IMPLEMENTATION OF THE GLOBAL MALARIA CONTROL STRATEGY

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Geneva, 8–12 February 1993

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1. **Introduction**

A WHO Study Group on the Implementation of the Global Plan of Action for Malaria Control 1993-2000 met in Geneva from 8 to 12 February 1993. The meeting was opened on behalf of the Director-General by Dr P. de Raadt, Director of the Division of Control of Tropical Diseases. Dr de Raadt informed participants that in January 1993, in its resolution EB91.R4, the Executive Board of WHO had endorsed the World Declaration on the Control of Malaria, adopted by the Ministerial Conference on Malaria (Amsterdam, 26-27 October 1992). The Board had urged Member States and interested partners to strengthen malaria control efforts in accordance with the Global Malaria Control Strategy (I) and to develop programmes that were flexible, cost-effective, sustainable and adapted to local conditions and local needs.

2. **The Global Malaria Control Strategy**

2.1 **Need for a malaria control strategy**

Despite considerable efforts this century to eradicate or control it, malaria is still the most prevalent and the most devastating disease in the tropics. It threatens about 40% of the world’s population, undermining the health and welfare of families, endangering the survival of children, debilitating the active population and straining both countries’ and people’s scarce resources by excessive public health costs, low productivity and impaired growth.

The problem is becoming qualitatively more difficult to manage because of the continuous intensification and spread of resistance to antimalarial drugs among parasites, which poses a serious threat of increased severity of disease and death. Quantitatively, the number of foci of intense malaria transmission is increasing because of changing environmental conditions in areas of intense economic development and the spread of malaria to areas previously free of the disease, as millions of people move into malarious areas to claim land, seek wealth or escape civil disturbances and war.

2.2 **Developing the Global Strategy**

Taking account of this situation, in 1989 the WHO Executive Board and the World Health Assembly, respectively, adopted resolutions EB83.R16 and WHA42.30, asserting that malaria control must be a global priority, essential for the achievement of health for all and the objectives of child survival programmes. In January 1990 a proposal was made at the eighty-fifth session of the Executive Board that a global conference should be convened at a ministerial level to focus on this worsening situation, to adopt a global strategy for malaria control and to intensify the commitment to malaria control of political and health leaders and donor agencies.
The development of the Global Strategy was a combined effort involving experts at national, regional and global levels. It evolved during three interregional meetings held in Brazzaville, New Delhi and Brasilia in 1991 and 1992 and during the meetings of a global consultative group that guided the preparation of the Ministerial Conference. It was finally adopted by the Ministerial Conference in October 1992. 

2.3 **Aims of the Global Strategy**

Since malaria varies throughout the world, there is no single formula for its control in all countries or situations. On the contrary, each country's circumstances will determine the most practicable way to identify local problems and priorities and to design and implement appropriate interventions. The key is competent local action.

The Global Strategy stresses the indisputable advantage of sustainable, even if slow, progress over spectacular but ephemeral success. Its main goals concern problems that are not only important, but manageable. It recognizes that malaria control is an essential part of health development and, as such, has to contribute to the health system as well as make use of it. It allows its approaches and goals to be modified in response not only to the expected progressive improvement of the epidemiological situation, but also to unexpected situations arising from social, economic or political change.

The ultimate goal of malaria control is to prevent mortality and reduce morbidity and social and economic loss, through the progressive improvement and strengthening of local and national capabilities. But the necessity for local action must not be emphasized at the expense of the ability to see the situation as a whole and to convince decision-makers at district, national and international levels of the need to provide sustained intersectoral support for local action.

The four basic technical elements of the Global Strategy are:

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

2.4 **Setting priorities**

In setting priorities, the following major problems faced by malaria control programmes have to be recognized:

- In most countries of Africa south of the Sahara, where 80% of malaria mortality occurs, the quality and coverage of disease management by existing health services are still inadequate.
Many control programmes in Asia and the Americas lack the managerial and epidemiological capability to adapt their activities to the Global Strategy.

Many countries lack both financial and technical resources for implementing their malaria control programmes.

Although the needs of different countries vary enormously, it is possible to define the following common priorities.

In Africa south of the Sahara, disease management should be strengthened. As malaria is mainly a problem of young children, health services should receive guidelines and training for the diagnosis and treatment of malaria as part of WHO’s “sick child” initiative. This initiative includes disease management for malaria, diarrhoeal disease, acute respiratory infections, measles and malnutrition.

Availability and affordability to patients of effective antimalarial drugs should be assured. Government services may not be the only or even the predominant source of health care for malaria in communities. Control programmes therefore need to assess health-seeking behaviour and therapy practices outside the general health services and ensure that nongovernmental and private health care providers become partners of the health services. Drug providers outside the health services should be informed about the appropriate use of antimalarial drugs and the public should be informed about the risks of malaria. Given the rapidly evolving drug-resistance situation, assessment of the therapeutic efficacy of the antimalarial drugs in use should become a routine activity of control programmes. Certain malaria control programmes in Africa possess appropriate epidemiological information systems, based on health service data, in areas where transmission control would be cost-effective and sustainable. These countries could now establish a capacity for prevention through personal protection measures or vector control.

In Asia and the Americas, malaria control programmes that maintain eradication practices need to be adapted to ensure successful implementation of the Global Strategy. The main priorities in this process should be:

- political commitment for change and for planning malaria control as part of primary health care;
- ensuring proper disease management by the general health services;
- making available epidemiological information on morbidity and mortality, which should be produced by the general health services;
- using all relevant epidemiological data for better and more judicious targeting of vector control;
- selective use of appropriate methods of prevention, determined by an analysis of the local epidemiological situation and by operational research;
- training central-level and intermediate-level staff in programme management, health systems research and epidemiology.
In certain countries of WHO's Western Pacific and South-East Asia Regions, where programmes face extremely complex problems such as multidrug resistance and the heterogeneity of underlying social, economic and ecological factors, the priorities are:

- to ensure long-term technical assistance for operational research, applied field research, technological development, training and programme management;
- the rapid evaluation of new drugs with potential for the treatment of multidrug-resistant malaria.

In recognition of the enormous variability of malaria problems and of existing control programmes, objectives and targets will have to be defined country by country as well as region by region. The mobilization of adequate resources for planning, training, implementation and evaluation is crucial to success. While some countries will be able to provide those resources themselves, external assistance, both financial and technical, will be required in many cases. Mechanisms should be established for monitoring the global malaria situation, the implementation of the Global Strategy by national control programmes and the work of WHO. This will require, among other measures, the application of standardized indicators for information systems and programme evaluation.

2.5 Implementation

The Global Malaria Control Strategy represents a concerted effort to bring about changes in the way the malaria problem is addressed. Under the Global Strategy, malaria is no longer considered in isolation, with no reference to other health problems; instead, emphasis is placed on malaria's contribution to mortality, ill-health, inability to work and absenteeism, and to its adverse effects on the quality of life, especially among people in places where access to services is lowest and the risk of infection is greatest. The Global Strategy calls for a strengthening of health and social infrastructure, while promoting the fundamental right of all populations affected by malaria to have access to early diagnosis and treatment.

Implementation of the Global Strategy will require substantial re-orientation and the increasing involvement of the general health services, other government sectors, the private sector and, most importantly, the communities and individuals at risk from malaria. It will also require decentralization of the management structure and the strengthening of the local general health services to manage malarial disease.

Malaria control is already carried out in some communities as part of primary health care activities. In other areas, given the importance of malaria as a public health problem, malaria control operations may well serve to stimulate the development of effective local health systems.

Effective decentralization of malaria programmes should enable local authorities to respond to the needs of individuals, households and
communities promptly and appropriately. Decentralization entails the transfer of responsibilities, resources and knowledge from the central level to a country’s regional, intermediate and local authorities. It may be achieved in a variety of ways, depending on the political structure and economic situation of the country, but may meet with some opposition because of its political and social implications.

Since more tasks, responsibilities and resources will be entrusted to the general health services, legislation and the regulations of health ministries and programmes may need to be revised. Legislation may also be required to ensure intersectoral collaboration.

At the national level, a malaria control policy defining the national objectives and organizational responsibilities for malaria control must be formulated early in the process of programme planning or reorientation. A national plan for the implementation of this policy is essential.

Effective planning of malaria control activities requires the involvement of:

- professionals with an intimate knowledge of malaria as a disease, as well as the ability to select malaria control strategies and interventions in keeping with local conditions;
- general health service staff;
- experts on the political, social and economic factors related to malaria control;
- professionals in sectors other than health whose activities are related to the malaria problem and its control.

It is essential that there should be a core of malaria expertise within the health ministry to assist in planning, implementation and evaluation and to work with the general health services.

By changing the way in which the malaria problem is addressed, implementation of the Global Strategy should affect many current practices. With regard to disease management, it should:

- improve diagnosis and treatment, especially for severe and complicated malaria, by focusing early diagnosis and prompt treatment on those most at risk;
- ensure development of a national policy for disease management, which should be followed by the health services and all those providing patient care within the community;
- ensure that laboratory diagnosis is related to patient care and therefore save resources by reducing unnecessary collection of slides;
- ensure, where possible, that private diagnostic and treatment services are partners with the general health services in the management of malarial disease.

In the context of disease prevention, Strategy implementation should:
- promote self-protection measures where they can serve a useful purpose;
• speed up the recognition of and response to emergency situations;
• confine the use of vector control measures to the situations where they are most needed and where results can be sustained in the long term;
• ensure that malaria-safe practices are used in individual and community activities.

Implementation of the Global Strategy has implications for all the following groups:

• *Individuals, families and communities*, who should:
  – know how and when to protect themselves
  – be able to recognize illness
  – know what to do when they become ill.

• *General health service staff*, who should:
  – provide effective diagnosis and treatment
  – manage severe and complicated cases or refer them to facilities that can deal with them
  – provide health education for patients and communities.

• *Intermediate-level specialized service staff*, who should:
  – provide support and training for the general health services
  – analyse the local malaria situation
  – provide support and training in community-based malaria control
  – act to contain outbreaks and epidemics as quickly as possible
  – know in what situations to organize prevention on a wider scale, incorporating vector control where cost-effective.

• *Central specialized service staff*, who should:
  – know how to plan, guide and evaluate the implementation of national programmes that are consistent with the strategy for malaria control
  – ensure intersectoral collaboration
  – know how to adapt the health information system so that it provides useful information to those who need it, when they need it.

3. **About this report**

This report starts where the Global Strategy (1) ends. It gives guidance for the implementation of the Global Strategy, first at the regional level and then at national level, by providing:

• a framework for national governments to set priorities for the development and management of malaria control adapted to local situations and needs;
• guidance on the strengthening of the general health services to enable them to take full responsibility in the provision of early diagnosis and treatment for those at risk;
• guidance on the involvement of communities as full partners in malaria control activities;
• standards for the development of epidemiological and managerial information systems that will serve local and global needs for assessing the malaria situation and for programme planning, monitoring and evaluation.

It is aimed primarily at health service administrators and programme managers, as well as international partners in health development who have a role to play in malaria control.

4. Disease management

Early diagnosis and adequate treatment are basic elements of any malaria control programme. Early and correct treatment of malarial disease will shorten its duration and prevent the development of complications and the great majority of deaths from malaria. Despite the problems of drug resistance, falciparum malaria remains one of the most curable afflictions known. Access to early diagnosis and treatment should be seen not only as a component in any malaria control programme, but as a fundamental right of all populations affected by malaria. As such, it must be an essential part of health care development efforts. In contemporary control, treatment is provided to cure the patients of their disease, rather than to reduce parasite reservoirs.

4.1 Diagnosis and treatment of malarial disease

4.1.1 Development of a national policy for malarial disease management

It is the responsibility of every national programme to develop a policy for malarial disease management. Such a policy could be prepared by the technical unit and its advisers, discussed within the ministry of health, and adopted by a national meeting involving care providers, drug providers, health education specialists, and everyone else who has a part to play in making the programme work.

Ideally, a document should be prepared in the form of a declaration of the national malaria control policy, covering prevention as well as disease management. The disease management section should define criteria for diagnosis and the role of diagnostic tools, establish treatment algorithms and malaria drug policy, define the care providers (health services, community health workers, informal services, family members) and specify the structure of the referral system. It should also define the care to be provided, according to the type of malaria, the level of the health service and the resources available, e.g. drugs, personnel and finance.

National guidelines for the treatment of malaria should define for health personnel the recommended norms and criteria for recognition and diagnosis, therapy, referral and patient education for all forms of malaria.
4.1.2 *Malaria recognition and diagnosis*

Determination of patients' clinical history, signs and symptoms not only is an acceptable basis for the management of malarial disease, but can produce effective and standardized medical care.

