Support activities and milestones

Learning objectives:

By the end of this Unit you should be able to:

- identify relevant programme support activities
- describe modern approaches to training
- list the elements of a needs assessment
- define a milestone
- set milestones for malaria control

In deriving the activities necessary to achieve operational targets a number of support activities, depending on local circumstances, are necessary to implement the selected interventions. Training, supervision, information, education and communication are necessary for almost any intervention, but the technical content and the target groups may be very different. The personnel needing training in laboratory diagnosis are not likely to be identical to the staff requiring training in clinical disease management or in spraying. The way supervision is carried out is also likely to be very different. Hence, support activities related to different malaria control interventions may and may not be integrated. It is therefore important at the planning stage to define the targets, establish the activities, and identify which are support activities. The following are some general support activities for almost all approaches.

Training

It is important to distinguish between the training of a core group of specialists (the national capability development) and the training of service staff. Normally, the national core group is responsible for planning and implementing the training programme, although the members of the core group are not necessarily themselves the trainers.
Training should be task-based, problem-solving, practical and interactive. Often, job descriptions are necessary before meaningful training can be planned. The modern concept of training is based on full participation of the trainees. The interaction between the trainer and the trainee, and among trainees must be well understood and utilized. The interaction could be achieved through large group discussions, small group work sessions and successive presentations. The amount of lectures should be kept at a minimum.

For training specialized staff, be it at national or peripheral level, it is necessary to consider career structures, post descriptions and career promotion as prerequisites for retraining well-trained people in service. Training is expensive and time consuming and thus the long-term investment for malaria control must be protected.

A careful assessment of the training needs must be made in order to clarify:

- the subject areas and the level of training needed and the priorities
- the number and categories of staff to be trained in each subject
- the training materials needed, and which of them are already available, which need to be updated and/or translated, and which are not available. Available materials should be screened to evaluate the appropriateness of the quality and content for the local circumstances
- visual aids needed
- information system requirements
- infrastructure development
- resources available and needed
- the content and structure of a training programme to meet the needs

Where possible, training materials should be produced locally. They must be interesting, clearly written, well edited and unambiguous.

Courses should be planned based on this needs assessment. Locations for training should be selected with regard to facilities, possible availability of patients and proximity to the trainees’ workplace.

Well-motivated facilitators and tutors are indispensable. Stationery and visual materials are important; the supplies should be ample to allow for group work activities. Each course must be seriously evaluated and a short report written with recommendations to improve future training.
Supervision

Supervision should be designed to assure competence, skill and motivation among the health workers. This is possible through refresher training courses and with the development of continuing education programmes. Supervision may be direct through supervisor/employee direct contact or indirect through reporting systems, quality control mechanisms and cross checks.

Supplies and logistics

It may be necessary to make provision for some medical equipment, especially for laboratory diagnosis. Often it may be opportune for a malaria control programme to join forces with other programmes to strengthen existing services. Obviously reserving some microscopes for malaria and others for tuberculosis should be avoided. Planning must be based on quantity and quality of available materials, assessment of the potential duration of use (especially microscopes), and analysis of the actual distribution of the materials, to teaching institutions, universities and to village dispensaries. An evaluation of needs for selective coverage (sentinel sites, potential epidemic zones) or general coverage must be made.

To the extent possible, locally available material should be used for personal protection and vector control. Training and information equipment ranges from blackboards and overhead projectors to more modern equipment including television or videos, computers and computer programmes. It should be borne in mind that the latter are more costly, require more extensive training and more maintenance.

To budget recurring costs in the short and long term, it is necessary to take into account equipment, maintenance, replacement, training of personnel to repair and to use the equipment, a sufficient stock of usable and spare parts, and additional supplies as appropriate.

Information, education, communication

Training, information, education and communication are based on several elements:

- knowledge of how the community actually perceives the malaria problem(s)
- evaluation of the needs for training/information/education
- adaptation of the educational messages to the sociocultural context
Planning malaria control programmes: Learner’s Guide

- development of training modules adapted to national, regional and local needs
- use of communication and pedagogical techniques adapted to the content
- use of operational and useful material from posters to computers, and group meetings to teleconferences

Adaptation is the key to any activity - adaptation to the international, national, regional or local context.

