

# Evaluation of WHO's antimalaria programme during the past 50 years and prospects for the future

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*People have watched a hundred thousand times as their plans and intentions came to nothing, and nothing went the way they wished. But God gives them forgetfulness to bear this and go on.*

Rumi: Fihī ma fihī [1]

## Introduction

The above quotation reflects the history of humanity's battle with malaria since the beginning of this century. The World Health Organization (WHO), since its birth in 1948 until now, has been heavily engaged in this battle and its successes and failures have been attributed to the degree of man's understanding of the striking power of malaria and to the extent of his collective determination and effort to pursue the battle until final victory.

The ravages malaria inflicted on the Allies' military forces during the Second World War, particularly in the south-east Asian and western Pacific battle fields, were still fresh in the memory of the eminent malarialogists, leaders in preventive medicine at the time, when they met during the Fourth Congresses of Tropical Medicine and Malaria in Washington in May 1948. The Second Expert Committee on Malaria of the Interim Commission, entrusted to develop the programme of work of WHO, was also convened in association with these Congresses. The effectiveness of the newly discovered antimalaria weapons, namely the insecticide DDT

and the antimalarial drug chloroquine, had been already demonstrated in war zones and since 1946 in Greece and Venezuela.

The participants in the Congresses as well as in the Second Expert Committee on Malaria were convinced that the time had come to wage a battle against malaria using these cheap and effective weapons in all malaria-endemic areas of the world. In his opening address to the Congresses, the US Secretary of State, George Marshall, stated that the "conquest of diseases which hold millions weak and inefficient, and the maximum production of foodstuffs in lands now yielding little, are tremendously important requirements of the world situation" [2]. The Interim Commission in response to the recommendations of the Congresses and the Second Expert Committee on Malaria and realizing the political and economic support being given to the control of malaria on a worldwide basis, saw in such a programme a means of rallying and uniting public health opinion and hence the priority given to such programme in future WHO work. The objectives of such a programme as stated by the Interim Com-

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mission were "to assist governments to accomplish effective malaria control along modern scientific lines" [3]. In line with these objectives, WHO and its regional offices started to implement a global malaria programme, and throughout the Organization's 50 years both successes and failures have been encountered.

The evaluation of the antimalaria programme presented in this paper is divided into the three periods that mark its evolution, namely:

- the period of pilot projects and conception of global eradication (1948–55);
- the period of eradication—successes and failures (1956–69);
- the period of reversion to control and integration (1970–97 and continuing).

While this evaluation concentrates on trends in the malaria situation and the activities conducted in each period, one has to keep in mind that the antimalaria programmes of different countries, though technically guided and supported financially by WHO and other agencies, remained national enterprises carried out by various ministries of health in these countries, whose competence in implementing the commitments in their agreements with WHO varied greatly.

## Evaluation of the programme during the period 1948–1955

### Period of pilot projects and conception of global eradication

WHO, at its birth in 1948, was entrusted by the UN Socioeconomic Council to take charge of controlling malaria, which amounted at that time more than 250 million cases, and was claiming 2.5 million deaths annually, apart from being a great obstacle to economic progress. The biggest part of the problem was confined to subtropical

and tropical countries, where it constituted a major health problem. The Second and Third WHO Expert Committees on Malaria established WHO policy in the Global Programme, which ran as follows [4]:

- to assist governments to accomplish effective malaria control along scientific lines;
- to render practical assistance in formulating programmes and setting up adequate governmental machinery for malaria control;
- to train suitable candidates, both professional and subprofessional personnel;
- to disseminate relevant information and to develop uniform international procedures and nomenclature.