Laboratory support for the diagnosis of malaria is of limited value for children and to some extent for adults in highly endemic areas, because of the high prevalence rates of asymptomatic parasite carriers. However, even in these groups, laboratory diagnosis is desirable for treatment failure and severe disease and, in many cases, for uncomplicated disease during the low transmission season.

In many parts of the world where malaria endemicity is comparatively low, especially in Asia and the Americas, malaria control programmes persist in promoting incomplete presumptive treatment for febrile patients and sometimes their relatives, and radical treatment only for slide-confirmed cases. However, since slide confirmation of malaria may take many days, this practice is not conducive to good patient care and usually it is not even epidemiologically sound or cost-effective. The principle should be that patients everywhere who are suspected of having malaria must receive full treatment without delay. Laboratory diagnosis should be used primarily as a support for clinical care. With the increasing problems of drug resistance in most areas with falciparum malaria, the need for laboratory diagnosis services nearer the periphery of the health services is increasing. Each malaria control programme should consider this in the context of other priorities. As far as possible, the extension and strengthening of health service laboratory facilities should be integrated with the efforts of other disease control programmes and the upgrading of general health services. The need for supervision and quality control by a reference laboratory should be kept in mind.

4.1.3 *Malaria drug policy*

The basis for the national drug policy should be a set of defined criteria for efficacy, side-effects, costs and compliance (see the WHO Technical Report *Practical chemotherapy of malaria* (2)).

Rational prescribing in the public sector should be promoted through the development and introduction of treatment guidelines, which can be used for basic and in-service training. These activities should be supported by the supply system to ensure that the drugs health workers have been trained to prescribe are actually available.

A drug policy based on the concept of essential drugs has many advantages. Promoting rational prescribing in the private sector is notoriously difficult, as the prescribers are influenced by many different factors, including patient demand, drug advertising and drug quality. The best option is often an efficient regulatory authority that critically reviews all applications for market approval, with strong inspection and
enforcement. Such a system can exclude many irrational therapeutic alternatives from the market. Better training in therapeutics at medical schools is also needed, although it will have only a long-term effect.

Many of the factors that influence national drug policy, such as the drug susceptibility of the parasite and drug pricing and availability, will fluctuate over time. National guidelines for treatment of malaria will, therefore, require periodic reassessment and revision. The problem of resistance to antimalarial drugs, especially chloroquine, has become a major concern for managers of malaria control programmes throughout the world. The malaria treatment policy should define the first-line drug to be used, taking account of the best available information on resistance. There is a need to establish a procedure for detecting an increasing rate of treatment failure and acting rapidly to counter it.

Particular attention must be paid to maximizing the availability of effective therapeutic drug regimens to malaria patients, while taking into consideration the necessity to protect some drugs from undue exposure. National policies have tended to result in the distribution of less efficacious drugs to peripheral health facilities, more effective drugs being reserved for central or referral facilities. In practice, this has sometimes institutionalized suboptimal malaria therapy.

An appropriate monitoring system for drug efficacy and resistance could incorporate the following components:

- Systematic notification of treatment failures, which may be defined using clinical criteria in the absence of laboratory facilities – this could provide an early-warning system.
- Precise determination of the proportion of treatment failures in a given patient population through simplified in vivo testing, based on a minimum number of post-treatment checks, and simple clinical assessment.

In any case, there will be a need to adapt treatment guidelines and take account of the wide variability between countries. It is important to be aware of the possibility of counterfeit drugs; a patient's failure to respond to treatment may be due to a substandard formulation or a missing active ingredient, and should not be confused with drug resistance.

During the past decade, a troubling array of adverse reactions to antimalarial drugs has been documented, in both prophylactic and therapeutic use. National malaria therapy guidelines should detail the known adverse effects of drugs, and define conditions, such as pregnancy, in which specific drugs are contraindicated for prophylactic and/or therapeutic use.

Where possible, a system for the monitoring of adverse drug reactions should be established.
Finally, if the private sector is to be improved, it may be necessary to review legislation regarding the distribution and sale of drugs, including antimalarials, over the counter. In many cases, better use could be made of salespeople's capabilities and their extensive network of contacts with the public.

In rural communities where government health services are inaccessible, antimalarial services should bring information to important individuals in the community, such as community leaders, schoolteachers, traditional healers and shopkeepers, who could learn to recognize malaria and be motivated to refer severe cases to the health services.

4.1.4 Special problems

Management of febrile illness and anaemia

The capacity to assess patients presenting with acute febrile illness is required at every level of the health services. Algorithms and treatment guidelines are recommended and are now increasingly used to diagnose and treat malaria. They describe the path to be followed from the first symptom through to the successful treatment of the patient. Ideally, algorithms should be developed and tested under local conditions. It is particularly important to take into account such factors as self-medication and the possibilities for referral. In the design of algorithms, the need for simplicity must be carefully balanced against the need for comprehensiveness.

Diagnostic criteria for febrile illness should be developed in an integrated format to cover the broad range of diseases that can manifest with fever in defined age groups (see also section 6.4.2 of this report). Algorithms for the management of febrile illness in children provide a valuable model for the logical integration of malaria management with other disease management programmes in the health services.

It is now increasingly recognized that persistent Plasmodium falciparum infection may produce anaemia in young children and pregnant women in the absence of fever. Clinical criteria for the definition of anaemia have proved to be difficult to standardize, except in severe and life-threatening cases, and laboratory support is generally required. There is a need for operational research to define suitable approaches to the management of these syndromes at peripheral health service levels.

The implementation of guidelines and algorithms is normally assured through training and supervision. This may be costly, particularly since it takes health workers away from their regular duties. Close coordination with related programmes, such as those dealing with diarrhoeal diseases, acute respiratory infections and essential drugs, is therefore required.

Management of severe and complicated malaria (3)

Malarial disease can progress to a catastrophic disease in a short time and, to date, it is not possible to predict which patients are at risk. Severe
malaria is not readily distinguishable from other severe diseases (pneumonia, typhoid, meningitis, bacteraemia) that require very different therapy. Optimal care therefore requires well developed diagnostic facilities and intensive care. Many patients cannot reach hospitals in time.

Clear guidance must be provided on the management of severe febrile illness, emphasizing the most effective distribution of diagnostic and therapeutic capacity for managing life-threatening disease. Centralizing these capacities in facilities that serve larger populations may be logical from a managerial standpoint, but this will not necessarily provide an appropriate service for people at greater risk, except those who reside in the immediate catchment area of that facility. It is therefore important to optimize, by means of guidelines and training, the capacity of services in the periphery for providing emergency treatment.

**Antenatal and perinatal care**

In areas of *P. falciparum* transmission, pregnant women require special attention. Depending on the local intensity of transmission, pregnant women may be at increased risk of severe malarial illness or impaired fetal development, due to maternal anaemia and poor nutrient transfer across the placenta. Historically, health services have focused on the prevention of malaria in pregnancy rather than on treatment, with chemoprophylaxis delivered in antenatal clinics. In most countries, however, compliance has never been adequate, and chloroquine resistance is making it increasingly difficult to define effective and acceptable regimens.

Opportunities for more integrated care of pregnancy-associated diseases are evolving in the context of the WHO/UNDP/UNFPA Safe Motherhood Initiative and other initiatives whereby more comprehensive risk assessment during pregnancy can be offered in the health services. These initiatives combine disease therapy and prevention, and malaria management should be an integral part of them. Operational research is under way which will probably suggest new approaches to antenatal and perinatal care, based on screening for anaemia and radical treatment when necessary.

**Referral systems**

An important element of current strategies is the referral of severe and complicated malaria cases to more specialized facilities. Referral of cases of suspected therapy failure for further evaluation and treatment with restricted second-line drugs has also been advocated.

In general, it is recommended that referral mechanisms should be strengthened to ensure that referred patients receive prompt care at higher levels of the health care system. It has to be recognized, however, that a visit made to the health services may be costly in terms of both time and money. Referral of patients with minimal resources to another level of the health service may, therefore, result in no further treatment being given, since they
may never actually attend for treatment at the next level of care. It is therefore important for countries to clarify the purpose and ensure the efficiency of their referral systems.

4.2 Training and health education for malarial disease management

4.2.1 Training

The management of malarial disease by health personnel is frequently inadequate. This may be due to deficiencies in curricula in medical schools and training courses and the absence of established mechanisms to enable health services personnel to keep up with changes in national policy and guidelines. A critical task for the specialized services is to develop training programmes and materials for all levels of the general health services. It is important to promote an understanding among health personnel that, in areas with inadequate health care facilities, market traders, shopkeepers, etc. are not adversaries, but actual or potential partners in the provision of health care.

4.2.2 Health education

People in malaria-endemic areas generally recognize malaria and have some sense of what to do if they or their children have the disease. The population's perception of malaria is one of the most critical factors in determining whether any disease, be it malaria or not, will be treated effectively.

Health workers and malaria programme managers need to understand people's beliefs about malaria and its complications. In some areas people still do not know that malaria is transmitted by mosquitoes. Malaria may be viewed as a febrile disease, but severe complications such as convulsions, splenomegaly and anaemia are sometimes thought to be completely unrelated. In some countries convulsions, for example, are believed to have supernatural origins. Under such circumstances, it is easy to understand why delay in presentation to the health services is common.

It is an important responsibility of the health services to educate communities in the use of available services. National programmes must clearly define the message to be given to individuals about where and when to seek care and when to come back for further treatment. Health education should enable people to identify disease symptoms that indicate the possibility of malaria or other febrile illnesses requiring medical attention. It should be integrated with health education for related disease control programmes, in planning as well as implementation and evaluation.

Private-sector treatment and self-treatment, especially in rural areas, are often the rule rather than the exception. A large percentage of households
in malarious areas keep a stock of chloroquine on hand, and antipyretic drugs are frequently used in conjunction with, or in place of, antimalarial drugs.

In addition to traditional beliefs about malaria, the reasons for the widespread practice of self-medication are numerous, and include:

- inaccessible or poor-quality health services, resulting in lack of confidence in the health services and in the availability of drugs;
- ineffective or unrealistic treatment policies;
- social and cultural barriers and the cost of seeking care, including transport and fees for service.

In many countries, the public receives most of its information on malaria from commercial sources, rather than the health services.

Although there are problems with self-medication, it will continue to be an important source of treatment for the foreseeable future. The time and money spent privately by patients and their families constitute an important resource for malaria treatment. The most productive and realistic course of action is, therefore, to improve local practices. Ways in which this can be done include:

- Development of simple, clear messages for dissemination to the population at large, including information on the causes of malaria, its symptoms and complications, the appropriate drug and dosage, and when to seek further treatment.
- Development of new methods for disseminating information and services. While community health workers are not always effective, they are sometimes the best approach for providing services to people in remote areas. In some cases, improvements could be made to make them more acceptable to the population. Other options might include peer educators, women's clubs, schoolteachers and schoolchildren (often more literate than their parents); advertising; and training and upgrading the skills of rural and urban shopkeepers and drug sellers.
- Ensuring that treatment policies are realistic. The widespread use of self-medication ought to be more specifically recognized in guidelines for treatment in health facilities; frequently, the treatment provided in a health facility is not in fact the first treatment for that episode of illness, and patients will not be satisfied if they are prescribed the same drugs as they have already taken.
- Reducing or eliminating economic barriers to seeking care in formal health services. If the cost of care at health facilities is a deterrent, then no purpose is served by a fee-for-service policy, which may actually increase morbidity and mortality. Requiring cash contributions, in particular, may pose an insurmountable barrier for certain target groups.
- Taking account of people's traditional beliefs about malaria, to ensure that efforts are not misguided or misunderstood. More local investigation into this is needed; the results must then be translated by
local and national initiatives into more appropriate messages and more appropriate ways of ensuring that treatment is both prompt and adequate.

4.3 Drug supply and logistics

In malaria-endemic areas, antimalarial drugs are often in restricted or short supply in the health services. To a great extent the demand is met by commercial sources; yet, in general, this marketing is unregulated, and drug quality and pricing vary widely.

While the national malaria drug policy should serve as the guide for drug procurement and production, the general health services are normally responsible for providing access to safe and effective drugs at an affordable cost. National governments are addressing the need for such drugs in many ways, notably through essential drugs programmes.