Universities and other institutions should be involved from the beginning of the process in identifying community attitudes, developing information documents, carrying out promotional programmes, evaluating the perception of the message and resulting behaviour. It is a multidisciplinary activity. Specialists in communication (media) and education (teachers) should be used. Training in oral, written, and audio-visual communication techniques should be given to the “scientists” participating at various levels in malaria control activities.

The distribution of educational and information messages should be accompanied by a continuous evaluation of their spread, impact, and comprehension.

Health and management information systems (HIS/MIS)

An epidemiological information system for malaria is what holds a malaria control programme together especially if it includes a preventive component in addition to disease management. Currently, in international health, there is a strong emphasis on monitoring quality and coverage of care through indicators related to targets. This is fully justified, and malaria control programmes should participate as actively as possible in the design of monitoring, health facility surveys, supervision and quality assurance. At the same time, it needs to be emphasized that a malaria control programme must maintain surveillance of cases of malarial disease and death. If it is deemed impossible to establish this surveillance, it might be preferable not to create or maintain a malaria control programme but to let the priority activities be part of research and/or quality of care programmes.

The existing general health information systems may or may not function adequately to serve as a basis for the needs of malaria control. If they do, the task is mainly to ensure that clear case definitions are applied. If the system does not function adequately, then the options are to try to strengthen it, create a new system
with malaria control cognate partners, or create a system for malaria which might then be the vanguard of a general health information system. Development of a health information system is part of the development of health services.

If several information systems already function in a country, it should be avoided at all costs to produce more. Often, a malaria control programme like all other programmes, will need to negotiate what it can get from a routine information system. If its needs are not filled, it should establish a small network of sentinel facilities and undertake special surveys rather than try to establish its own routine system.

Applied research

Planning a malaria control programme should not normally await the results of research. It should be based on what knowledge is available or can easily be obtained and the planning process should identify the research needs for improving the programme.

Operational milestones

Some targets may have to be achieved within a certain time frame for the effective implementation of the control approaches and achievement of the objectives. These are sometimes referred to as milestones. They may refer to, for example, the implementation of a surveillance system, or the attainment of a specified coverage of quality care in relation to a population. Other targets may be relatively flexible and modified on an annual basis according to progress and resource availability.

Milestones often relate to changes that are expected to take place before the plan can be fully implemented. Milestones therefore have specific target dates for achievement and the successful implementation of the programme and achievement of the objectives are dependent upon achieving the milestones on time.

These may be:
- introduction of new services (information, supervision, treatment)
- extension and increased work load of the existing services (information, diagnosis, treatment, supplies)
- the appointment of new staff to existing posts
- creation of new posts and/or categories of staff.
- training of new staff
- on-the-job training, upgrading, distance learning
- additional budget for new services

It is important to represent the milestones on a time-line so that their relative importance and priority can be appreciated. In the planning process it is useful to make a separate schedule for the training activities throughout the planning period since this activity (milestone) represents a high risk, high cost component of any plan.

Please read carefully the next Unit of this module before commencing the session to which it relates.
Learning Unit 14

Programme budgeting

Learning objectives:

By the end of this Unit you should be able to:

- define a process of programme budgeting
- calculate the resources needed to implement a plan for malaria control
- conduct a cost analysis

Introduction

At this point in the planning process you will have all the information necessary to calculate costs and develop a broad budget for the plan and write a budget statement.

The operational targets and the activities that have to be carried out to achieve those targets, including support activities, determine the resource requirements of the malaria control programme. The purpose of programme budgeting is to consolidate the resource implications into a budget statement and to ensure that the plan is realistic and has not gone beyond the resources available or that can definitely be mobilized.

All major categories of expenditure will need to be covered including personnel, supplies, equipment, training and research. Also a time schedule of expenditures will need to be developed at least for the period of the first budget cycle.