Five Expert Committees on Malaria were convened during this period (first to fifth inclusive) and together with the Expert Committee on Insecticides, elaborated many details on ways and means of realizing the above objectives. The steps taken by the WHO Malaria Unit were as follows:

- At headquarters, the Malaria Control Division organized and staffed three units, epidemiology, programme planning and research, (and later an administrative manager). The professional staff consisted of malariologists, an entomologist, a sanitary engineer, a medical scientist and a chemist.
- At regional offices, the malaria units were each staffed with a senior malariologist, an epidemiologist, a sanitary engineer and an administrator. These units were responsible for developing operational plans for antimalaria projects.
- At country level in representative countries from each WHO region, a malaria team composed of a malariologist, an entomologist and a sanitarian (and later an administrative officer) was assigned by WHO to each pilot demonstration area in

selected highly malarious areas. These pilot projects were assisted mostly by UNICEF which provided the insecticides needed, spraying equipment, laboratory items, vehicles and antimalarial drugs. The percentages of the international funds for the pilot projects in the period 1949–53 were 71.8% from UNICEF, 19.7% from UN Technical Assistance and 8.5% from WHO regular budget [5].

- WHO ensured the continuity of financing for antimalaria activities by coordination with UNICEF, UN Development Programme and Food and Agriculture Organization of the United Nations, as well as by establishing a WHO Malaria Voluntary Fund.
- WHO ensured adequate flow of DDT by liaising with the UN Socioeconomic Council. The UN Secretary General, on request from WHO, submitted a report on the availability of DDT worldwide and its annual production. It also encouraged some developing countries to establish DDT factories with UN Technical Assistance help. Governments were also requested to lift taxation on antimalaria supplies, equipment and vehicles.
- The WHO teams in the demonstration projects, with their national counterparts, introduced the methodology of geographical reconnaissance; technique and dosage of DDT per square metre of sprayed walls; organizational set-up in field operations to ensure supervision at every level, and the epidemiological, entomological and laboratory services inputs in the evaluation process. The number of these projects kept increasing, and by 1953 there were 30 projects in the African Region, 13 in the American Region, 6 in the Eastern Mediterranean Region, 4 in the South-East Asian Region and 5 in the Western Pacific Region.
- Training activities for malaria personnel by WHO headquarters and regional offices and by WIHO teams at country level were actively pursued. Fellowships to candidates from over 40 countries were given to attend courses in WHO-assisted regional malaria training institutes as well as to the previously established training institutes in Egypt, India, Italy, Mexico, United Kingdom and Venezuela.
- WHO sponsored a series of international conferences on malaria to apprise participants of the successes gained in controlling malaria in the pilot projects. Noteworthy among these were the 1950 Conference in Equatorial Africa, the 1953 Bangkok Conference, the 1954 Conference in the Philippines, and the Pan American Sanitary Conference held in Santiago, Chile, in 1954, which was the first to accept the concept of global malaria eradication.
- The dissemination of knowledge on modern technology in malaria control was effected by WHO through its publications, reports and press releases. A manual on health education also appeared during this time, and much dissemination was done through exchange of scientific workers, seminars and malaria regional and inter-country meetings.
- WHO stimulated governments to expand their programmes from the pilot areas to their whole country in preparation for an eventual malaria eradication programme which was stated to be desirable, technically feasible, and had the promise of assistance from UN specialized agencies.

The stunning success of the application of modern technology, as demonstrated in the WHO pilot projects, in interrupting malaria transmission and seemingly eradicating malaria at a low cost of US\$ 0.25 per head per annum in most pilot projects, convinced

**Table 1 Results of surveys in Mindoro pilot project, Philippines [6]**

Type of survey	In pilot area under DDT coverage (%)	In comparison area
<i>Infant parasite rate</i>		
before DDT spraying	32.1	remained at 21.4%
after first spraying	1.0	
after second spraying	0.6	
<i>Children 2-9 years rate</i>		
before spraying	52.4	remained at 34.2%
after first spraying	5.3	
after second spraying	4.5	

everybody of the health and socioeconomic gains of such programmes. To cite one example, the Mindoro pilot project in the Philippines produced the results shown in Table 1.

The results obtained from pilot projects in equatorial Africa showed a reduction in rates although malaria transmission continued; hence the exclusion of the countries of equatorial Africa from the global eradication programme. They were advised, however, to use modern technology in controlling malaria.