Antimalarial drugs are often the most widely consumed and most expensive single items of expenditure in a national drug budget, and the essential drugs programme has a strong incentive to cooperate in making sure that they are used as rationally as possible. In virtually every case, generic drugs will be the most appropriate for malaria treatment. Their use in preference to more expensive proprietary products could make more funds available for other malaria control activities, such as training and education.

Governments are increasingly asking their peoples to pay for services or drugs, or both. If user charges are well designed and affordable, they can have a positive impact on the availability and rational use of drugs. But to achieve this, the community has to be involved in decisions about the management and use of funds and the level of fees, and in making sure that the system is equitable and protects vulnerable groups. Such schemes should not allow the government to abdicate its responsibility to provide and fund health services.

4.4 Quality assurance

The Global Strategy’s emphasis on case management leads naturally to consideration of the quality of care provided in suspected malaria cases, for prophylaxis and in the clinical management of malaria and related conditions such as anaemia. In its most common form, a quality assurance programme consists of a set of continuous activities carried out by programme staff themselves, with the objective of assessing the care actually given, developing interventions to improve the quality of care or its efficiency, and evaluating the impact of these interventions. For most malaria control programmes, clinical care should be the first priority in a quality assurance programme.

Quality-of-care assessments carried out in several different programmes suggest that actual care often varies widely from the standards set by the
programme. Implementation of the Global Strategy's disease management component will require programme managers to give systematic attention to measuring and improving the quality of care, for example by action in the following areas:

- **Development of standards**: standard case management procedures need to be defined.
- **Communication of standards**: a systematic effort to ensure that the standards are clearly understood by clinical staff is one of the simplest ways for managers to promote high-quality care. Among the measures that can be used to communicate standards are manuals, treatment charts, checklists, standardized clinical records, formal meetings, supervisory visits and written communications.
- **Supervision**: objective standards should provide a point of reference against which supervisors can evaluate specific components of history-taking, physical examination, treatment, counselling, referral, follow-up and any other element of care. Where care is deficient, supervisors have a well defined opportunity to take action to improve service providers' performance.
- **Patient satisfaction**: many issues of programme coverage, patient compliance and referral appear to be reflected by the subjective impressions of patients. Techniques for assessing patients' views include target-group studies, patient exit interviews and more informal discussions.

5. **Disease prevention**

5.1 **Introduction**

Malaria remains endemic in areas where:

- the standard preventive measures of eradication programmes (indoor insecticide spraying, case detection and mass treatment) have not been effective or could not be used on a large scale; or
- the large-scale application of those preventive measures resulted in a decrease, or even interruption, of malaria transmission, but malaria resurgence, often in the form of epidemics, could not be prevented for various reasons.

The commitment of established control programmes to the continuous application of these measures consumes the largest proportion of their resources in the pursuit of malaria prevention, with progressively diminishing returns. Moreover, the emphasis on trying to achieve total coverage in house spraying in the past meant that services did not develop epidemiological information systems that would have alerted them to the appearance of new, often rapidly developing problems.

The Global Malaria Control Strategy stresses the selective use of preventive measures, wherever they can lead to sustainable results. Such
use should also aim at minimizing the wasteful use of resources, halting the current deterioration in the malaria situation, and contributing appropriately to the development of health services, intersectoral cooperation and community participation.

When planning malaria control, key elements in the epidemiology of malaria should be taken into consideration, such as the following:

- Malaria is focal as well as very variable in its epidemiological characteristics, as a result of the different ways in which humans, vectors and parasites have adapted to different biotopes and to environmental modifications, whether natural or produced by human activity.
- Although malaria vectors have developed resistance to insecticides in some areas, and *P. falciparum* has become resistant to the most common antimalarial drugs in most of its area of distribution, malaria can still be prevented in many situations if appropriate measures are taken in time.
- The main obstacles to achieving effective control are the economic, social and educational barriers typical of the poverty, marginalization, discrimination and rejection that characterize the populations chronically exposed to high risk.
- Moreover, although malaria is a disease of poverty, because of its dependence on human/vector contact, it tends to spread following attempts at agricultural development, colonization or exploitation of natural resources, to such an extent that it often leads to the death or economic failure of the pioneers.

The issues involved in prevention are very different in countries that have never attempted eradication (referred to as Category 1 countries in the Global Malaria Control Strategy) and in countries with malaria control programmes that maintain large-scale vector control, using practices inherited from the eradication era (Category 2 countries).

The application of disease prevention methods currently faces a number of interrelated problems and obstacles, the most important being:

- Wastage of resources, particularly in the case of house spraying which is often done in areas where the risk is very low or where the effect, for operational or technical reasons, is very limited. In contrast, areas or situations where the risk is high and where spraying could be effective are sometimes left unprotected because of inefficient resource allocation.
- An inadequate epidemiological basis for vector control measures, using only parasitological data and ignoring morbidity and mortality data.
- Disregard of data from sectors outside the malaria services, e.g. the general health services, meteorological services and social, agricultural and development sectors.
- Lack of guidance in the selection of appropriate methods.
• Lack of qualified staff to ensure sound epidemiological targeting, evaluation and assessment of entomological parameters.
• Lack of funds.
• Outmoded managerial practices and administrative problems.

5.2 Identification of epidemiological types

The traditional approach to identification of major malaria zones by stratification has recently given way to a more pragmatic approach. This involves the identification of a limited number of main ecological prototypes based on accumulated empirical experience, their further characterization by local determinants, and the establishment of a link between situations with certain characteristics and specific options for control.

On the basis of readily available information, seven dominant epidemiological types of malaria have been identified in the context of the Global Strategy (I). For each of these, certain risks are particularly important and certain approaches to control more likely to succeed than others. These types will, however, require further refinement at the regional and national levels to reflect more fully the local and changing nature of malaria. Within the national context, the epidemiological types may correspond to major areas, specific ecotypes, population groups, individual localities such as cities with an urban or periurban malaria problem or even smaller units such as high-risk individuals in specific work situations.

The identification of epidemiological types and their refinement are particularly important for the definition of priority situations warranting preventive action. Particular areas of intense problems where preventive measures may be promoted and supported include forests, forested foothills and hills, forest fringe areas, development projects, agriculture, mining, construction projects for dams, irrigation systems and roads, and periurban areas, particularly those experiencing intense growth. The identification of different epidemiological types may also help to prioritize efforts to extend diagnostic and therapeutic services, particularly to the populations at greatest risk.

Vulnerable high-risk groups include: infants, young children and pregnant women in all endemic areas; mobile population groups, particularly those engaged in forest-related economic activities, gem mining, fishing and industrial and road construction work; ethnic minorities, refugees, displaced persons, travellers and pilgrims.

5.3 Selective vector control: options and criteria for use

Selective vector control is the application of targeted, site-specific control methods that are cost-effective. The principal objective of vector control is the reduction of malaria morbidity and mortality by reducing the levels of transmission. Specific strategies and activities are expected to be different
for different countries, owing to their diverse epidemiological, ecological, social and economic characteristics, which will determine the nature and extent of selective preventive action.

Thus, malarious areas should be carefully delineated in order to identify situations in which there is a priority need to resort to vector control and to select appropriate methods. The available methods differ widely in nature, in the level of and duration of their efficacy and in their appropriateness for local malaria situations, i.e. their site-specificity. Selectivity is essential, both in deciding whether and where to attempt vector control and, if the decision is to do so, in determining the particular method to use.

The sustainability of any vector control activity will be dependent not so much on the measure itself, as on the way it is promoted and applied and the perception that people have of its usefulness. Even if a certain method might be technically sound in a given area, a lack of infrastructure may prevent its efficient implementation. If funding for commodities and operational costs cannot be gradually taken over by local or national sources, the method is unlikely to be sustainable. If the qualified staff necessary for sound technical management are not already present, they must be trained.

The selection must be based on an adequate knowledge of the vectors concerned and the relevant environmental, ecological, social, economic and health service features. Expertise in all these areas should be drawn upon when preparing national guidelines for decision-making about the use of vector control.

Sections 5.3.1-5.3.4 describe the methods that are currently of greatest importance in vector control.

5.3.1 **Personal protection measures**

Many methods are available for personal protection. At present, much attention is being given to bednets, curtains, hammocks, eave strips, beads and other barriers impregnated with long-acting insecticides such as synthetic pyrethroids. Impregnated bednets have proved their efficacy in reducing morbidity and mortality in certain areas, but more research is needed to evaluate their efficiency under different epidemiological conditions.

Impregnated barriers have potential for individual and family protection. They also have the potential for reducing transmission when used on a large scale. However, their efficacy will be reduced where the mosquito species are primarily exophagic, or when people stay outside during the evening.

It is important to distinguish between the promotion of impregnated materials through public education, and their application as an intervention for malaria control, aiming at a certain level of coverage of a given population and funded fully or partially by public funds. In the latter
case, it is important that their efficacy under local conditions has been
documented and that sustainability can be ensured.

In many areas and cultures, the use of bednets has been widely accepted,
since they are considered to increase the quality of life and reduce the
nuisance from a variety of other arthropods such as bedbugs, ticks, lice and
cockroaches. Where people already use bednets, insecticide-treated
bednet programmes may be implemented relatively easily. In such cases,
impregnation with insecticide can be done by the community if an
adequate promotional campaign is carried out. However, reimpregnation
may not be carried out unless users feel that it is effective in reducing not
only bites from mosquitoes, but also the nuisance caused by other
arthropods.

There is a concern that mosquitoes as well as nuisance arthropods might in
the long term develop resistance to the insecticides used for impregnation
and compromise the acceptability of impregnated bednets for malaria
control.

5.3.2 Indoor residual spraying

From a technical point of view, house spraying with long-acting
insecticides has been effective against anthropophilic and endophilic
species in many epidemiological situations. In contrast, it is ineffective
against exophilic and exophagic species. The efficacy of residual
insecticides may also vary according to the structure of the house and the
type of sprayable surface (e.g. mud, wood, wattle, thatch, palm leaf,
corrugated iron). The effectiveness of house-spraying programmes also
depends on public acceptance, which is very often reduced when spraying
programmes continue over many years.

In some countries, the extent of house spraying has been reduced without
an increase in malaria by a gradual shift to well targeted spraying of priority
areas identified through effective information systems. House spraying
remains particularly useful and effective in the control and prevention of
epidemics, provided that it can be applied at the right time and its
effectiveness can be maintained. The use of insecticides is also warranted
in areas of economic importance, for limited periods of time in refugee
camps, and for the initial protection of non-immune settlers in
development areas.

House spraying and space spraying require skilled managers, reliable
equipment, well trained staff and strong financial support. Therefore, the
choice of these methods has to be made with great care according to actual
and foreseen needs. Because of the enormous resource implications, it is
necessary to:

- define those situations where spraying is justified;
- establish priorities for the use of resources and the identification of
  areas where spraying should be gradually discontinued;
• define areas where spraying can be maintained in a rational, cost-effective way and where continued application is fully justified by its impact on malarial disease.

In this context, it has to be considered that, where spraying is still acceptable and seen as useful by the population, it cannot simply be stopped without explanation. Changes have to be carefully planned.

Entomological expertise is required for the decision whether or not to use spraying. This competence should be shared with control programmes for dengue, leishmaniasis and other vector-borne diseases, and coordination with the agricultural sector must be assured.

In instances where spraying has been undertaken continually for a long time, an assessment of its epidemiological impact is required. This may be difficult because of the inevitable influence of many other factors. However, it is possible to interpret most situations by a careful analysis of the relationship between the quality and coverage of spraying operations and trends in malarial disease. For example, if there is little or no reduction in the incidence of malaria after high-coverage spraying with an effective insecticide, it can be concluded that the spraying programme is ineffective. Under such circumstances, the spraying should be discontinued. It will also be appropriate to discontinue spraying if malarial disease decreases despite very poor spraying coverage, since the reduction cannot be attributable to the spraying per se.

In many countries, plans for spraying are based on a single uniform criterion, e.g. a certain annual parasite incidence (API). This is unacceptable, since such criteria do not reflect the disease problem and do not take into account the other epidemiological and social factors that affect the efficacy and sustainability of the spraying programme. The planning process and epidemiological information systems of such programmes require thorough revision.

The decision to undertake a spraying programme should be made only where it is operationally feasible and fully justified by relevant epidemiological information. It should never be an open-ended programme. In some parts of the world it is expected that impregnated nets may gradually replace spraying as a major prevention measure. However, this will not solve any problems if the change is made only from an operational perspective, without adequate testing of its effectiveness in terms of disease control under local conditions.

5.3.3 Larval control and environmental management

Larval control is realistic only in restricted areas, where the breeding sites are well defined. It can be achieved by environmental management and the use of larvicides or larvivorous fish.

