacillus thuringiensis* H-14 that we named *B.thuringiensis* M-H-14.

- The microorganism was deposited in DSMZ culture collection (Germany).
- The DSMZ is an international patent center under the Budapest treaty located in Germany.
- The Slow Release formulation of *Bacillus thuringiensis* M-H-14 was patented in European patent office (EP 1 306 008 A1) and published in 02.05.2003.

Properties of *Bacillus thuringiensis* M-H-14

- The *Bacillus thuringiensis* M-H-14 has a high toxicity effect of 18730 I.U. to the mosquitoes.
- *Bacillus thuringiensis* M-H-14 isolated from *Anophele stephensis* larvae, the most serious chemical insecticide resistant and most important Malaria Vector in the region, has high effect against *Anopheles* and *Culex* species.
- Production time and toxin formation take only 28.5 hours.
- 4- Growth of *Bacillus thuringiensis* M-H-14 for the log-phase 10 h.
- Sporulation is completed by 16-20 hours after inoculation.
- Lysis is completed by 24-28 hours.

The Properties of Formulation

- 1- This formulation showed a high vector feeding affinity as compared to the other formulation used.
- 2- The new formulation showed a high enough volume of toxin to water surface ratio. The 20th day of laboratory investigation show constant release of toxins, which slowly spread during application and resulted in quick exposure to mosquito larvae.
- 3- It is environmentally safe for drinking and has no harmful effects on human, animals and other organisms. At the same time, it is highly toxic and kills about 100% of surface feeding mosquito larvae.
- 4- The Formulation has outstanding staying powers. *Bacillus thuringiensis* M-H-14 stays on the surface of the water for long as 17-20 days with consistently proven levels of toxicity. Comparable commercial products have an active in-situ life of 72 h.
- 5- Another important consideration is that is deployed in hot condition but is immune to the sun ultraviolet radiation.
- 6- Although *Bacillus thuringiensis* M-H-14 lacks recycling and provides no persistent control, its usefulness has been established in an integrated approach toward the control of *Anopheles stephensis*.
- 7- A total of 1.7 kilograms of slow releasing formulation of *Bacillus thuringiensis* M-H-14 applied/hectare, which showed 100 percent killing of larval mosquitoes in 24 hrs time. This killing ratio was stable for 17 days.
- 8- Local people were trained in order to use slow release formulation product in their water ponds and reservoirs.

On the basis of 9 years research in isolation, identification, production and formulation of *Bacillus thuringiensis* M-H-14, using more than 136 production medium and 16 formulation,

Know-how was transferred to an Iranian company, (Nature Biotechnology Co.) with one thousand tones per year production capacity, and the trade name of BIOFLASH®

The properties of Bioflash

- Bioflesh is a slow releasing floating formulation of B.t. M-H-14.
- Product form: Granules, Powder and concentrate liquid.
- Color: Yellow.
- Non Inflammable.
- Non Corrosive.
- Non explosive.

The granules were evaluated against a population of larval of Anopheles and Culex in defferent fields in many parts of Iran and Sudan.

Bioflash: A Magic Weapon in Malaria campaigning

This new formulation showed a high enough volume of toxin to water surface ratio. The 20 day's laboratory investigation showed constant release of toxins, which slowly spread during application and resulted in quick exposure to mosquito larvae. This golden characteristic is rare in larviciding agents, both chemical and biological commercial products, that make the expense reduction and easy application of granules.

High Vector Feeding Affinity

The slow release formulation of *Bacillus thuringiensis* M-H-14 showed a high vector feeding affinity as compared to the other formulation used to increase its efficacy in different fields in spite of presence of many natural larval feeding material. It is necessary to explain that *B. thurigiensis* toxin only effects through digestion system of mosquito and mosquitoes beat it. Because of this excellent characteristic, it may use Bioflash in different fields.

Bioflash: An Environmental Friendly Product

Bioflash is environmentally safe for drinking and leaves no harmful effects on human, animals and other organisms. At the same time, it is highly toxic and kills about 100% of surface feeding mosquito larvae. This high important specification causes this agent more usefulness in comparison of most of larviciding agents.

Outstanding Staying Powers of Bioflash

- The formulation has outstanding staying powers.
- *Bacillus thuringiensis M-H-14* stays on the surface of the water for long as 17-20 days with consistently proven levels of toxicity.
- Comparable to commercial products have an active in-situ life of 72 hours.
- Another important consideration is that it is deployed in hot and humid conditions, but is immune to the sun Ultraviolet radiation and temperature up to 600 C.
- High quality packaging and low weight are other important characteristics of Bioflash that decrease transport expense and easy application.

Advantages of Bioflash:

Acceptability, Safety and Budgeting Consideration

- This product is accepted very well in public health and local communities. The acceptability of the Bioflash has been demonstrated in trials in Queshm Island in Iran.
- There are many successful symbols of community participation in easy application of Bioflash in their water ponds and reservoirs.
- Safety, easily application, no need equipment and relative long lasting efficacy due to slow releasing granules are basic principles of community participation.
- This product is safe to environment and non-target organisms.
- *B. thuringiensis M-H-14* is essentially non toxic to human, pets and wildlife. This safety characteristic is a very important advantage of this product.
- It is usefulness in different fields due to safety and high vector feeding affinity.

SUMMARY OF THE CONCLUSIONS AND RECOMMENDATIONS

SUMMARY OF THE CONCLUSIONS AND THE RECOMMENDATIONS

The Symposium on **"Health Millennium Development Goals: Reversing the Incidence of Malaria in IDB Member Countries,"** is the 15th in a series of symposia organized by the Islamic Development Bank in conjunction with the Annual Meetings of its Board of Governors.