The planning group should strive to present the budget in the most meaningful way possible. The exercise is therefore not restricted to an assessment of overall budget requirements. It should also serve to indicate the objectives that are being strived for and the approaches to achieve each one. This should not be difficult if the process described in this module has been followed since the targets and activities have been derived from the measures proposed in each approach to achieving the objectives.
Presumably the planning group will have to defend the budget that is proposed. It is in their interests to formulate a budget statement which succinctly relates what the national decision-makers can expect to see achieved (objectives), by what means (the approach) and at what cost.

However, budgeting involves more than preparing a budget statement. The planning group needs to review the existing budget control procedures to see if these procedures need to be modified in the light of the approaches that have been formulated. There are two major issues as far as malaria control is concerned: do the budgetary procedures allow for a quick response to unusual circumstances (epidemics) and does it allow for evaluating costs of measures being applied and therefore costs of the approach and elements of the approach?

At issue is the question of whether those responsible for controlling the flow of resources in the health system are in a position to react favourably to the resource needs of the malaria control programme. This is a complex issue that is beyond the scope of this module. Suffice it to say that it relates to issues such as decentralization, institutional autonomy, programme autonomy and financial policies such as cost recovery mechanisms and how they are managed. A health system in which a common budget is under central administration is radically different from one where there is a high degree of local autonomy and peripheral resource allocation.

The budgetary process

A suggested logical sequence of deriving the cost of what is being proposed in the plan and preparing the budget is:

1. Consider each objective separately.

2. State the approach that has been agreed upon by the planning group (if more than one approach has been considered then a selection may be possible, if not then cost all approaches to achieving the same objective and examine these costs in the light of expected effectiveness) noting the measures being proposed.

3. Define the operational targets that have been set and note the two components, the operational output and the dimension; these have budgetary implications for their successful implementation.
4. List the activities, including support activities, that are needed to achieve the target and quantify these activities.

5. Derive costs of carrying out activities.

6. Develop a table showing for each stratum, objectives, approaches, activities, targets and costs (see example table 5).

7. Apply the costs of each target to a line item budget format (personnel, supplies, equipment, transport, research)

8. Prepare a clear budget statement for the plan and be prepared to defend it.

9. Determine whether budget control procedures need to be changed, and if so in what way and how it could best be done. Make recommendations with full explanation.

10. Note major budgetary implications regarding a decentralized organization.

Costs

An important aspect of programme planning and evaluation is the estimation and analysis of costs of various activities and an assessment of the impact of the activities in relation to their costs. Apart from a general analysis of activities and their costs, an assessment of the efficiency, effectiveness and impact of the interventions in relation to their planned implementation and their costs (cost/effectiveness analysis) must also be considered.

For planning purposes, the costs of broad categories of activities may already be known and may have been used for previous planning exercises or for on-going programme activity monitoring. If this is not the case then a task analysis will need to be carried out for each major activity related to each target, where possible. You will need to determine the time taken to perform each task and the labour costs in order to estimate the number of personnel needed, what can be accomplished in a day, week, and month, the quantity and type of supplies and equipment required to accomplish the task and the costs.

It is worthwhile to develop a system to record costs relative to activities so that indicative figures can be used for planning and so that change can be monitored. There is a need to distinguish between direct costs (variable) and fixed costs (non-variable). It is possible to arrive at a cost per activity for planning purposes (cost per unit of activity) such as vehicle costs in terms of so much per kilometre travelled.
which includes depreciation on the vehicle, cost of petrol, maintenance and the
driver’s salary. Similarly, the cost of spraying one house with a specific insecticide
which includes the cost of purchasing the insecticide, labour time to prepare and spray
the product, cost of transportation and supervision.

By applying indicative costs of various activities to each target and the results
of the task analysis in terms of human activity, it is possible to estimate the number of
staff required, the supplies and equipment needed and the total cost.