Environmental management deserves to be used more often by the local community for collective protection from vectors, and incorporated into
the planning of development projects. Its incorporation into development activities requires collaboration between the health sector and those involved with development, agriculture, water supply and other relevant activities. National and international bodies supporting development activities should be, and often are, aware of the need for careful environmental, social and demographic planning and management. Policies must be established to ensure that development activities contribute to malaria prevention rather than creating or exacerbating a malaria problem.

At the village level, particularly in Asia and the Americas, the community can achieve good results by filling in abandoned wells and borrow pits. However, in many situations the epidemiological impact of such measures may be uncertain, since it will depend on the breeding habits of the local vectors. For example, anopheline mosquitoes breed in such a variety of water collections in the African savanna that such environmental management may not have a significant impact on malaria transmission, even if it may sometimes reduce the mosquito nuisance.

Large-scale environmental management, as part of land reclamation, agricultural programmes, municipal sanitation or public works in general, requires large specialized teams of staff. This has a high initial investment cost but may have low maintenance costs. The maintenance cost has to be taken into account at the planning stage; otherwise mosquito breeding may increase as a result of poor maintenance. The benefits of land reclamation are diverse; the recovery of fertile land is usually more important than a reduction in malaria. However, ecological considerations impose some limitations on wetland reclamation. Environmental and entomological factors should be carefully assessed before specific control measures are planned for a particular situation. Agricultural projects such as irrigation for rice cultivation in arid areas can result in increased malaria transmission and morbidity. In general, however, good agricultural practices, if well maintained, may contribute to better malaria control. The use of larvivorous fish has been successful only in certain rice-growing areas where breeding sites are well known and restricted in size. In general, the impact of larvivorous fish in national control programmes has so far been modest.

In urban and periurban areas, the use of chemical or biological larvicides may be a successful prevention measure if it involves regular treatment of all breeding sites and careful inspection at frequent intervals. This requires organization, supervision and permanent stocks of suitable larvicides and sprayers. In rural areas, the use of larvicides is not only operationally difficult, but not cost-effective.

5.3.4 Chemoprophylaxis

Chemoprophylaxis cannot today be considered on a par with other methods of prevention. The problems of drug resistance have increasingly
limited the choice of drugs available for chemoprophylaxis. In addition, the widespread and long-term coverage of large groups by drug prophylaxis may lead to poor compliance and accelerate the development of resistance.

Chemoprophylaxis is still desirable for pregnant women living in areas where transmission is very intense and leads to parasitaemias, causing low birth weight and anaemia, or to a high risk of life-threatening malaria attacks. However, the choice of safe drugs is becoming increasingly narrow, and it may be necessary to replace chemoprophylaxis by prompt treatment of clinical episodes or periodic treatments during pregnancy. While the choice of strategy should be guided by the national malaria control policy, its implementation should normally be part of antenatal care.

Chemoprophylaxis is recommended for travellers from non-endemic areas and, as a short-term measure, for soldiers, police and labour forces serving in highly endemic areas. Chemoprophylaxis should be complemented by personal protection and, where feasible, by other methods of vector control.

5.4 Implementation of preventive measures

5.4.1 Reorientation

The reorientation of malaria control programmes towards selective vector control, rather than total coverage based on outmoded eradication concepts, cannot be undertaken in isolation. It will need to meet the national objectives of malaria control and be carefully planned and evaluated.

Programme reorientation should start by strengthening the capabilities of the malaria programme to guide and the health services to execute control activities. An essential step is the reorientation of the health and programme information systems and the epidemiological stratification of malarious areas.

Major emphasis should be placed on the establishment of mechanisms to predict, detect early and alert others to respond rapidly to changing transmission and epidemiological situations, epidemic risks and actual epidemics, and failure of ongoing control actions.

Other important elements in reorientation are:

- evaluation and reallocation of responsibilities to match the revised job definitions of malaria control personnel;
- reorientation of entomological services, where they exist;
- strengthening of intersectoral cooperation and activities;
- documentation of experiences.

Decentralization of decision-making and use of resources is essential for reorganization. Decentralization of the activities themselves may be done
in different ways according to national policies, the risks involved, and the feasibility of developing a decision-making capacity at the intermediate and peripheral levels.

The main task is to ensure that the health service has an adequate decision-making capacity, so that the malaria control programme can be reoriented in a responsible way. If the policy of house spraying is abandoned, this may be the opportunity for the general health services to take over responsibility for both disease management and prevention and to integrate malaria staff into their structures. Malaria staff can then be incorporated, for example, into multipurpose teams responsible for epidemiology and hygiene. Their special skills may be of benefit in controlling a range of communicable and vector-borne diseases.

It is important to review legislation, which may hinder reorientation of malaria control programmes in many countries. Many, for example, have legislation that prevents insecticide spraying by non-professionals. In the Americas, WHO is already working with parliamentary representatives on the revision of general parliamentary legislation related to insecticide spraying.

To be effective and sustainable, a vector control programme must be part of the general health programme and should be based on the availability of skilled staff and on genuine community participation.

5.4.2 Community participation

Disease prevention and control cannot be adequately achieved without the cooperation and involvement of the community. Health managers must understand people’s social and cultural beliefs about malaria, the relationship between “mosquitos” and “disease” and the benefits people perceive from vector control.

Some recent surveys in Africa have shown that:

- Malaria is considered the most important of all diseases by the population, but there is a large discrepancy between the diseases they perceive as “malaria” and malaria as determined by physicians.
- Most people are aware of the possible fatal consequences of malaria but, although they may associate the mosquito with the bite and fever with malaria, they do not always associate mosquitoes with malarial fever, and particularly not with cerebral malaria, which is often thought to be of supernatural origin.
- The advantages of bednets are seen in terms of protection against bites far more often than protection against “disease”.
- People consider that insecticide-treated bednets are very useful, whether or not they have actually used them. In other words, accepting a concept is not always followed by changes in behaviour.

Clearly, more research is needed on the community’s perceptions of malaria and the possibility of the community itself taking an increased
responsibility for its control. The observations made in Africa suggest, however, that greater compliance can be achieved by presenting any vector control measure mainly as a fight against nuisance insects, rather than a campaign against disease.

Nongovernmental organizations have an enormous potential for providing materials such as bednets for control at the community level and, in some cases, are already doing so. They should become partners with the national programmes to optimize resources and ensure that a common policy is adopted.

5.4.3 Training and health education

The reorientation of vector control activities and their gradual incorporation into the general health services will require retraining of malaria programme staff to fulfil their new roles in multipurpose teams responsible for epidemiology and hygiene. Training will also be required to enable health service staff to take over their new responsibilities. The type and degree of retraining will depend on the redeployment of staff, local structures and the level at which the staff will operate. Plans for training should be developed as part of the plan for reorganization.

Where preventive measures are contemplated, the health services will require access to entomological and vector control expertise. In many places, a fully trained entomologist may not be required, but rather someone experienced in vector control. Such expertise may be found in local institutions or jointly developed with agriculture. Different problems and different kinds of prevention may require specialized training, which should be task-oriented.

The decentralization of prevention activities will require a strengthening of the capacity of local staff to stratify the local malaria situation, prioritize activities and select the measures to be carried out.

Curricula should be developed for training community health workers both for the implementation of community-based prevention measures and for health education of the population. Health education is particularly important in malaria control, where a lack of knowledge will interfere with the correct application of control measures. It should be delivered as part of primary health care.

Malaria and self-protection should also be part of formal education, particularly in primary schools.

6. Health information systems

The implementation of the Global Malaria Control Strategy at the country level requires the strengthening of national and local capacities for assessing malaria situations, for selecting appropriate control measures
based on the disease burden in the community, and for adapting activities to changes in the malaria situation. Information systems are a vital element in this assessment and selection process.

In the past, information systems in many countries were based on eradication criteria, such as parasite infection rates, with data analysed centrally. Generally, there was little feedback to the source of the information and practically no impact on future activities at the local level. Information systems need therefore to be reoriented to deal with malaria as a disease problem and decentralized so that information is available to and used by those who need it. In this way, malaria control activities can be constantly adapted to local conditions. An alert person in the community or at the district level is often in a better position to detect an abnormality and understand its causes than people working with data at a central level.

Such decentralization requires peripheral and district staff to be trained in the collection, recording, analysis and reporting of data. Staff must also have the authority to take on this responsibility and their activities must be adequately monitored and supervised.

Better use of health service information is essential for improving health care and preventing malaria, but this can be achieved only if recording and reporting are limited to data necessary for proper case management, disease prevention or programme management. Data should not be requested unless they are required for action at the level at which they are obtained.

This section provides guidance on the essential features of information systems relevant to malaria control implemented in accordance with the Global Strategy. In recognition that the greatest burden of disease occurs in those who have little or no access to the formal health services, the highest priority is given to obtaining information to enhance disease management at the periphery (sections 6.1 to 6.4 cover essential aspects of this priority). The remaining sections give more details about monitoring health services, selective vector control activities and epidemic risks, and strengthening operational research capabilities.

6.1 Information needs at the periphery

In many areas, government health services do not reach communities at risk of malaria, and there is a wide range of alternative sources of care (see also section 4.2.2). The magnitude of the local malaria problem and the extent to which it is treated outside the formal health services are largely unknown factors, but they must be understood if health care in the community is to be improved and resources targeted in a cost-effective way on those at greatest risk. In areas where government services do not exist, this information will have to be obtained by special studies but, where formal health services do exist, it can be collected by the community or village health workers.
Patients have their first contact with the formal health care system when they visit the community or village health workers. The type of information that could be obtained by the health workers at the periphery is given in the Annex, along with possible methods of collection and possible sources. Some of these data will be considered useful by the health workers, and so they will be motivated to continue gathering them. Other data, very relevant to the objectives of those working at the upper levels of the health system, will be of less interest and may, therefore, be badly and inaccurately collected. Thus, to ensure that data are of adequate quality, only the minimum of essential information should be requested from the periphery of the health care system.

6.2 Generation of information by general health services

6.2.1 Rationale

A change from specialized information systems for malaria towards integrated health information systems is essential if the general health services are to take full responsibility for managing malaria. An integrated health information system will allow the malaria problem to be related to other health problems in the country. Only in this way can the recognition of disease guide the management of individual care, as well as identify the places where preventive services are most needed. Using the same information systems for all health problems, with additional indicators for evaluation and monitoring of malaria control activities, will help to ensure that the evaluation process is well established within the general health services themselves, as opposed to being an external and specialized responsibility.

6.2.2 Epidemiological services

Although the specialized malaria service in most malarious countries may be far from perfect, it is often one of the few branches of the health services, or indeed the only one, which has the vocation and training for the analysis of epidemiological information. It therefore forms a basis on which to build or strengthen epidemiological services within the general health services.

A core of epidemiological specialists is crucial for the successful evolution of an integrated information system. The work of the core group will be to manage the transition from a malaria-only approach to an integrated perspective which brings malaria under the responsibility of the general health services.

In some countries, these changes will involve a radical redefinition of the information that should be collected, as well as an extensive redeployment of resources to obtain, analyse and report information. A revised health information system cannot be put in place overnight. The core group will need to plan, manage, implement and evaluate these changes. The following sequence is suggested in keeping with the orientation of the Global Strategy:
1. Reorientation towards the use of data directly related to disease management, especially at district and lower levels.
2. Development of a monitoring system for emergencies.
3. Reorientation of existing evaluation procedures to achieve cost-effective disease management and related support functions.
4. Strengthening of epidemiological capacity to support the selective use of prevention measures.
5. Prompt feedback to ensure replanning and modification of activities.

6.2.3 **Improving the quality of information generated through the general health services**

The main strength of information generated routinely through the general health services is its intrinsic link with service provision and its potential for immediate use in planning and improving activities. This potential is not being fully used at present, and intensive training at district and peripheral levels is required to develop the local capability to analyse data for local needs. Getting information quickly has been a particular problem, especially when data are forwarded to higher levels for analysis and interpretation. The potential for routine surveillance and constant analysis has seldom been achieved, principally because service personnel find the task of collecting data burdensome, receive little benefit from doing it and are poorly trained in simple analytical techniques. While these weaknesses are not easily rectified, the generation of data through the general health services can be improved by training courses and workshops and standardized diagnostic, treatment and referral criteria. The type of information that could be collected routinely as part of patient management at health centres or at the district level is shown in the Annex.

There is also a need to strengthen the capability to use these data at the intermediate and central management levels of the health services and to ensure feedback. The type of information required at this level of planning is also shown in the Annex.