The stupendous work carried out by WHO during this period was acclaimed by successive World Health Assemblies (First to Seventh inclusive). As little was known about the implications of a global eradication programme WHO, carried away by the successes obtained in the pilot projects, began to encourage countries to join the eradication campaign, sometimes with some oversalesmanship to disperse fears arising in certain scientific circles. For example, it showed that the eradication programme run at US\$ 0.25 per head per annum would prove economical in the long run, as the seemingly indefinite repetitive expenditures would be struck out from the health budgets following eradication

in a matter of 10 years or less. Fears regarding population pressure resulting from eradication and regarding the development of DDT resistance in malaria vectors, were dispelled by stating that the current public health view was that nobody could predict accurately what harm might occur, or the solutions that might be worked out [7].

## **Evaluation of the programme during the period 1956-69**

### **Period of eradication: successes and failures**

This period was ushered in with the resolution of the Eighth World Health Assembly in May 1955, which based on the Assembly's study of the report of the Director-General of WHO and the recommendations of the XIV Pan American Sanitary Conference in Chile in 1954, and the Western Pacific and South-Asia Conference in the Philippines in 1954, and aware of the potential danger of vectors acquiring resistance to insecticides, requested governments to intensify plans of nationwide malaria control so that malaria

eradication might be achieved, and the insecticidal spraying safely withdrawn before the vectors developed resistance to insecticides.

One year later, the Sixth Expert Committee on Malaria, held in Athens, attested to the feasibility, desirability and preference of a malaria eradication programme using modern technology over the protracted and never ending malaria control pursuits. It defined the eradication programme as one aiming for "the ending of malaria transmission and the elimination of the reservoir of infective cases in a campaign limited in time and carried to such a degree of perfection that, when it comes to an end there is no resumption of transmission [8]." This definition imposed certain requisites to be adhered to, if success were to be attained within a limited time-frame of about 10 years (1-2 years for planning; 3-4 years attack phase with DDT residual spraying; and 3-4 years consolidation phase). These requisites were included in the detailed plans of operations for the eradication programmes as commitments to be implemented by governments, by WHO and by the assisting international organizations.

A detailed guide for presenting such a programme was given as an annex to the report of the Sixth Malaria Expert Committee. The different sections of this programme dealt with the geographical description of the country, epidemiology of malaria, assessment of malarious areas, organization (including structure, executive power, financing, administrative management setup), training, position of the malaria service within the general health services, detailed plan of operation, calculation of expenses and a general timetable for the programme. Many developing countries with expanding malaria control programmes were eager to sign agreements with WHO and UNICEF without prior appraisal of their capacity to fulfill the requisites, especially their contin-

ued financial commitment until the end of the programme. Most of the eradication programmes were run as vertical structures and were accorded executive functions to avoid any administrative delays or obstructions brought about by the prevailing bureaucratic procedures in the participating governments. As a matter of fact the eradication services were models of efficiency and demonstrated the three tiers of supervision for every field operation, epidemiological inputs in the assessment of progress and discipline imposed on the personnel involved.

The malaria eradication programmes were welcomed by the people especially as DDT spraying eliminated nuisance insects such as flies, bedbugs, fleas, cockroaches, etc. Unfortunately these insects developed resistance to DDT spraying hence the growing refusal by residents to allow their houses to be sprayed. As health education in most developing countries with high illiteracy rates was thought to be a long-term affair, governments resorted to legislation to enforce the right of entry into houses by malaria personnel to perform their functions. This led again to making the programme unpopular in most rural malarious areas and the people resorted to closing their houses or immediately replastering after spraying.

Another ominous obstacle to progress was the appearance of insecticide resistance in nine main vectors by 1958 [9]. Unfortunately this resistance increased year after year and, as reported by the Eleventh Expert Committee in 1964 [10], the extensive research to find an insecticide as safe and cheap as DDT among the hundreds of candidate insecticides tested was disappointing. Two types of vector resistance were identified, namely physiological, when the vector resists the toxic action of DDT after its ingestion, and behaviouristic when the vector avoids coming into contact with the insecticide.

At this time, one began to hear about problem areas that were not amenable to the application of modern technology and the underlying causes were attributed to one or more adverse factors such as: refusal of spraying by people, vector resistance, villages engaged in bee or silk worm cultivation, roofless houses, nomadic populations, etc. All these adverse factors began to slow the progress of the eradication programmes leading to prolongation of the attack phase and financial straining of budgets. To deal with these problem areas the Eleventh Expert Committee recommended the introduction of environmental methods of malaria control and larviciding [11]. One year later the Twelfth Expert Committee [12] recommended fortnightly or monthly antimalarial drug administration together with residual spraying where residual spraying alone was ineffective or not practicable. It was obvious that the attack phase was meeting great and unsurmountable obstacles.