The Symposium was chaired by H.E. Dr. Mohammed Khazaci, Deputy Minister of Economic Affairs and Finance of the Islamic Republic of Iran. Dr. Fatoumata Nafou-Traoré, Director of the Roll-Back Malaria Department of the World Health Organization in Geneva, Switzerland, delivered the keynote address. Dr. Hoda Atta, Regional Advisor on Malaria in the WHO East Mediterranean Region Office, Cairo, Egypt; Prof. Omar Gaye from the Faculty of Medicine, University of Cheikh Anta Diop, Dakar, Senegal; and Dr. Abdul Mannan Bangali, a National Professional Officer from WHO office, Dhaka, Bangladesh, acted as panelists and delivered addresses on the subject from the perspective of the Arab, African and Asian Regions respectively. A presentation was also made by Dr. Nasrin Moazami, Head of the Biotechnology Centre of Iran Scientific and Industrial Research Organization on research and application of new locally developed methods for fighting malaria in Iran.

Participants recognized that malaria is a complex problem, affecting the vulnerable groups in many IDB member countries and requires concerted efforts at all levels to effect a resolution. The Symposium emphasized that:

- i. The impact of malaria on the socioeconomic development of countries in Africa, south of the Sahara and Asia with high malaria burden heightens the urgency for effective control of the disease in these regions.
- ii. In countries with intense transmission, malaria mainly affects vulnerable groups such as pregnant women and young children. Unless the health status of these vulnerable groups is significantly improved, attaining malaria-related Millennium Development Goals (MDGs) will remain a distant dream. The potentials for contribution of health towards socio-economic growth and poverty alleviation would, therefore, not be realized.
- iii. In complex emergency countries, particularly in Africa south of the Sahara, it may not be realistically possible to attain the health-MDGs within the envisaged time frame. Nonetheless, malaria, for humanitarian as well as developmental reasons, should be addressed in these countries to curb at least the mortality burden and part of the morbidity burden.
- iv. In countries where interruption of malaria transmission has been achieved, or almost achieved, there is a dire need to maintain the efforts to prevent

reestablishment of transmission. However, the MDGs do not have any bearing on malaria in these situations and the countries in question have the financial and technical capacity to address the problem. Nevertheless, in many cases, control can be reinforced through cross-border cooperation and collaboration, especially in such areas as the Arabian Peninsula where malaria elimination can be achieved and consolidated.

- v. The success of malaria control programmes depends on the utilization of cross-sectoral approaches and sustained efforts at both national and regional levels. The main determinants of success are:
 - Sustained and sufficient financing;
 - Effective human resource development;
 - Practical integration with general health system planning;
 - Partnership with the community, private sector, NGOs and all other agencies;
 - National government commitment and leadership.
- vi. The international funding required in the medium term to supplement current inputs for all the low-income IDB members is estimated at US\$ 500 million per year.
- vii. In modern time, security involves health factors with cross-border implications. Cooperation on health issues should, therefore, lead to more security at both the national and regional levels.

Recommendations

The Symposium made the following recommendations:

At the national level:

IDB members are recommended to:

- i. to recognize control of malaria, along with a commitment for effective implementation as a developmental and humanitarian priority. It is essential for attaining all of the MDGs and reducing poverty among the most vulnerable groups.
- ii. promote community-based approaches for sustainable malaria control.
- iii. Include capacity building/strengthening of the establishment of long-term mechanisms for developing strategies appropriate to each region in the country.
- iv. include malaria control in sector-wide approaches with planning at all health system levels towards clear targets consistent with the MDGs.
- v. engage the private sector and civil society in malaria control.

- vi. strengthen the environmental and health impact assessments of development projects and ensure that capacities are in place for sustaining the implementation of measures for the mitigation of the adverse health impacts.

At the regional level:

OIC/IDB members are recommended to:

- i. strengthen collaboration on malaria control interventions among the countries which are geographically close to each other.
- ii. enhance regional information exchange and cooperation on operations and development of health services in borders areas with special emphasis on malaria.
- iii. establish a regional endowment fund to support malaria control and malaria resource centers for long-term malaria control programmes.
- iv. support regional networks to exchange information and best practices in the area of malaria control.

At the IDB Group level:

The IDB is recommended to:

- i. give priority in its health-financing programmes to significantly improve the health of the vulnerable groups in the member countries.
- ii. provide technical and financial support to member countries for effective malaria control, aimed at addressing the following:
 - Increasing prompt access to effective treatment and high coverage of prevention measures to communities at risk;
 - Resistance monitoring to antimalarial medicines and insecticides;
 - Epidemic detection and control, improved surveillance and timely reporting;
 - Institutional development for malaria control with emphasis on the integration of malaria control with other health programmes;
 - Technology transfer in the area of malaria control.
- iii. support human resource development and management in both the public and private health sectors.
- iv. help raise awareness regarding the seriousness of malaria and its relationship to development, the environment, and health in member countries with intense transmission.

- v. encourage and support innovative approaches to malaria prevention and control which are based on local resources and technology and supported by evidence.
- vi. consider developing innovative financing mechanisms to accelerate malaria control in member countries.
- vii. take appropriate steps to ensure that prevention and control measures for transmission of malaria that can be associated with some of its development projects are built into the project's planning and implementation requirements.
- viii. support malaria research, development of innovative strategies for effective malaria control, medical training, environmental education and public campaigns.
- ix. support regional initiatives to control malaria in member countries.
- x. help demonstrate that malaria is not an intractable problem in the endemic countries. To this end, support initiatives for learning from successful malaria control programmes in member countries.

These recommendations should assist the setting of policies and priorities for investments in malaria control at the national, regional, and IDB Group levels.