An example of using indicative information is that for spraying purposes.
Normally, a sprayman can treat an average of 8-10 houses per day, or about 200 per
month (depending on distances and road conditions). Assuming 8 houses per day, or
176 houses per month, it requires 4125 man-days, or 187 man-months to treat 33 000
houses. If the campaign is to take 4 months (or 88 working days), each sprayman will
be able to treat 88x 8 = 704 houses; therefore, 47 spraymen will be needed to treat
33 000 houses. A spraying team generally consists of 2-4 workers, with a team leader
and an assistant (to prepare the insecticide and fill the sprayguns). For the 33 000
houses to be treated in 4 months by 47 men, it will be necessary to form 15-16 teams
of 3 spraymen plus 1 assistant and 1 team leader each, or 80 workers, to which must
be added agents to notify and sensititize the community, supervisors, drivers, etc.
Some 100 people will be required. The number of rounds will depend on the
insecticide used, length of the transmission season and the objectives of the campaign.
If there is a 6-month transmission season and the insecticide is effective for 3 months,
two rounds will be needed for maximum coverage. The budget must include the cost
of the insecticide, the necessary personnel, and the depreciation of the equipment
(vehicles, spray equipment, etc.).

Support activities are extremely important and often represent a high cost.
However, since they are common to most approaches, it is worthwhile having
indicative costs for these, kept up-to-date. In particular the cost for refresher training
of a microscopist, basic training of a health workers in malaria diagnosis and
management, and so on. Research may present some difficulty but generally each
research project is carefully costed, thus an estimate of past project versus time span
and scope will be a helpful guide.
Costs may be divided into direct costs which relate directly to an activity or output such as supplies, equipment, insecticides and which vary with the magnitude of the activity; and fixed costs, which do not usually vary with an increase or decrease in the programme output but may change over time, for instance the costs of facilities and utilities.

Do not forget to include an amount for maintenance of equipment and facilities, for utilities (although usually these are taken as included in facility costs), transportation, travel (including allowances at local rates) and a contingency factor. This latter item always presents difficulties for the budget officers. In reality planning is carried out at least one, and probably two years, in advance of approval and implementation. Therefore by the time you can expect to implement your plan the costs will have risen. It is for that reason that a contingency item of 5-10% is added in the planning stage and should be defended accordingly.

If the budget is derived in this way, the cost of various approaches will be apparent and furthermore when budget cuts are imposed, it will be relatively straightforward to either cut an entire target out or reduce the target so that it will take longer to achieve an objective, in which event the objectives will also have to be modified. Several possibilities exist, but provided priorities have been set, the decision-making is greatly facilitated.

One area where costing will be difficult is for integrated activities, especially within primary health care. It will be difficult to cost and to determine expenditure on disease management at various levels. Estimates will have to be made on time spent on malaria. However, it should be possible to estimate the total cost of managing, for example, a simple case of malaria versus a complicated case. This was calculated in Uganda in 1994 as US$ 2 for an uncomplicated case and US$ 40 for a severe malaria case. Based on the statistics of expected number of cases, costs can be calculated. These costs include the use of both first and second line drugs for the uncomplicated case, plus diagnosis and follow-up and for the severe cases, the cost of hospitalization, support services and drugs.
Cost analysis

Cost/effectiveness of a control measure is the ratio of its effectiveness to its cost, over a specific period of time. This means the greater the effectiveness in relation to the cost the more desirable will be the outcome. The calculation should include all estimated or actual costs incurred during the specified period for which the cost effectiveness analysis is made including those of measures applied for maintaining adequate effectiveness of the control methods during the specified period. The cost analysis should also take into account and quantify benefits derived from the application of the method in controlling other diseases or in bringing about general health or social and economic improvement. A check must also be made on such matters as appropriateness of plans of operations, work schedules and the methods applied.

For all types of cost analysis it is essential that cost estimates or a record of all expenditures incurred be made. If some activities are to be assessed for cost analysis, then a separate record for each activity and its cost needs to be kept and used for the desired analysis. In malaria programmes, as in any other health programmes, the estimation of costs and their analysis constitute an essential component of planning as well as evaluation. Costing must be done before a programme is implemented, based on a projection of activities, or after when part or all of the activities have been completed and actual expenditures incurred. During the planning phase costs of various alternative control approaches are estimated and related to their degree of efficacy and are used for the selection of the most cost effective approaches.