Countries advancing to the consolidation phase began to note certain adverse factors. This phase was based on the total coverage of the population with malaria surveillance, which had to be introduced during the last year of the attack phase when parasite rates in children fell to below 2%. The surveillance mechanism consisted of screening the population for fever cases and taking blood slides from suspected cases. The malaria services had surveillance agents that made house to house visits once monthly, this is termed active case detection (ACD) to distinguish it from screening done by health establishments which is termed passive case detection (PCD). Certain epidemiological criteria were applied to qualify areas inhabited by a population of one million (termed zones) to enter the consolidation phase; namely when annual parasite incidence reached 0.1 cases per 1000 population and provided the annual blood examination rate (by ACD and PCD)

was about 10% of the total population in each zone of about one million. The supervision of the ACD agents proved expensive. The responsiveness of the people decreased rapidly and mothers began to hide their young children, fearing the needle prick in their fingers, quite apart from the sense of inconvenience they felt in having their privacy and domestic activities disturbed. As the governments bore the expenditures on salaries they began to feel that at such a low level of malaria they could not justify expenditures on this phase, and thus a laxity was noted. This resulted in the occurrence of many foci in different zones that could not be investigated by the malaria teams responsible for investigation and elimination of malaria foci.

As the criteria for eradication and entry into the maintenance phase were the absence of any locally transmitted cases during the last two years of the consolidation phase and the competence of the health infrastructure to attend to the vigilance activities; all the eradication programmes of developing countries could not advance to the last phase because of the paucity of the network of basic health services in areas cleared from malaria. This realization was a fatal blow to the eradication policy. One example is India, which could not financially or technically meet the requisites of the consolidation phase and this led to premature entry into the maintenance phase with disastrous consequences (see Table 2).

By the end of 1967, it was obvious that the global malaria eradication programme could not progress further and the malaria situation in many developing countries started to deteriorate at varying rates. In 1967 WHO, summing up its assessment of the global eradication programme, stated the following: "Today malaria eradication is an accomplished fact for 619 million people who once lived at risk of this disease. An additional 334 million people live in areas

Table 2 Reported cases of malaria [16]

Year	No. malaria cases from all countries <sup>a</sup>	No. of cases from India
1965 (eradication era)	4 942 883	99 667
1970	7 009 156	694 017
1975	11 853 829	5 166 142
1980	15 813 583	2 989 140 <sup>b</sup>

<sup>a</sup>These figures were obtained from WHO sources and do not include cases reported from Africa south of the Sahara or from China.

<sup>b</sup>The apparent steep drop of cases from 1975 was due to the massive distribution of antimalarial drugs by more than 370 000 drug distribution centres established in addition to the basic health units in all rural areas to combat the malaria pandemic that raged all over the country in 1977 and 1978.

where transmission of the parasite is no longer a major problem. To have progressed this far and to have brought a sustained measure of well-being to a total of 953 million people, more than one quarter of the world's population, is an international achievement without parallel in the provision of public health service" [13]. The last Expert Committee on Malaria during this eradication period was the fourteenth, convened in September 1967. It was ironic that one section of its report was devoted to "conditions to be met before initiating a malaria eradication programme" and listed 11 conditions [14]. This was perhaps a hindsight reflection on WHO's sad experience in developing countries. Two of the conditions, namely that governments should have a definite plan for developing their basic health services and that adequate provision be made for effective vigilance activities, might have been a prelude to the imminent change of WHO policy on global malaria eradication.

## Evaluation of the programme during from 1970 to present

### Period of reversion to control and integration

This period was ushered in by World Health Assembly resolution WHA22.39 (1969).

This resolution summarized the then current views on the global malaria eradication programme by referring in its preamble as follows: "the part played by socioeconomic, financial, administrative, and operational factors, as also by the inadequacy of the basic health services", and which advised governments which had failed in the time-limited eradication programme to change to long-term control programmes but to have at the same time the eradication of malaria as their ultimate goal.