Often, routine surveillance cannot adequately monitor mortality and severe disease in the community. This information can be obtained only by special studies or operational research. The capability and means of carrying out such studies should be available at least at the central level.

6.3 **Reorientation of information towards disease management**

The implementation of locally feasible and effective disease management programmes requires information to be available and be analysed at the source.

In countries that have previously concentrated on eradication, too many data are gathered which are unrelated to clinical disease. The information generated from the active case-detection process and from mass parasitological surveys is costly in terms of human and financial resources, provides no indication of the true burden of disease and generally serves
no useful purpose. Instead, it should be replaced by estimates of the impact of malaria on health. There is a belief in some countries that exhaustive details about the number of cases are useful. This attitude must be modified through training, so that staff learn to accept that disease trends and patterns are the principal concern of malaria control programmes.

Implementation of the Global Strategy should lead, in time, to the disappearance of the indicator “positive slide”, and its replacement by “fever treated with antimalarial drugs” at community health workers’ posts, “clinically diagnosed malaria” at peripheral health centres, “referred severe cases” and “referred treatment failures” from both these levels, and “parasite positivity of referred severe cases and treatment failures” in hospitals and health centres.

As blood smears are confined to patients seeking care, it becomes important to decide and report on the care given to those whose blood does not show malaria parasites on microscopical examination. This raises the wider issue of reporting on the diagnosis and treatment of diseases other than malaria, a subject that is not covered in this report. Nevertheless, it is important to note that “integration” of health care at the periphery has important implications for the reporting of patient care, which will need to be taken into account in the design of new reporting procedures and forms.

6.4 Malaria case definition

In all countries of the world malaria must primarily be defined in association with clinical disease symptoms. The most common case definition assumes malaria if the patient presents with a fever that has no other clear cause, either alone or with accompanying symptoms, but this global definition lacks both sensitivity and specificity. The case definition for malaria cannot be uniform throughout the world. Each national malaria control programme must adapt the definition and introduce additional indicators to make it more applicable to local epidemiology and control targets. The number of cases can then be used as one of the principal indicators of the impact of malaria control. The malaria case definition will vary according to how malaria is perceived in the country, by its local pattern of transmission and its disease consequences. It will also be influenced by logistic factors, including the level of the health service at which diagnosis is made and the methods available for treatment.

6.4.1 Case definition by microscopy

In areas where both *P. falciparum* and *P. vivax* occur and where preferred therapies for the two infections are different, confirmation of malaria diagnosis through microscopy is both feasible and desirable. Microscopy should be used to confirm the species in sick patients and to identify recrudescence resulting from treatment failure or relapse. This information will provide a basis for evaluating the impact of disease
management activities. Although exhaustive information on every case is unnecessary, some attention must be given to the origin of the infection and previous use of antimalarial drugs.

6.4.2 Clinical case definition

In areas of stable and intense malaria transmission, e.g. much of tropical Africa and Papua New Guinea, the high level of immunity acquired early in life results in a high prevalence of asymptomatic infections. Over 90% of these are due to *P. falciparum* and there is limited correlation between the level of parasitaemia and the clinical condition of the patient. In these situations, microscopy may not be particularly useful in defining a case of malarial disease. In many of these areas, malaria is virtually indistinguishable from other febrile illness at the community level and, in the absence of adequate laboratory support, even at higher levels of the health service. Modification of the classical case definition is required to take into account the disease consequences of malaria and the interpretation of malarial disease in the presence of other disease. Severe anaemia in children and pregnant women, low birth weight and high rates of splenomegaly may be used as indicators of inadequately controlled malaria in the community.

In areas where several diseases are prevalent, and there is a need to focus on disease management in general, rather than specific malaria management, a disease indicator may be adopted that covers all the commonly seen diseases forming part of the differential diagnosis. This will vary from country to country and, occasionally, within the same country. In many African countries, such an indicator might be called "acute febrile illness". It could, for instance, be applied to a child who has developed a sudden illness characterized by fever, with or without respiratory symptoms or diarrhoea.

6.4.3 Monitoring malaria deaths

Mortality has always been considered the obvious primary indicator of a serious malaria problem, especially in vulnerable groups. However, the cause of any particular death is difficult to assess without recourse to autopsy. Malaria-associated deaths occurring in the community, estimated to be about 90% of all malaria deaths, cannot be ascertained through most routine surveillance systems, particularly in African countries south of the Sahara.

Alternative approaches for estimating malaria-associated deaths in the community are required, for example special surveys or "sentinel-site" monitoring. Trends may be observed through sentinel-site monitoring of selected hospitals, and data have shown that such trends sometimes, but not always, represent mortality occurring in the community.
6.5 Information requirements for evaluation and monitoring

6.5.1 General aspects

Evaluation and monitoring of service procedures inside the health services, and outputs from other sectors outside the health services, are the basis for determining the efficiency and effectiveness of malaria control. The management and planning of evaluation and monitoring are described in section 7.3 of this report.

Locally generated information is required to:

- define locally effective malaria management and standardize guidelines and practices, both within the general health services and outside the formal service delivery infrastructure;
- coordinate the roles of the different sectors and the general health services;
- assure full coverage and access to disease management and disease prevention activities for populations at risk from malaria.

The concept of monitoring through health indicators needs careful application. Although certain categories of indicator data may be felt to deserve special attention by health workers and may be of special value for summarizing and passing on to a higher level for monitoring purposes, they must also be useful to the people responsible for recording the data. As mentioned previously, to ensure that data are of adequate quality, only the minimum of essential information should be requested from the periphery of the health care system. The main criterion should be direct relevance to the key objectives of the malaria control targets set at the different levels of the system.

Care must be taken to avoid promoting indicators nationally or globally that have not proved useful in service management. International reporting and monitoring requirements should not influence the choice and definition of national and service indicators to the detriment of data that are more appropriate to the local circumstances.

6.5.2 Monitoring of the health services

Key disease indicators

Service and control procedures within the health care system can be monitored by assessing their direct impact on health. Measurement of disease is derived from the locally defined case definition of malaria, discussed in section 6.4.

A selection of key disease indicators is listed below; they represent the types of important data that are required to determine the presence of malaria. Regions and countries would need to choose those most appropriate to their own malaria situation. The list is not exhaustive, and changes to the existing indicators and the addition of new ones may be required, according to local epidemiology and the level of the health services.
- The number of patients with acute febrile illness seen at a health facility in any one month.
- The proportion of febrile patients among patients seen at health facilities.
- The number of patients each month who have clinical disease that has been confirmed as malaria in the laboratory.
- The number of microscopically confirmed severe malaria cases seen at referral health facilities during a one-year period.
- The proportion of microscopically confirmed severe malaria cases among all patients seen at referral health facilities during a one-year period.
- The proportion of children with severe anaemia among paediatric admissions to health facilities.
- The proportion of pregnant women with severe anaemia among those attending antenatal clinics.
- The proportion of patients in whom first-line therapy has failed in any one month.
- The proportion of babies of low birth weight (<2500g) delivered in health facilities.

Although malaria-specific mortality is difficult to monitor, particularly in health facilities, indicator data should still be gathered because they provide a basis for monitoring mortality trends and quality of care. The following indicators are examples, which again may need to be modified at regional and country level according to epidemiological characteristics and health service structures.

- The number of deaths in health facilities that follow a malaria-like illness, confirmed microscopically.
- The proportion of all deaths in health facilities that follow a malaria-like illness, confirmed microscopically.
- The proportion of patients hospitalized with a malaria-like illness, confirmed microscopically, who die in hospital (case fatality rate).

Management indicators
Some countries where malaria is highly endemic are finding that direct indicators of disease impact provide little positive information about the progress of control measures. Monitoring the progress and efficiency of planned activities is now taking precedence in these countries. Such indicators, which can be generated through the health services, are extremely varied and countries should select a minimum number that best reflect the activities and targets of the control programme.

The first group of indicators is concerned with the performance of service providers, for example:

- The proportion of patients seen by the provider and meeting the local/national case definition whose illness is correctly diagnosed.
- The proportion of patients in whom malaria is diagnosed by the
provider who are prescribed treatment in accordance with national policy.
• The proportion of providers who use national disease-management guidelines correctly.

The second group is concerned with facility resources, for example:
• The proportion of health facilities in which providers can produce a written copy of national/local guidelines for case management of disease.
• The proportion of health facilities having at least one thermometer in working order.
• The proportion of referral facilities where malaria confirmation by microscopy is possible within two hours of a request.

The third group is concerned with quality of care, for example:
• The proportion of all patients receiving the full course of antimalarial therapy.
• The proportion of mothers and carers given advice by the provider on unresolved symptoms in children that require a return visit.
• The proportion of patients turned away to be seen on the following day.

The fourth group is concerned with supervision, for example:
• The frequency of supervisory visits made in one year.
• The proportion of supervisors possessing national/local case-management guidelines.

The fifth group is concerned with training, for example:
• The proportion of staff in a health centre who have received training or refresher courses in the past five years.
• The number and type of training courses available for district medical officers in one year.

Indicators of staff competence can be derived from the indicators concerning quality of care (see above) and distribution of supplies (see below).

The sixth and final group of indicators is concerned with distribution of supplies, for example:
• The proportion of facility directors who report that, during the past three months, stocks of antimalarial drugs present in their clinics have been sufficient to treat all patients appropriately.
• The proportion of hospital directors who report that, during the past three months, stocks of safe blood and transfusion equipment have been sufficient to treat all patients appropriately.
6.5.3 Monitoring factors outside the health care system

Intersectoral collaboration for the gathering of data available outside the health services is essential. These sources will enable managers to identify and predict the potential impact of demographic, social, economic and environmental factors on malaria and strengthen the local capacity for negotiation with other sectors. In general, the data sources outside the health services that can be used will depend on the epidemiological situation of each country (see also section 5.2). The various types of information that may be required concern:

- **Environmental factors**, for example:
  - seasonal variation and changing patterns of rainfall, temperature and humidity
  - type of settlements and housing construction.

- **Demographic factors**, for example:
  - population density, growth and settlement patterns
  - population movement and occupation.

- **Developmental factors**, for example:
  - staple economies (e.g. local agriculture)
  - local development projects and industry
  - economic commitments.

- **Drug procurement and distribution factors**, for example:
  - registration policies of the drug regulatory authority
  - local manufacturers and distributors
  - import practices and quality control
  - drug availability
  - basis for provision of drugs (legal, guidelines)
  - drug types, dosages and regimens
  - costs.

Information will also be required from other sectors at all levels of programme planning. Ministries of agriculture, trade and industry, and development are an invaluable source of information on many factors influencing malaria.

6.5.4 Monitoring for disease prevention

The Global Strategy calls for the selective use of preventive measures and the reorientation of vector control activities. As a consequence, information systems supporting disease prevention will also need to be reoriented.

**Information for disease prevention**

Disease prevention requires an information system that provides the epidemiological and other data necessary to identify the situations where activities can be focused and to measure their efficacy and
cost-effectiveness. Knowledge and information about the following aspects are required:

- Geographical areas and populations affected by or at risk from malaria.
- Development activities and other factors affecting population movements, living conditions and the environment.
- Sensitive indicators to detect epidemic risks in areas with different levels of epidemicity.
- Epidemiological and operational determinants relevant to the selection and use of methods.
- Control methods – their specifications, costs and sources; their efficacy and appropriateness under local transmission situations; their cost-effectiveness; the procedures for their application.
- Experiences – successes and failures in disease prevention, and the reasons for them.
- Community-based programmes involved in or with potential for disease prevention.

Selection of indicators for disease prevention

There is a great need to rationalize the type and amount of information collected to support disease prevention activities. Indicators are required that enable managers to monitor the main epidemiological and operational determinants. Key disease prevention indicators are:

- **Malarial disease** (see also section 6.5.2), for example:
  - the number of clinical episodes of acute febrile disease reported by local clinics in one month;
  - the number of pregnant women with acute febrile disease reported by antenatal clinics in one month;
  - the number of patients each month with clinical disease that has been confirmed as malaria in the laboratory;
  - the number of patients each month with severe malaria that has been confirmed in the laboratory;
  - the proportion of babies of low birth weight, premature deliveries, stillbirths and neonatal deaths, reported monthly;
  - the proportion of maternal deaths, reported monthly.

- **Entomological factors**, for example:
  - vector species, density and feeding habits.

- **Human factors**, for example:
  - the proportion of families sleeping in accommodation open to the outside;
  - the number of migrant workers arriving from non-endemic areas;
  - the number of families refusing specified vector control initiatives (house spraying, bednets);
  - involvement of malaria advisers in development projects.