A similar analysis may also be made in respect of each control measure in order to select those that should be included as part of the proposed approach. However, when an approach is selected and a programme drawn up and applied, cost analysis thereafter will be based on the actual follow-up and recording of all costs incurred and their appropriate classification to permit a cost analysis of the various activities and of the programme as a whole. This operation may require additional manpower and other resources and increase considerably the volume of paper work and reporting, but the results will permit substantial improvement in a programme's operating efficiency and considerable savings in the long-term.
The correlation between the type and quality of operations introduced and the epidemiological situation resulting from the intervention will indicate whether the measure(s) applied under local conditions is (or are) sufficient to reach the objectives or whether complementary or alternative actions are to be considered.

It would then be necessary to assess whether the same or even better results could have been obtained by utilizing less expensive control measures. Cost efficiency should be measured in terms of services provided in relation to costs. Factors which may assist and be taken into account in assessing cost efficiency are:

- human resources in comparison to plans, and efficiency of human resources in relation to expectations
- financial resources for the implementation of the programme and the correct utilization of the resources
- suitability of the sequence of activities and the appropriateness and timeliness of the logistic support
- the contribution from collaboration with other services in the health, social or economic sectors
- appropriateness of plans of operations
- work schedules
- methods applied

**Indicative prices of some commodities**

As a basic guide, some costs are provided in Tables 6, 7 and 8 for antimalarial drugs and insecticides. However, in practice these prices must be carefully checked in each country as they change by location and over time. Also the availability and recommendations will also change with time. However, you may find the tables useful in guiding you as to the kind of information that will help your plan. Concerning the drugs, artemisinin derivatives have not been added at this time. Concerning the insecticides, no doubt newer products will have to be added.

Please read carefully the next Unit of this module before commencing the session to which it relates.
<table>
<thead>
<tr>
<th>Strata</th>
<th>Features &amp; Problems</th>
<th>Objectives</th>
<th>Approaches</th>
<th>Activities</th>
</tr>
</thead>
</table>
| I.     | Areas around Nile boundaries and agricultural zones, including urban & peri-urban slums.  
* Mesoendemic malaria  
* Perennial malaria transmission  
* Population of 4,266,000 (89% of total population)  
* High incidence of severe malaria cases  
* High mortality in all age groups | 1. To reduce the incidence of severe malaria by 60% in the area by the end of the year 2001.  
2. To decrease malaria mortality in the area by 40% by the end of the year 2001. | To achieve both objectives, health education to raise the awareness of the community about the disease, the importance of seeking early treatment, the completion of treatment and using self-protection methods.  
* To achieve objective one (in addition to health education):  
1. Strengthening PHC units in diagnosis and treatment of febrile cases by increasing the capabilities of staff and provision of supplies in addition to supervision.  
2. Application of appropriate anti-vector measures, such as reduction of breeding sites indoor and outdoor depending on community participation, in addition to reduction of man-vector contract.  
* To achieve reduction of mortality (at all ages):  
- proper management of severe malaria cases is needed at all PHC levels (1st contact), improving referral system  
- increase capability of referral centres | Health education through:  
* health units  
* media  
* mosques  
* Training of health cadres  
* Provision and distribution of diagnosis and treatment guidelines chart  
* Adoption of supply system  
* Adoption of supervisory system  
* Application of intermittent irrigation by Ministry of Agriculture and farmers  
* Training of school children  
* Training of health cadres in managing severe malaria cases  
* Distribution of guidelines chart for referral purposes  
* Adoption of supply system for referral centres |
| II.    | Displaced population  
* Mesoendemic malaria  
* Perennial malaria transmission  
* Population of 594,000 (11%)  
* High mortality in children under 5 years | To reduce mortality in children under 5 years of age by 25% in displaced persons camps by the end of the year 2001. | Health education of mothers to use impregnated mosquito nets and for seeking early treatment  
* Reduction of man-vector contract using nets provided with collaboration with NGOs.  
* Delivering of services through PHC units (temporary) (cost of construction shared with NGOs & MoH)  
* Provision of nutrition with collaboration of NGOs. | Education of mothers by NGOs feeding centres  
Provision and distribution of impregnated nets  
construction of temporary PHC units  
Distribution of food |
| III.   | Rural arid area  
* Hypoendemic malaria  
* Transmission is seasonal (rainy days)  
* Population of 540,000  
* High seasonal morbidity & mortality | 1. To reduce seasonal malaria morbidity in the area by 60% by the end of the year 2001  
2. To reduce seasonal mortality caused by malaria in the area by 50% by the end of the year 2001 | Health education to raise the awareness of the population about importance of using protection methods during the season.  
Provision of early diagnosis and treatment through construction of PHC units and training of community health workers (CHWs). | Health education through:  
* mosques  
* schools  
* Establishment of PHC units  
* Training of CHWs (basic) |