As there is no universal strategy for malaria control that can be applied across the infinitely varied forms and degrees of social, economic and cultural development, across differing levels of political stability and the variation in malaria epidemiological features in the different geographic areas in each country, most governments to which the above WHO's resolution was addressed continued their routine eradication activities of spraying or surveillance, while relaxing on the supervision element and on the epidemiological assessment. Governments faced with the withdrawal of international financing for malaria programmes, with the increasing cost of control programmes and being preoccupied with other pressing international programmes such as family planning, smallpox eradication, basic health services and later primary health care sys-

tems, sacrificed the malaria vertical structures and used their assets in personnel, vehicles and financial national resources in other programmes.

During the past 25 years, while universally applying modern technology to control malaria, the science of malariology has been forgotten. These combined factors have led to a progressive deterioration in the malaria situation in many developing countries. This deterioration, as reported by WHO, continues to the present day. Table 2 coverage shows the number of malaria cases reported from the whole world compared with those of India, whose eradication programme was once regarded as the biggest ever launched in the world.

One has to remember that since 1975 one cannot rely on the official statistics on malaria cases from developing countries with ex-eradication programmes as a result of the integration of the vertical malaria structures into the primary health care system. This is to be expected in the absence of some form of vertical and efficient management structure that can at least take care of controlling malaria epidemics and collect valid statistics on malaria to predict the occurrence of such epidemics.

Some independent health establishments monitoring the work of WHO and the progressive deterioration of the malaria situation began to think that the Alma-Ata advocacy of global primary health care, promising health for all by the year 2000, had overtaken the vertical malaria services without providing a proper mechanism to deal with the problem and began to question on what basis the decision to integrate malaria programmes had been made.

In 1994 the WHO Division of Control of Tropical Diseases classified the world into four zones from the malaria point of view. These are given below together with, as an

example, the situation in the countries of the Eastern Mediterranean Region (EMR).

- Areas where no malaria existed or disappeared without specific measures, representing 27% of the world total population. In EMR countries, Kuwait falls into this category.
- Areas where the WHO eradication campaign was successful and the success had been maintained, representing 31% of the world total population. In EMR countries, Bahrain, Cyprus, Jordan, Libyan Arab Jamahiriya, Qatar, Saudi Arabia (except the two southern-west provinces) and Tunis.
- Areas where malaria has resurged in certain regions or where fulminant malaria epidemics have occurred, representing 31% of the population of the world. Both instances exist in EMR countries. Examples of the first instance include Egypt, Morocco, Oman, Syrian Arab Republic and United Arab Emirates where specialized antimalaria services were continuing their efforts in conjunction with overall socioeconomic development aimed at eradication. On the other hand the eastern bloc of EMR countries comprising Afghanistan, Islamic Republic of Iran, Iraq and Pakistan where social strife has been going on (as in Afghanistan), or has recently subsided (as in the other three countries), the malaria situation was worsening. As these countries are rich in skilled human resources and have had experience in antimalaria work, one would expect improvements in their malaria situations once the social conflicts are over and political stability is established. The real malaria problem area in EMR is the southern region comprising Djibouti, Somalia, Sudan and the Republic of Yemen, where the African vector *Anopheles gambiae* is the main vector, and where



climatic conditions are favourable for flagrant malaria epidemics, such as the recent one in southern Somalia and Sudan.

- Areas where endemic malaria has never substantially changed representing 9% of the total population of the world. These included all countries situated in a broad tropical belt south of the Sahara in Africa. According to WHO's Division of Control of Tropical Diseases the countries in this belt contribute 90% of all the clinical cases of malaria in the world (estimated at 300–500 million cases annually) and almost 100% of the global mortality attributed to malaria (estimated at 1.5–2.7 million deaths annually). All these countries share *Anopheles gambiae* as the main vector and *Plasmodium falciparum* as the predominant species. Chloroquine-resistant strains of falciparum parasite are spreading across this belt and pyrimethamine-sulfadoxine-resistant strains have been already detected in some countries both east and west of this belt.