- **Environmental, ecological and climatological factors**, for example:
  - rainfall patterns, altitude and temperature;
  - extent and type of breeding habitats near human settlements.
The monitoring of operational activities should depend on selected indicators specifically related to the control activity and target, for example:

- Proportion of households targeted for use of impregnated bednets which report that bednets are easily available.
- Proportion of targeted households that are sprayed during a single spraying cycle.
- The timing of spraying in relation to the local transmission cycle.
- Proportion of villages involved in community vector control activities.
- Proportion of health/environmental control facilities with:
  - insecticides selected according to national policy
  - sufficient spray pumps in working order
  - adequately trained staff
  - adequate transport resources to complete the spraying cycle.

In many countries, nongovernmental organizations and the private sector contribute to disease prevention, in particular by providing bednets and by carrying out other prevention activities as part of development projects. It may be difficult to obtain information about these activities by routine monitoring, so special surveys may be needed.

6.6 Mechanisms for monitoring epidemic risk

The Global Strategy includes epidemic preparedness as an essential component of malaria control and recommends the strengthening of information systems in all areas prone to epidemics.

Areas of epidemic risk and possible risk factors should be identified by consideration of the epidemiological history and ecological and social characteristics of specific areas. The possibility of predicting epidemics should be a constant preoccupation of services in all epidemic-prone areas, which include most areas in the highland or desert fringes, forest areas attracting agricultural colonization or mining and areas subject to sociopolitical unrest, natural disasters and the movement of displaced or refugee populations. Such forecasting may be possible if based on an information system capable of identifying high-risk periods, areas and populations at risk. The most relevant meteorological indicators are rainfall, humidity and temperature. Information from development projects regarding population movement and environmental change is also essential. If the indicators show that conditions are suitable for malaria transmission, it is appropriate to carry out special surveys on vector distribution and density.

In socially unstable areas where malaria is endemic, indicators reflecting population movement and the breakdown of health services may be used to predict potential malaria outbreaks or epidemics. Since routine data collection is impossible in politically unstable situations, rapid assessment techniques are the most useful way of assessing such situations.
Health workers responsible for areas and populations in epidemic-prone areas must be trained to recognize epidemic indicators, especially significant increases in the number of acute febrile episodes. They will need to appreciate the importance of accurate, timely and complete reporting of such episodes and of the quantity of drugs consumed, as these two indicators may be invaluable for early warning. It is very important that reports of an abnormal situation from the periphery are acted upon immediately by the higher levels (see also section 7.1.4).

6.7 Strengthening operational research capabilities

Operational research should be an integral part of the development of information systems for malaria control, so that the collection of data can be cost-effective and relevant to the planning process. Existing epidemiological practices may require modification to make them more relevant to control activities and more capable of providing the information required for the implementation, evaluation and replanning of control programmes.

Operational research on the standardization of procedures and improvement of decision-making tools for health information systems is essential for improving disease management procedures at district and peripheral levels. Simple tools, criteria and mechanisms are required to help staff at the periphery to analyse their own health data, to improve referral, to chart and take action on impending epidemics and to recognize and take action on developing community health problems. Operational research is also required for the development and field-testing of indicators for evaluating and monitoring programme activities, developing methods of sentinel-site monitoring, and assessing the potential for computerized databases at various levels of the service.

7. Programme management

For the application of the Global Strategy, the major priorities for programme management are to:

- ensure that the general health services take full responsibility for the management of malarial disease;
- ensure that malaria control is targeted on the populations most at risk;
- ensure intersectoral and community involvement in malaria control;
- decentralize management and strengthen managerial capacity at the intermediate and local levels;
- reorient programmes and resources away from malaria eradication practices;
- ensure that evaluation is a part of all programmes and that it leads, when appropriate, to replanning and changes in activities.

If it is to succeed, the Global Malaria Control Strategy needs to be translated into effective national malaria control plans and programmes.
This will require strengthening of the capacity of the health services to manage malaria control so that the human, financial and structural resources are used effectively and efficiently to accomplish the programme's objectives. Management should be a continuous cycle of planning, implementation, evaluation and replanning. This requires the establishment of relevant management and epidemiological information systems to provide the manager with the data needed to plan and revise the programme according to changing circumstances. Since one of the key features of the Global Strategy is the application of control measures in accordance with local situations, it will be essential to prepare feasible national plans and programmes that permit careful analysis of local problems and flexibility of response to them and to decentralize programme management so that those closest to the problem are given the responsibility of using the available resources most appropriately. The basis for good management is good planning.

7.1 **Programme planning**

7.1.1 **What is planning?**

Planning involves the following steps:

- definition of the overall programme aims;
- analysis of the malaria problem and its underlying causes;
- setting of priorities and objectives;
- allocation of resources and their organization for effective and efficient delivery;
- implementation of activities;
- evaluation of progress in achieving the objectives.

Where staff, commodities, funds and infrastructure are scarce, as in many developing countries, planning is of great importance in getting as much as possible accomplished with what little is available.

Planning should be a systematic and continuous process (see Fig. 1). It is a way of defining why, how, when, where and by whom the objectives should be achieved. It will require the establishment of links with areas outside the health sector to address the broad social and economic implications of malaria, as well as the support of appropriate government policies and

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**Figure 1**

The planning process

- Define programme aims
- Review existing situation
- Select strategies, plan activities, set targets, allocate resources
- Implement activities
- Monitor and evaluate
- Reconsider programme aims

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regulations. If the plans are realistic, well written and easily understood, then management will consist of action to achieve the objectives and targets of the plan and responses to divergences from the agreed plan when they occur.

Evaluation, including monitoring, should be a continuous part of planning. Ideally, it should provide the information needed for decision-making to increase the malaria control programme's relevance, efficiency and effectiveness.

7.1.2 Cost-effectiveness

This report has frequently referred to the need to identify cost-effective interventions and courses of action. Cost-effectiveness analysis can help managers to make decisions at various points in the planning cycle. It is designed to identify efficient courses of action, but it can also be used to analyse operational efficiency, i.e. to identify the most cost-effective way of performing a particular activity.

The costs used in cost-effectiveness analysis are economic, not financial costs. They should reflect the opportunity cost of using resources and not merely the price paid. For example, vehicle maintenance costs form a part of the total cost of malaria control, even if the vehicles are maintained by another part of the government and the cost is not charged to the malaria control agency. Moreover, economic costs should include, where possible, those incurred by users and not only those incurred by the provider of services. For example, a comparison of the cost-effectiveness of treatment centres needs to take into account the travel costs for users.

Where information on effectiveness is difficult to obtain, and at lower levels of management where managers are more concerned with operational costs, cost analysis may be a useful substitute for cost-effectiveness analysis. Cost analysis produces information on the total and unit costs of interventions, but not on their effectiveness. It can produce valuable information on the degree of waste, and if there is good reason to believe that the effects of the interventions being compared are similar, then cost analysis on its own may be sufficient for concluding that one intervention is more desirable than another. Assessing the productivity of resource use (without costing the resources) may sometimes be sufficient for determining efficiency. For example, relating workload to staff numbers can identify areas where staff capacity is not fully used.

Cost-effectiveness analysis can be applied at different points within the planning cycle. At the point when health priorities are established, attention must be paid not only to the need for particular health interventions but also to their costs. Once malaria control has been identified as a priority, there needs to be a detailed appraisal of the costs and effectiveness of feasible strategies. This assessment is more difficult in the initial planning stage than at the later evaluation stage of the planning
cycle, since some of the control strategies to be considered may not previously have been applied in the country in question. If this is the case, costs will need to be estimated from a detailed specification of the resources required, and assumptions about effectiveness made on the basis of general knowledge and information from other countries. Alternatively, pilot studies can be used to predict the cost and effectiveness of more widespread implementation. Once the strategies are implemented, they should be evaluated to assess whether they are really cost-effective.

The case with which costs can be assessed depends on the adequacy of the information system. The ideal accounting system is one based on programme budget principles, where programmes are identified that relate to the objectives of the health sector, and expenditure and volumes of activity are then recorded for each programme. However, such a budget system is less easy to implement when malaria control activities are fully integrated with general health service delivery, because programme budgets are likely to be structured by level of care, type of health facility or health service function, rather than by disease-programme functions.

It is unrealistic to expect all management levels to be able to carry out cost-effectiveness analysis. For example, at the district level managers are likely to lack both the time and the necessary skills and will, moreover, have limited scope to change policies and strategies. Table 1 shows the type of analysis that should be emphasized at different levels, distinguishing between resource-use assessment (where resource use is monitored in physical not monetary terms), cost analysis and cost-effectiveness analysis.

At the district level, managers should be primarily concerned with operational efficiency and avoiding waste in resource use. They should routinely monitor important areas of resource use such as the number of patients seen per staff member and drug costs per patient.

| Table 1 | Responsibilities relating to cost-effectiveness analysis at different levels of management |
|-----------------------------------------------|
| | Resource-use assessment | Cost analysis | Cost-effectiveness analysis |
| National managers | * | ** | *** |
| Provincial/ regional/ state managers | ** | ** | - |
| District managers | *** | *** | - |

* Least important; ** most important; — not applicable.
At provincial/state level, staff have less direct responsibility for service
delivery and hence more time for monitoring and evaluation. They should
also be concerned with deciding whether the malaria control strategies
adopted are appropriate to the particular epidemiological circumstances
within their region. Thus, they should have some limited capacity for
cost-effectiveness analysis, though in practice they are likely to focus on
resource-use assessment and cost analysis. Given the level at which they
operate, they are ideally placed to compare total and unit costs of service
provision across the region, and to identify ways in which resource use
could be improved.

At national level, staff should have the skills to assess the cost-
effectiveness of alternative strategies of malaria control in different
epidemiological settings, or at least to identify when a cost-effectiveness
study is appropriate and to commission it. They should also be capable of
using economic arguments to support the case for malaria control, and to
demonstrate the efficiency of their control efforts.

Cost-effectiveness analysis and cost analysis represent ways of ordering
and analysing information. They are concerned primarily with efficiency,
i.e. with comparing inputs and outputs to identify the strategy that provides
greatest value in relation to its cost. They are an integral part of the
planning and evaluation of malaria control programmes, but programme
managers must also take into account other factors, including
administrative and legal feasibility, financial and resource availability,
long-term sustainability, acceptability, social, economic and political
effects, and distributional/equity effects.

7.1.3 Planning the national malaria control programme

The development of a national plan for malaria control is critical. This plan
should be part of the national health plan which, in turn, should be an
integral part of the national social and economic development plan. A
national intersectoral coordinating group may be established to develop
the national plan for malaria control. Legislation may also be needed to
ensure that this intersectoral collaboration can operate efficiently.

The immediate need is to analyse the malaria situation to identify
populations exposed to a particular risk of disease and death and
situations in which epidemics may occur, as well as plan national and local
action according to epidemiological characteristics. Since a complete
analysis is practically impossible, malaria control will often have to be
planned on the basis of imperfect knowledge, although continuous
monitoring and evaluation should provide new information so that
programmes can be replanned and objectives modified.

The second step in planning the control programme is to stratify the
malaria situation in the country according to epidemiological criteria, and
link these strata to the resources available for control. Malaria is a focal
disease and its distribution may vary considerably. The same degree of
disease reduction cannot, therefore, be achieved simultaneously throughout the country. It will be necessary to define specific targets for disease reduction and appropriate control strategies for each of the different strata that have been defined nationally. As a consequence, it may be necessary to redeploy resources to the places where they are most needed and where they can be most effective.

The next level at which planning takes place is the one to which the administrative, and especially the financial, management of the programme has been decentralized. This may be a state, province or district, depending on the size and administrative structure of the country. At this level, an implementation plan needs to be developed to achieve the objectives set for each of the epidemiological strata in the national plan.

The implementation plan should clearly describe:

- activities and tasks that need to be carried out in the various epidemiological strata;
- the different categories of staff who will carry them out;
- details of the commodities required and the logistics of their supply;
- supervisory, monitoring and evaluation mechanisms;
- training needs and schedules;
- mechanisms for financial management and accountability;
- reporting systems and their periodicity;
- quality assurance.

It is good practice to identify elements of the plan at all levels that may be in danger of failing. These elements should receive the particular attention of managers.

7.1.4 Planning for emergencies

Most malaria control programmes with centralized structures are not designed to detect or react quickly to emergencies. Often, an aberrant situation is first reported by peripheral authorities outside the health sector. There is, therefore, an urgent need to strengthen the capacity for the early detection of epidemics and to speed up communication between the peripheral health services, the epidemiological services and malaria programme managers.