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<table>
<thead>
<tr>
<th>Targets</th>
<th>Cumulative desired results</th>
<th>Costs in USS (whole period)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1998</td>
<td>1999</td>
</tr>
<tr>
<td>1) proportion of PHC units to be covered with posters carrying message about the disease</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>2) number of hours in mass media to be covered with message about the disease (drama, speech, etc.)</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>3) proportion of mosques carrying message (one every 2 months) as part of Friday prayers</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>1) proportion of PHC cadres trained properly to deal with fever (malaria) cases (clinical and laboratory staff)</td>
<td>40</td>
<td>55</td>
</tr>
<tr>
<td>2) provision and distribution of diagnosis and treatment guidelines charts</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>3) the supply system coverage</td>
<td>60</td>
<td>75</td>
</tr>
<tr>
<td>4) the supervisory system % of coverage of facilities</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>5) proportion of schemes and farmers applying intermittent irrigation</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>% of school children trained to deal with indoor breeding sites</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>1) Health cadres trained to manage severe malaria cases (%)</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>2) provision and distribution of referral guide line charts</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>3) % of referral centres equipped to deal properly with severe malaria cases</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>4) provision of drugs free of charge in referral centres for treatment of severe malaria cases</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>1) proportion of mothers receiving message at NGO-led feeding centres about the importance of using mosquito nets</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>2) proportion of households in displaced camps that received two impregnated mosquito nets</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>3) coverage of displaced people with PHC units</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>coverage of displaced population with food rich in basic nutrients to be achieved</td>
<td>60</td>
<td>75</td>
</tr>
<tr>
<td>1) proportion of school children who received message about the disease</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>2) % of mosques through which malaria message was delivered at Friday prayers during the season</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>3) coverage of the population with PHC units</td>
<td>25</td>
<td>40</td>
</tr>
<tr>
<td>4) coverage of the population with CHWs</td>
<td>25</td>
<td>40</td>
</tr>
<tr>
<td>5) regular supply of drugs free of charge for treatment of malaria</td>
<td>30</td>
<td>50</td>
</tr>
</tbody>
</table>

(Cost based on existing staff and does not include salaries)
### Table 6. Antimalarial drugs commonly used, their action on the phases of development of the malaria parasite (sensitive strains), formulations and cost