During the period 1970 to 1997 a good number of useful WHO publications concerning malaria and primary health care appeared to help health authorities in developing countries address the continually worsening malaria situation. Among these publications are the reports of the Expert Committees on Malaria (the sixteenth was published in 1974, the seventeenth in 1979, the eighteenth in 1986 and the nineteenth in 1992). These reports tried to advise on the strategies to be applied in malaria control under a myriad variety of conditions relating to the malaria epidemiological picture, the socioeconomic position, the primary health care coverage and the status and structures of the general health services.

These reports gave broad outlines and a long menu of approaches for the organiza-

tion of antimalaria services and their linkage with, or integration within, the primary health care system, as well as in the different methods that could be applied in the multitudinous varieties of epidemiological situations. However, one notes that their impact, both on WHO work or in the antimalaria activities of developing countries, left much to be desired. Certain excerpts from these reports show the dilemma faced by health authorities of how to extract from them recommendations that were suitable under the various epidemiological conditions, especially in the absence of a competent, specialized antimalaria service to plan control programmes and to implement them through a centralized command to reach epidemiological targets. This dilemma was expressed in the Nineteenth Expert Committee Report in 1992 [16] which stated the following:

“In January 1989, the WHO Executive Board, in resolution EB83.R16, had noted that the malaria situation had continued to deteriorate, increasingly hampering socioeconomic development and severely affecting the overall health status of populations, especially in the least developed areas of the world. Dr Bektimirov (assistant director-general of WHO) noted that, in May 1989, the World Health Assembly, sharing the concern of the Executive Board, had adopted resolution WHA42.30 affirming that malaria control must remain a major global priority essential for the achievement of the health-for-all policy and the objectives of child survival programmes. The control strategy enunciated in the report of the previous Expert Committee held in 1986, had in most countries not been implemented successfully, and the experience gained in these countries indicated a need for certain aspects of that strategy to receive further consideration. The four main aspects of malaria-control strategy that have been shown to require clarification and elaboration are: the diagno-

sis and treatment of the disease as presented at the various levels of the health care system; the epidemiological approach to malaria control; the contribution of antivevector measures to malaria control; and the management of epidemic malaria.”

The above quotation reflects the paucity of malaria expertise in most developing countries, after more than a decade since the integration of specialized malaria services into the primary health care system. It seems that WHO's consciousness of the deteriorating malaria situation, and the inaction of the ministries of health to redress the situation led the WHO Executive Board in 1990 to recommend the convening of a ministerial conference on malaria. It took two years to prepare for this Conference and it was held in Amsterdam in 1992. The objective of the conference was to mobilize those countries with deteriorating malaria situations, and the international community, to intensify disease control efforts. An excerpt of the executive summary of the conference expresses the present stand of WHO and Member States as represented by their ministers of health [17].

“In most endemic countries, the goal of malaria control will be to prevent malaria mortality and to reduce morbidity and the socioeconomic losses provoked by the disease. The goal in malaria-free areas will be to maintain that freedom. Success in achieving these goals depends on political support from the highest level. It also depends on a change in emphasis from highly perspective, centralized control programmes to flexible, cost effective and sustainable programmes adapted to local conditions and responding to local needs. This requires the progressive creation of national and local capacities for assessing malaria situations and selecting appropriate control measures that are aimed at reducing or preventing the disease problem in the community rather than being concen-

trated on reducing parasite rates in the population, as was too often the case in the past. In some countries the development of disease-oriented malaria control programmes has started, but in others too little is being done, or malaria control programmes persist with inefficient practices based on eradication principles. In the great majority of countries, eradication is not a realistic goal”.

The absence of examples of successful control programmes that had adopted the above goals and procedures to show to the delegates did not help the cause of the Conference. No wonder four years later the WHO Division of Control of Tropical Diseases, in its 1996 progress report, stated; “Globally the malaria situation is serious and worsening, with an increasing number of epidemics, particularly in poorer countries. The problem is increasing due not only to insufficient financial and human resources for control, but because of land degradation, deforestation and the expansion of agricultural exploitation and mining as populations migrate and countries strive to improve their economies. Furthermore, war, civil unrest and climatic change contribute dramatically to the malaria burden.” [18].

