GLOBAL MALARIA CONTROL AND ELIMINATION:

report of a technical review

17–18 January, 2008
Geneva, Switzerland

World Health Organization

GLOBAL MALARIA CONTROL AND ELIMINATION:

report of a technical review

17–18 January, 2008
Geneva, Switzerland

World Health Organization

WHO Library Cataloguing-in-Publication Data :

Global malaria control and elimination : report of a technical review.

1.Malaria - prevention and control. 2.Malaria - epidemiology. 3.Antimalarials - supply and distribution. 4.Program evaluation. I.World Health Organization.

ISBN 978 92 4 159675 6 (NLM classification: WC 765)

For more information, please contact:

Dr K. Mendis
Global Malaria Programme
World Health organization
20, avenue Appia - CH-1211 Geneva 27
Tel. +41 22 791 3751
Fax +41 22 791 4878
E-mail: mendisk@who.int

Design & Layout by WHO Graphics
Printed in France

CONTENTS

EXECUTIVE SUMMARY

Malaria is endemic in 109 countries and territories in tropical and sub-tropical zones, spanning all continents of the world except Antarctica and Australia, with intensities of transmission that vary from very low to extremely high. Since the launch of the Roll Back Malaria Initiative by WHO in 1998, and particularly in the past few years, malaria control has intensified in endemic countries, supported by a greatly increased investment of financial resources and technical assistance from the international community. As a consequence of the resulting high coverage with malaria interventions, especially in sub-Saharan Africa where the burden of malaria is greatest, the malaria burden is being reduced, albeit variably, in all regions of the world. In some countries in Africa with high malaria burdens, there is evidence of significantly decreasing malaria incidence and deaths among children and adults. In countries with lower transmission intensities, such as southern Africa and Asia, the malaria burden has been reduced to such an extent that it has ceased to be a major public health problem. In 16 endemic countries, the risk is limited to *Plasmodium vivax* malaria, some of those countries having eliminated *P. falciparum* over the years. A few countries in which the malaria burden was relatively low but persistent have completely eliminated malaria: in 2007, the United Arab Emirates was certified by WHO as being malaria-free, and another five formerly endemic countries have reported no locally acquired malaria cases in recent years. In 11 countries, programmes are under way to eliminate the disease.

Given the moral imperative of eliminating malaria, control and elimination of the disease have been contemplated since the beginning of the twentieth century. It was soon realized, however, that the achievements of aggressive, time-limited campaigns were unsustainable and that progress required continuous effort. Before the Second World War, most of western Europe had virtually eliminated the disease by focal vector control and by making diagnosis and treatment widely available. In the decade that followed, the availability of DDT and chloroquine, both with impressive efficacy, led to a resurgence of campaign spirit and, in 1955, the launching of the Global Programme for Malaria Eradication, a campaign that targeted all endemic countries except mainland sub-Saharan Africa and Madagascar. The campaign demanded perfect execution of prescribed activities by a highly disciplined workforce, which was to spare no effort in reaching the remotest houses. Nevertheless, mosquito vectors and parasites did not respond everywhere as expected, and progressive attrition began in both the operational *esprit de corps* and discipline as well as in the collaboration of the population. The progress of the campaign slowed, and malaria outbreaks occurred

during the consolidation phase of the programme in some areas that had initially responded well. Analysing the failures during the consolidation phase, WHO recognized that the basic requirements for achieving and sustaining malaria control are (1) integration of malaria control into a reasonably well-established health system, (2) an uninterrupted, continued effort and (3) research into new and improved tools. In 1978, WHO reoriented its policy from eradication and elimination to control. During and following the Global Malaria Eradication Programme, up to 1982, 24 endemic countries were certified by WHO as malaria-free.

The objectives of malaria control programmes range from reducing the disease burden and maintaining it at a reasonably low level, to eliminating the disease from a defined geographical area, and ultimately to eradicating the disease globally. These levels of control are defined as follows (WHO, 2007):

- *Malaria control*: reducing the disease burden to a level at which it is no longer a public health problem
- *Malaria elimination*: interrupting local mosquito-borne malaria transmission in a defined geographical area, i.e. zero incidence of locally contracted cases, although imported cases will continue to occur. Continued intervention measures are required.
- *Malaria eradication*: permanent reduction to zero of the worldwide incidence of malaria infection.

Since the last attempts at malaria elimination or eradication more than half a century ago, the landscape in which antimalarial activities are being conducted has changed considerably. New, more effective tools are available, communication technology has improved, as has the wealth of nations and the social and economic standards of people living in endemic areas. These changes, combined with the malaria control achievements of the past few years, have inspired the governments of malaria-endemic countries and major international donors to aspire to a more ambitious, accelerated effort. History shows that new goals and targets for global malaria control, elimination and possible eradication must be realistic in order to avoid disappointment and disillusionment and the devastating implications of disease resurgence, experienced in the past. The lessons of the past and the efficacy and effectiveness of the current tools will serve as guides to setting realistic targets. Potential threats to malaria control—the prevailing state of health systems and the epidemiology of malaria in endemic countries—must also be taken into account in setting realistic targets.

Effective mosquito control tools (including long-lasting insecticidal nets and indoor residual spraying) and medicines for early, effective termination of human infections (including artemisinin-based combination therapy) are available today, with which substantial reductions in the malaria burden have and can be achieved. With these tools, elimination of local transmission has been possible in areas where transmission is marginal; however, these preventive and curative tools rely heavily on chemical entities—insecticides (pyrethroids) and therapeutic agents (artemisinins)—that are vulnerable to resistance by the mosquito vector and parasite, respectively. The development pipeline for alternatives to pyrethroids and artemisinins is weak at present, placing malaria control at considerable risk.

The unit of measurement of the spread of malaria (transmission) is the basic reproduction rate, which is the number of new malaria cases generated by a single case. This is an expression of the efficiency of the mosquito vector (vectorial capacity) and the magnitude of the infective parasite pool in humans. Vectorial capacity is determined by the density of mosquitoes, their feeding frequency on humans, their daily survival rate and the duration of the parasite's development cycle in the mosquito. It is extremely sensitive to changes in the daily survival of the mosquito and, to a lesser extent, to their density and human biting frequency. For malaria to be eliminated, the basic reproduction rate (the number of new malaria cases generated by a single case over the duration of infection) has to be less than 1. With the existing arsenal of tools, only the density of mosquitoes, the daily survival rate of the mosquito, their human biting rate and the duration of infection in humans can be manipulated by intervention. Current antimalarial interventions lead to a reduction in the basic rate of reproduction of malaria by reducing human infectivity with early and effective treatment and reducing vectorial capacity with mosquito control measures. Indoor residual spraying reduces the daily survival rate of the mosquito; insecticide-treated mosquito nets reduce the human biting rate of the mosquito and, to a lesser extent, its daily survival rate.