Health services should ensure the recognition and reporting of abnormal situations, such as excessive numbers of cases of fever or stocks of antimalarial drugs that are used up more quickly than expected, and community health workers and peripheral health services should report their findings immediately to the specialized services. The latter should have the capacity to respond by implementing appropriate control measures based on a rapid evaluation of the situation. Thus community health workers, who have the closest contact with communities, have an important role to play in monitoring unusual circumstances and reporting them promptly to the health officials responsible.
At each level of the health care system, monitoring will vary. In some countries, selected hospitals and health institutions have been used as sentinel posts for assessing changes in the number of malaria deaths and cases of severe and mild malaria. If they are carefully selected, especially in relation to high-risk strata, they can provide valuable information on which the epidemiological services can act.

It is the role of the epidemiological services constantly to analyse and interpret the information on communicable diseases arriving from the periphery. They should notify those responsible in the general health services and, if a special malaria service exists, the malaria control specialists should evaluate the situation and advise the health services on the most appropriate action to be taken.

Areas prone to epidemics can be identified by epidemiological stratification. Highland forest and desert fringe areas are particularly likely to experience epidemics, especially when affected by ecological disruption. On the basis of this stratification, a limited number of indicators of epidemic potential or selected risk factors can be monitored by local health personnel and used to build up community preparedness and prevention (see section 6).

Contingency plans should be worked out according to the most probable risk situations, and resources that could be rapidly mobilized should be identified. The emergency plan should, moreover, include the deployment of personnel. A core group of expertise within the country should be identified in advance, trained, and provided with a copy of the emergency plan, which should indicate what is expected of each individual. A central reserve of drugs, insecticides and spraying equipment should be permanently maintained to deal with epidemics.

Control of a malaria epidemic involves: (1) dealing with the immediate clinical consequences; and (2) preventing the spread of the epidemic (in both time and space). This requires appropriate disease management and some form of transmission control. Strengthening the capacity for early diagnosis and effective treatment of cases, and for special management of severe ones, is essential. Epidemic control requires an adequate supply of antimalarial drugs and insecticides and the ability rapidly to check the response of *P. falciparum* infections to the available antimalarial drugs (if necessary) and the response of the vectors to insecticides. In some emergency situations, e.g. in large refugee camps or during natural disasters, control of transmission may require periodic mass treatment or mass chemoprophylaxis for the people most exposed until vector control can begin.

In epidemic-prone areas prevention of epidemics should consist of strengthening diagnosis and treatment facilities, together with indoor spraying with residual insecticides to control transmission. Personal protection measures should also be encouraged and supported. Epidemic situations may have a large enough social impact to stimulate the initiation
of appropriate coordination between health services and community organizations, and the incorporation of these services and organizations into the system of epidemiological vigilance and environmental sanitation. Malaria epidemics have often led to the mobilization of additional resources for spraying operations; usually, however, by the time these become fully operational the epidemic is declining and epidemic conditions may have disappeared. Such spraying activities, particularly if they depend largely on external assistance, may also slow down as time passes and have become ineffective or been discontinued by the time a new epidemic occurs.

Where feasible, appropriate site selection, environmental sanitation and protection of human shelters, together with personal protection, should constitute the basic elements of malaria prevention in refugee and labour camps, in army and police camps, and in new human settlements constructed as part of economic development projects.

Evaluation of the measures applied should be part of the emergency plan. The lessons learned from each epidemic should be used to modify the plan. Thus, all implemented measures should be carefully evaluated in terms of their efficiency in time and space, their ability to protect the populations at risk, and their effectiveness in reducing morbidity, mortality and transmission. Costs should be carefully monitored for future planning purposes, especially if additional resources have been mobilized.

A progressive reduction in the consequences of each epidemic is an indication that the health system, including community participation, has reached the stage of development necessary to ensure sustained malaria control.

7.2 Programme implementation

7.2.1 The programme manager

The major challenges of the manager of the malaria control programme will be to:

- guide the general health services to take full responsibility for the management of malarial disease;
- ensure that the specialized services support the antimalarial activities of the general health services;
- ensure that resources are redirected as the malaria situation develops, as appropriate to implementation of the national malaria control plan;
- reorient health information systems so that information for the management and evaluation of programme activities is provided for those in need, when they need it;
- ensure intersectoral and community involvement.

Managers need to be aware of the total resources available for malaria control, know what is technically feasible and sustainable under the prevailing epidemiological, social and economic conditions and be
capable of using the resources optimally. An important yardstick of managers' ability will be their performance in taking corrective action as situations demand. Particularly in programmes requiring reorientation, a major part of managers' efforts should be devoted to corrective action, such as securing and reallocating resources, changing personnel assignments, sending supplies and equipment to where they are needed, and ensuring the continuing education and training of staff.

The ability of managers to delegate responsibility is vital to the success of the programme. Detailed job descriptions and work schedules for all staff should be developed. These will give guidance both for selecting personnel with the required experience and background and for task-oriented training. Managers at all levels must understand the programme's objectives, targets and implementation and be able to operate the management information system effectively.

7.2.2 General health services

The diagnosis and treatment of malaria should be the responsibility of the general health services. Where such activities are still partly carried out by the specialized services, they should be gradually transferred as the capabilities and resources of local health services are strengthened. The emphasis must be on planned, sustainable capacity-building, although the ways in which this is achieved will vary according to each country's circumstances and health structures.

Government programmes should assess malaria therapy practices outside the general health services and ensure that nongovernmental and private health care providers become the partners of the health services in providing malaria control. The health services must, however, be the leaders in this partnership, ensuring that diagnosis and treatment outside the formal health services are carried out according to the national policy for disease management. The provision of national disease-management guidelines to, and active collaboration with, private drug sellers has provided a good basis for partnership in some countries. It will also be important for the health services to teach communities and potential patients how to use the available services.

7.2.3 Specialized services

At the central levels of national health services, the development of long-term malaria control demands a strong core group of specialists trained in malariology, disease management, epidemiology, entomology and programme management.

Experts at the central level should be responsible for:

- advising the health authorities on the management of the national malaria control programme, including financing and details of long-term capital and recurrent expenditure;
- formulation of the national policy for malarial disease management;
• technical organization, monitoring and evaluation of national programme activities;
• training of intermediate-level staff;
• any research component of the programme.

At the intermediate level, specialized skilled personnel will also be required to:

• analyse the local malaria situation according to local epidemiological, social and economic criteria;
• guide the implementation of the national malaria control plan according to this analysis, particularly in the selection and implementation of preventive measures;
• react to emergency situations and epidemics;
• advise on drug and diagnostic needs and assist the local general health services in providing appropriate referral, supervisory and logistic support where it is needed;
• train and supervise multipurpose medical and laboratory staff in the malarialogical aspects of their duties;
• develop and operate the relevant information systems for programme management, monitoring and evaluation;
• promote and maintain links with provincial and district-level administrative and general medical personnel (governmental as well as nongovernmental);
• maintain a dialogue with community leaders and the population, educating them and ensuring their cooperation and collaboration.

Implementation of both disease management and preventive measures requires continuous involvement of the core group of experts, not only in planning but also in monitoring, evaluation and replanning. Replanning is extremely important, since organized activities tend to become self-perpetuating and are very seldom evaluated in terms of their final objective. It has been estimated that established malaria control programmes spend over three-quarters of their financial resources on maintaining routine and largely ineffective insecticide spraying. Even in tropical Africa, large municipalities maintain costly but often obsolete and ineffective vector control services.

In this context, the principal task of the core group is to review current activities and to select those that should continue and be strengthened and those that should be discontinued or given lower priority. In order to guide possible changes of strategy, it may be necessary to determine how and to what extent different agencies and levels of government, nongovernmental organizations, public or private development projects, industry, communities and individuals might bear the costs involved. While such choices should be based at the central level on cost-effectiveness analysis, decisions at the intermediate level are more likely to be based on an assessment of the use of resources and cost analysis (see section 7.1.2 above).
When a decision to change recommendations or activities is made, it is important to keep its operational implications in mind. Even in industrialized countries where communications are easy, it is difficult to convey information on changes in policy to the periphery. The problem is far greater in most malarious countries.

7.2.4 Training

Technical training for programme staff consumes a large proportion of malaria programme resources, and should be undertaken only after a review of existing deficiencies and assessment of personnel requirements. Specific needs for technical training, as a key component in the implementation of the Global Strategy, are discussed in sections 4, 5 and 6.

In the past, training activities have often been solely measured in terms of the number and types of staff trained in a given area, or the average frequency of training for an individual. It is more relevant to define and measure also the competences actually acquired by trainees in achieving learning objectives and the consequent changes in staff performance. Such measurements permit managers to test innovative, potentially more cost-effective approaches to training. These considerations also apply to the training provided for support staff, such as supervisors, supply managers and trainers themselves.

Training must be cost-effective and, as far as possible, integrated into the other programme activities of the health services. The content and scope of training will be different for personnel working at different levels of the health system. Standards and guidelines for case management, disease prevention and other control-related activities should be incorporated into training programmes, and can provide a basis for evaluating the competences acquired by trainees during both training and work performance. Particularly important will be the training of district or intermediate-level personnel who will be the focal points for adapting malaria control activities to evolving local situations. Staff at all levels will need to develop appropriate skills to enhance the interaction between the health services, other sectors relevant to malaria control and the community.

Strategies other than formal training should also be considered, as a means of reducing training requirements and costs. Workshops and seminars, including the use of case-studies, are particularly useful for staff training since they permit a freer exchange of ideas for problem analysis and solution. Continuing education is essential for all categories of staff, and mechanisms need to be developed to keep them informed of changes in malaria control methods and approaches. Supervisors should contribute substantially to the continuing education and retraining of their staff.

It is important to develop training programmes gradually and make sure that they are adapted to the needs of the overall programme. Incentives and
possibilities for career development will be needed if staff are to be retained after training.

7.2.5 Logistics

Programmes need to estimate and plan for essential commodities, in particular drugs, and follow a regular cycle to guarantee procurement and distribution. The expected drug need should be based on the estimated malaria morbidity and the established priorities of drug type and formulation. The costs of all commodities need to be estimated, sources of good quality materials identified, funds secured and supplies procured. Receipt, storage and distribution are critical to the logistics cycle. Distribution should be secure (i.e. minimal loss from damage and pilferage) and supplies should be stored in good conditions. Schedules should be established for the advance supply of drugs to areas and at times of high risk. Systems need to be established that rotate drug supplies to take account of expiry dates and set minimum levels at which requisitions are made (usually three months' supply).

Insecticide requirements should be predicted on the basis of programme objectives and targets, and insecticide availability assured. The implementation of the Global Strategy should result in a reduction in overall insecticide use, with subsequent savings in resources which can be reallocated to other programme activities.

7.3 Programme evaluation

Programme evaluation should be continuous, operational, useful to programme managers and only partly governed by the information needs of the Ministry of Health and external agencies. Above all, evaluation should not be perceived merely as an academic exercise of little practical value.

The specific purposes of programme evaluation are:

- to measure progress and assess programme achievements;
- to detect and solve problems;
- to assess programme effectiveness/efficiency;
- to guide the allocation of programme resources;
- to provide the information needed for revising policy and replanning interventions;
- to assess sustainability.

7.3.1 Types of evaluation

The type of evaluation and the elements of the programme to be evaluated will depend on the stage of programme implementation, and should be limited to those that can provide relevant, timely and useful information. Evaluation should consist of routine administrative monitoring and formal evaluation. Indicators for programme evaluation and monitoring are
discussed in section 6.5. Sometimes decisions cannot be made solely on the basis of evaluation, but will require operational research.

**Monitoring**

This form of evaluation involves the continuous collection of information during the implementation of the programme, both to allow immediate assessment and to identify deficiencies that can be rectified without delaying the programme's progress. Monitoring provides the type of feedback that is most frequently used in management, as it is usually easy to carry out and assesses aspects of programme activities that change frequently. Many monitoring systems follow the quantity and timing of elements such as: activities undertaken; staff movements; utilization of services; supplies and equipment; and budgeting. Monitoring should, however, also focus on the process of implementation of the malaria control strategy, seeking the reasons for successes and failures. In some situations, monitoring systems also look at the quality of implementation, and monitoring is then closely related to quality assurance.

Monitoring should be performed by those people directly involved in the programme at various levels. By taking part in data collection, analysis and report writing, managers can gain a deeper understanding of the programme's progress, strengths and weaknesses, they will be able to see where and why changes are needed and how to put them into practice.