Addressing the malaria hyperendemic tropical belt of Africa, which contributes 90% of the global number of clinical malaria cases, and almost 100% of the global number of deaths, WHO can only recommend the use of drugs as a cure or prophylaxis. This approach has been going on for years, but the lack of financial resources and socioeconomic infrastructure have been a serious impediment to reaching the majority of dispersed rural populations. In comparatively affluent countries, a very high rate of consumption of antimalarial drugs is taking place and such abuses have led to the appearance of chloroquine-resistant falciparum strains which have spread rapidly across the tropical belt. The appearance of py-

rimethamine-sulfadoxine (Fansidar) resistance in falciparum strains in some countries in both the east and west of this tropical belt is quite ominous as its spread will deprive the health authorities of an effective alternative drug to chloroquine. This will constitute the health catastrophe of the 21st century, as the health budgets of most countries in this tropical belt will not be sufficient to cure malaria patients with the more expensive and still effective combination of quinine and tetracycline. The future impact of malaria on the social and health aspects for inhabitants of this tropical belt can be projected as follows:

- A drastic adverse demographic effect which is already happening but is being ignored. It is known that malaria kills directly and indirectly about 20% of the child population annually. This is the toll currently imposed by malaria to allow the surviving children to acquire some immunity against the disease. The acceptance of such human sacrifice to the malaria dragon is a breach of the Convention on the Rights of the Child. With the spread of resistant strains of falciparum and in the presence of a high rate of HIV infections, the human resources of the inhabitants of this belt will dwindle rapidly.
- The loss of the nutritional value of food; as it is known that a febrile episode of a clinical attack of malaria in an adult uses approximately 5000 kCal a day, or the equivalent of 2–3 days food energy [19]. The effect of this on a vulnerable group such as young children and pregnant mothers is reflected in high mortality among these groups due to the lowering of their immunity, already lowered by malaria, to current infections.
- The malaria problem will prove a great hindrance to socioeconomic development in the fields of health education, land exploitation, mining, road construction, agriculture, and tourism—all of which are already being experienced in most countries of this belt, leading to greater poverty and underdevelopment.
- Formation of megatowns surrounded by insanitary slums due to mass movements to cities to escape from the ravages of malaria in the countryside, leading to a massive reduction in the agricultural labour force available and consequent loss in gross national revenue.
- The tropical belt is the motherland of falciparum parasites and, though at present one notes a retreat of falciparum malaria from its previous geographic distribution, these parasites are gaining more and more resistance to our chemical weapons, awaiting the approaching global warming phenomenon to regain their lost territories in the temperate regions of the world with catastrophic results among the malaria non-immune population of these regions.

It is apparent that both WHO and developing countries are losing the battle against malaria. No new strategy or declaration of war against malaria (still known as the king of tropical diseases) can help, unless there is a simultaneous socioeconomic uplift, and organized malaria control with an antivector component and epidemiological input. The falciparum axis is forcing the human race to take the difficult decision of establishing a new world order. Some of the intermediate steps that can be implemented with international technical and financial support, until the difficult decision is taken, are presented in the following text. It is to be realized in the meantime that as the WHO malaria eradication programme uncovered the skeletal health structures of developing countries, the implementation of the primary health care system uncovered the stark poverty of millions of people living in the least devel-

oping countries, who represent one-third of the population of all developing countries. According to WHO estimates, some US\$ 136 billion would be required to provide the 200 million people who live in dire poverty, with primary health care that could provide them with an internationally acceptable minimum standard of nutrition, health, transport and communications, housing, education and job opportunities [20].

### A forecast of the future— emergency measures

The forecast for the future global malaria situation under the prevailing policies and practices is rather grim. The continuing deterioration of the malaria situation arises mainly from the failure by health authorities to realize that the main objective of antimalaria activities should be to improve the components of the environment, both physico-biological and socioeconomic, that govern the chain of malaria transmission, making them more favorable to man. For this reason any redress of the situation should be directed simultaneously to both these components of the environment and not only to personal preventive and curative medicine.

Facing the urgent question of what can be done under the present circumstances, the writer presents below certain emergency measures to mobilize the resourcefulness of man against a deadly biological enemy, namely the falciparum parasite which is coming back with a vengeance and with renewed vigour; shielded from our antimalaria drugs with multiresistant strains and accommodated by vectors of high vectorial capacity who show little response to our chemical weapons, an enemy that can spread death and havoc in areas that had been freed from this scourge.

The following recommendations have to be considered in conjunction with those

mentioned by the author 17 years ago in the first issue of the WHO Forum under the title "Malaria Eradication Programme from Euphoria to Anarchy" [21].

- At WHO headquarters the Malaria Unit currently integrated within the Division of Control of Tropical Diseases should regain its former status as a division with its main units of planning and implementation, epidemiology and statistics, and operational research, so as to resume its effective contribution in providing technical support to the regional offices, in fostering much needed training activities and in reforming the disrupted malaria reporting system needed to give a valid assessment of the world malaria situation.
- WHO regional offices should follow the organizational structure of WHO headquarters. They should establish malaria control demonstration areas with WHO and other international agencies where they help to demonstrate how primary health care objectives can simultaneously address both socioeconomic reform and organize malaria control. These areas could serve as field training centres for future malaria workers.
- Ministries of health should establish malaria control units or services and accord them a vertical command structure up to district level to be able to reinstate the malaria reporting system and mobilize the teams of malaria epidemic control brigades stationed in the vertical structure at provincial levels.
- Each government of a country with developing malaria should establish a malaria task assignment board composed of ministries of health, agriculture, public works, development, communications and broadcasting, and defence—headed by the prime minister, to coordinate and assign certain tasks needed in implement-

ing the national socioeconomic and malaria control programme. This will be in consonance with the example given by the Secretary-General of the United Nations who, in January 1996 launched a Special Initiative on Africa and included malaria within the health sector.

- The Secretary-General of the United Nations should be requested to launch two further initiatives:
  - To keep the members of the Group of Seven industrialized countries involved in the needs of the global control programme via financial help and in fostering research on new antimalaria weapons and innovative development schemes.
  - To introduce in the UN Assembly a proposal for imposing a malaria social

development tax on oil exports as well as on gross agricultural products from tropical countries.

- The World Bank should foster the establishment of a consortium of the big pharmaceutical, chemical and genetic engineering companies to stimulate research aimed at finding new weapons against malaria and to help in socio-economic process.
- The decision by the 1969 World Health Assembly of maintaining the ultimate goal of all antimalaria activities as the global eradication of malaria be retained. By maintaining it, the public health authorities will be permanently reminded of their responsibilities and of what still remains to be done, even if it takes another century to reach the ultimate goal.

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I propose that together we Roll Back Malaria. Not as a revamped vertical programme but by developing a new health sector wide approach to combat the disease at global, regional and country and local levels.

Why malaria? Many have asked this question. For my part the answer is simple, I have learned it from many in this room and by travelling to your countries, particularly in Africa.

Malaria is the single largest disease in Africa and a primary cause of poverty. Every day 3000 children die from malaria. Every year there are 500 million cases among children and adults.

Who said that infectious diseases were becoming yesterday's problem? The human suffering is acceptable and so is the economic burden and impediment to progress. Time has come to respond with a new approach. Time has come to Roll Back Malaria.

Why now? Because the call is there. We have enough knowledge, skills and tools to launch a new concerted effort. Africa is responding. African leaders are committing to a renewed effort to control malaria. Africa should be spearheading the project.

I believe we should answer Africa's call and that of other regions if they choose to engage. I will invite broad range of stakeholders to join us in this initiative. UNICEF, the World Bank, industry, foundations and others who have a stake, a commitment and a contribution to make.

I encourage the leaders of the G8 countries to answer the call ....

Let me stress: Roll Back Malaria will not exclude work on other diseases. To the contrary. Successful containment is no endpoint. Rolling Back Malaria is no victory unless health systems are equipped to sustain the gains.

*Source: Dr Gro Harlem Brundtland, Director-General of the World Health Organization. Speech to the Fifty-first World Health Assembly, Geneva, 13 May 1998.*