Planning for monitoring involves decisions about what to monitor, who will do the monitoring, and when, where and how it will be done.

**Formal evaluation**

Besides regular monitoring, which should be built into programmes, there is a need for more formal evaluation at regular intervals to obtain a clear picture of programme progress.

Formal evaluation should be systematic, taking the form of a built-in system, a periodic review or a special study. Programmes may need to carry out different types of evaluation, for example:

- **Evaluation of need**, i.e. evaluation of the relative need for a programme.
- **Evaluation of plans or design**, i.e. evaluation of the feasibility and adequacy of programme plans or proposals.
- **Evaluation of implementation**, i.e. evaluation of the conformity of the programme to its design. Does the programme provide the goods and services laid down in the plan, in both quality and quantity?
- **Evaluation of outcomes**, i.e. evaluation of the more immediate and direct effects of the programme on relevant knowledge, attitudes and behaviour. For training activities, for example, the outcomes measured might relate to achievement of learning objectives and changes in staff performance.
- **Evaluation of impact**, i.e. evaluation of the programme's direct and indirect effects on the health and socioeconomic status of individuals and the demography of the community.
For practical reasons, mainly related to time, money and personnel, many programmes cannot conduct all types of evaluation. A decision on the type of evaluation should be based on the stage of programme operation, the need for information and the feasibility of the evaluation. However, evaluations of plans, implementation and outcomes are essential for good programme implementation. Comprehensive programme reviews will use several types of evaluation either separately or together, in order to cover many aspects of the programme. Because countries need to employ their resources as efficiently as possible, evaluation should ideally include cost-effectiveness analysis.

7.3.2 The evaluation plan

An evaluation plan should be an essential part of the overall programme plan and, like the latter, have realistic and assessable targets. With this proviso, the development of the evaluation plan consists of the following steps:

- **Clarification of the objectives of the evaluation** — these must be agreed upon by all concerned.
- **Identification of the resources available** — there must be sufficient resources to collect the data on the scale envisaged and turn them into useful information. The main constraints may be managerial skills and time.
- **Selection of the type of evaluation** — once the purpose of the evaluation is clear, it is necessary to decide what type of evaluation is to be conducted and the depth of information required.
- **Selection of indicators** — a good indicator is directly related to programme activities and anticipated outcomes, so that a change in the indicator may be attributed to programme interventions. However, the indicators chosen should be limited in number, readily and uniformly interpretable and operationally useful. From a global point of view, the use of standard indicators will introduce consistency into programme reviews and allow comparison over time among countries. Although there are many ways of classifying indicators, one useful way is according to the programme structure outlined in Fig. 2. Thus there can be input, process, outcome and impact indicators.

**Figure 2**

Aspects of a programme that can be evaluated

- **Inputs**
  - buildings
  - staff
  - finance
  - equipment
  - supplies

- **Processes**
  - training
  - planning
  - management
  - supervision
  - community participation

- **Outputs**
  - services delivered
  - goods delivered
  - staff trained

- **Outcomes**
  - changes in knowledge
  - changes in practice and behaviour

- **Impact**
  - changes in health situation

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- **Formulation of the detailed plan of evaluation** — the detailed plan should include: the objectives; the methods, sampling procedures, sources of data and methods of data analysis to be used; and budgeting and administrative arrangements. It should also give details of staff responsibilities for each activity, the reporting mechanism and the strategies for ensuring that results are used for programme replanning and implementation.

- **Data collection** — the objective of this step is to ensure that procedures are followed in such a way that data are collected in a reliable and timely manner.

- **Interpretation and analysis of data** — decisions about the main approaches to data analysis will have been made when the indicators were selected and the detailed plan was formulated.

- **Replanning** — at this step the results of the evaluation are fed back into the managerial process. Unfortunately, it is often this replanning step that is done the least well.

### 7.3.3 Evaluation and practical programme management

Programme evaluation will provide the manager with information about how well the programme is fulfilling its purpose and whether it should be continued, expanded, reduced, changed or abandoned. It can also provide data to reduce uncertainty and to facilitate decision-making by clarifying the gains and losses that different decisions incur. To be complete and worthwhile, the evaluation should aim at assessing the extent to which malaria control measures have been implemented and at measuring their impact on the epidemiological situation.

Experiences of the impact of programme evaluation on programme management remain poorly documented for malaria control activities. More extensive documentation would serve several purposes. In addition to the potential benefits for the programme itself from documenting its own experience, other programmes are likely to confront problems with the same features. Training programmes for managers of malaria services could also make use of case materials reflecting authentic problems, and the training of other programme personnel would probably benefit from well documented examples of problem-solving in relevant subject areas.

### 7.4 Operational research

Malaria control programmes need to develop the capability to undertake applied field research on issues of direct relevance to control objectives. Such research should be conducted by health personnel with assistance from research institutions and other groups. The objectives and design of operational research projects should be established within countries and should be closely tied to the particular problems identified during planning, implementation and evaluation of control programmes at all levels. Those who will have to implement decisions made as a result of the research should be closely involved in the research process, so that they are committed to its conclusions.
The research should address not only the efficacy and cost-effectiveness of specific interventions, but also related areas that influence them and other components of programme and management activities. These will include capabilities for effective epidemiological response; community perceptions of malaria and treatment practices; the effectiveness of referral systems; the implementation and effectiveness of antimalarial drug policies; career structures; the impact of migration and of ecological and environmental changes on malaria; training and health education for staff and communities; and programme evaluation.

8. Conclusions and recommendations

The Study Group emphasized that malaria can be controlled using the tools currently available for treatment and prevention. Its more specific conclusions and recommendations for action to promote optimal application of the Global Malaria Control Strategy are presented below.

1. Malaria control should be fully integrated into general health services and should reflect socioeconomic development objectives.

2. For the effective and sustainable control of malaria morbidity and mortality, management of malarial illness should be given priority.

3. Local capacity-building is a prerequisite for achieving effective and sustainable malaria control.

4. The effective implementation of malaria control strategies and programme management will require special attention to, and resources for, training and human resource development at all levels.

5. In countries with ongoing large-scale control programmes, disease prevention activities, including vector control, should be decentralized and selectively applied on the basis of effectiveness, feasibility and cost.

6. Population coverage with disease management services of good quality should be expanded through a partnership between the general health services and those in the community who provide treatment.

7. National reference centres should be focal points for the quality control and evaluation of diagnostic strategies and for monitoring drug and insecticide resistance.

8. Diagnosis and treatment through the formal health services should be made more accessible, attractive and effective.

9. Effective health education materials should be developed that take account of local cultural perceptions of malaria and its control.

10. Insecticide-impregnated materials should be adopted as an appropriate means of individual, family and community protection. Such
materials have proved effective in reducing the inoculation rate when vectors bite indoors and after people go to bed.

11. Residual insecticides should be selectively applied according to the local epidemiological situation, in particular for the control of epidemics.

12. Interdisciplinary and intersectoral collaboration at all levels should be promoted to ensure effective and sustainable malaria control.

13. National policies and coordinating mechanisms should be established to ensure that development activities do not create or enhance malaria problems.

14. Additional resources for malaria control should be sought from international sources and from communities. Successful resource mobilization will require national political commitment, clear objectives, and work plans specifying the gains to be anticipated from increased resource commitments.

15. Successful implementation of the Global Malaria Control Strategy requires the definition, selection and use of indicators, which should be simple and easily measurable and should relate to the objectives and processes of malaria control.

16. WHO should work to ensure that its management information and reporting system is consistent with the monitoring requirements of the Global Malaria Control Strategy.

17. National applied and basic research capabilities for recognizing and solving major technical and operational problems in malaria control should be strengthened with collaborative assistance from international partners.

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1 Unless otherwise stated, those listed are at WHO headquarters, Geneva, Switzerland. CTD: Division of Control of Tropical Diseases; TDR: Special Programme for Research and Training in Tropical Diseases.
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References


Annex

Information requirements for malaria control

1. Examples of key information obtainable at the community level

1.1 Information

- Disease (perceived disease and severity).
- Disease trends (in time, location, population group).
- Drugs (availability, drug use, regimens).
- Personal protection (use and methods).
- Knowledge, attitudes, behaviour and practices (KABP) as regards malaria.
- Local control activities (quantity, quality).
- Results of control activities.

1.2 Methods of collection

- Routine reporting by health workers.
- Routine reporting from selected (sentinel) sites.
- Specialized studies (community surveys, KABP studies).
- Qualitative investigations.

1.3 Sources of data

- Mothers, schoolchildren, sick persons.
- Traders, pharmacists, traditional healers.
- Village leaders, traditional/religious leaders.
- Schoolteachers.
- Traditional birth attendants, community health workers.

1.4 Purpose of data collection

- Health education to enhance the recognition of disease and of the need for its prompt treatment.
- Recognition and analysis of problems.
- Planning of action to prevent and manage malaria.
- Monitoring and evaluation of community activities to prevent and manage malaria.

1.5 Needs for training and materials

- Disease recognition materials.
- Development of questionnaires.
- Training in interviewing, data analysis, reporting.
Examples of key information for use at district or provincial level

2.1 Information
- Malaria epidemiological types.
- Malaria-associated disease in vulnerable groups (children under five, pregnant women, migrant workers).
- Severe anaemia in children under five and pregnant women.
- Severe and complicated malaria.
- Low birth weight.
- Frequency of concomitant disease.
- Frequency of genetic traits affecting treatment.
- Absenteeism from school.
- Malaria-associated deaths in hospital, case fatality rate in hospital.
- Proportion of time health centres are open.
- Availability of drugs in clinics and shops.
- Proportion of staff attending training courses.
- Proportion of severely ill people effectively referred to higher-level facility.
- Frequency of need for second-line therapy.

2.2 Methods of collection
- Routine surveillance (health centres, hospitals).
- Routine data compilation from district health offices and other sectors (e.g. meteorology, trade, agriculture, development).
- Demographic information.
- Routine data collection from selected (sentinel) sites.
- Special surveys (in association with training institutes).

2.3 Sources of data
- Community (see section 1.3 above).
- Health centres.
- Hospitals (district, mission, private).
- Private sector (practitioners, pharmacies, dispensaries, microscopists).
- Other sectors (meteorology, trade, agriculture).
- District offices.
- District health team.
- District medical officer.

2.4 Purpose of data collection
- Early detection of epidemics and special problems.
- Definition of risk groups.
- Programme management.
- Health education to enhance recognition of disease and influence treatment-seeking behaviour.
- Improvement of referral skills, supervisory capabilities and local monitoring.
• Improvement of diagnostic and management skills (auditing and supplies, monitoring capabilities).
• Creating awareness of need so that people will be motivated to communicate with other sectors.
• Sharing information.
• Development of skills for using available information for local programme evaluation and action, and to communicate needs to all relevant levels.
• Modification of existing school curricula.

2.5 **Needs for training and materials**
• Training to enhance epidemiological skills and operational research capabilities, training in report-writing, auditing and accounting.
• Tools and materials for monitoring and analysis.
• Guidelines for disease management, referral, drug treatment policies, management of severe and complicated disease and disease prevention.
• Visual aids and tools (e.g. for simple disease recognition and disease prevention).
• Promotional materials to stimulate community awareness and intersectoral collaboration.

3. **Examples of key information for use at central level**

3.1 **Information**
• Malaria epidemiological types (including morbidity/mortality patterns).
• Training availability and needs.
• Human and financial resources, logistics.
• Demographic data.
• Drug data (importation, available formulations, drug distribution, quality control, efficacy and toxicity).
• Development projects with an impact on malaria (planned or otherwise), development programmes.

3.2 **Methods of collection**
• Routine surveillance (health centres, hospitals).
• Routine data compilation from provincial/district offices.
• Routine data collection from selected (sentinel) sites.
• Special surveys and operational research.

3.3 **Sources of data**
• District/country data.
• Specialized data from referral levels.
• Industry, local manufacturers (drugs, insecticides).
• Ministries (agriculture, land and mines, water resources, etc.).
• International agencies, nongovernmental organizations.
• Provincial/district referral hospitals.
• Training/public health institutes.
• Provincial administrators, including those responsible for customs, water and sanitation, agriculture, trade and industry.

3.4 **Purpose of data collection**

• Programme planning, management and evaluation.

3.5 **Needs for training and materials**

• Managerial, epidemiological, computer skills.
• Data analysis and utilization.
• Curriculum development (designing training, including training materials, learning teaching skills).
• Development of operational research capabilities.
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