<table>
<thead>
<tr>
<th>Drug</th>
<th>Some proprietary names (excepting certain formulations)</th>
<th>Chemical class</th>
<th>Sporozoites</th>
<th>Primary tissue schizonts</th>
<th>Erythrocytic forms</th>
<th>Asexual Gametocytes</th>
<th>Hypnozoites forms</th>
<th>Sporogonic forms</th>
<th>Contraindications</th>
<th>Formulations</th>
<th>Packing</th>
<th>Cost US $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quinine</td>
<td>Cinchona alkaloids</td>
<td>-</td>
<td>++</td>
<td>VMO+ F-</td>
<td>-</td>
<td>Idiosyncrasy History or threat of black water fever</td>
<td>Tabs. 300 mg quinine sulfate</td>
<td>1000</td>
<td>26.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tabs. 200 mg quinine sulfate</td>
<td>1000</td>
<td>20.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tabs. 125 mg quinine sulfate</td>
<td>1000</td>
<td>not available</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ampoules 300 mg quinine dihydrochloride</td>
<td>100</td>
<td>10.30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ampoules 600 mg quinine dihydrochloride</td>
<td>100</td>
<td>14.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ampoules 1000 mg quinine dihydrochloride</td>
<td>100</td>
<td>not available</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloroquine</td>
<td>Aralen. Avloclor. Resochin. Nivaquine. Sanoquin. Delagil. etc.</td>
<td>4-aminoquinolines</td>
<td>-</td>
<td>++</td>
<td>VMO+ F-</td>
<td>Avoid large cumulative doses (collagen diseases) History of ocular and skin reactions</td>
<td>Tabs. 100 mg chloroquine base-sulfate or phosphate</td>
<td>1000</td>
<td>5.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tabs. 150 mg chloroquine base-phosphate</td>
<td>1000</td>
<td>6.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ampoules 200 mg chloroquine base in 5 ml</td>
<td>100</td>
<td>4.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amodiaquine</td>
<td>Camoquin. Flavoquine. etc.</td>
<td>4-aminoquinolines</td>
<td>-</td>
<td>++</td>
<td>VMO+ F-</td>
<td>Not for prophylaxis (risk of agranulocytosis) otherwise as for chloroquine</td>
<td>Tabs. 200 mg amodiaquine base as dihydrochloride</td>
<td>1000</td>
<td>not available</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tabs. 150 mg amodiaquine base dihydrochloride</td>
<td>1000</td>
<td>15.50</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 F = P. falciparum; V = P. vivax; M = P. malariae; O = P. ovale.
2 Indicative prices for planning purposes
Table 6. (contd) Antimalaria drugs commonly used, their action on the phases of development of the malaria parasite (sensitive strains), formulations and cost

<table>
<thead>
<tr>
<th>Drug</th>
<th>Some proprietary names</th>
<th>Chemical class</th>
<th>Action against specific parasite stages</th>
<th>Contra- indications</th>
<th>Formulations</th>
<th>Packing</th>
<th>Cost US $³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primaquine</td>
<td>Primaquine. Neo-Quineryl</td>
<td>8-aminoquinolines</td>
<td>++ but not used for prophylaxis</td>
<td>G6PD deficiency</td>
<td>Tabs. 15 mg primaquine base</td>
<td>1000</td>
<td>4.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>++</td>
<td>First trimester of pregnancy.</td>
<td>Tabs. 7.5 mg primaquine base</td>
<td>1000</td>
<td>3.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+/-</td>
<td>Tendency to granulocytopenia.</td>
<td>Tabs. 2.5 primaquine base</td>
<td></td>
<td>not available</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Infants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proguanil</td>
<td>Paludrine</td>
<td>Biguanides</td>
<td>+</td>
<td>No other than resistant strains</td>
<td>Tabs. 100 mg proguanil base</td>
<td>1000</td>
<td>8.20</td>
</tr>
<tr>
<td></td>
<td>Chlorguanide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biguanil, etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorproguanil</td>
<td>Lapudrine</td>
<td>Biguanides</td>
<td>+</td>
<td>No other than resistant strains</td>
<td>Tabs. 20 mg chlorproguanil</td>
<td>1000</td>
<td>11.60</td>
</tr>
<tr>
<td>Pyrimethamine</td>
<td>Daraprim. Malocide</td>
<td>Diamino-pyrimidine</td>
<td>?</td>
<td>Expectant mothers</td>
<td>Tabs. 25 mg pyrimethamine base</td>
<td>1000</td>
<td>2.30</td>
</tr>
<tr>
<td></td>
<td>Chloridin. Tindurin. etc.</td>
<td></td>
<td></td>
<td>Folate deficiency</td>
<td>Syrup 6.25 mg pyrimethamine base</td>
<td></td>
<td>not available</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/5 ml</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dapsone/Pyrimethamine</td>
<td>Maloprim</td>
<td>Sulfone/ Diamino- pyrimidine</td>
<td>F++ Increased gametocyte count reported</td>
<td>Hypersensitivity to sulfa drugs.</td>
<td>Tabs. 100 mg dapsone</td>
<td>12.5</td>
<td>2.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Infants children and expectant mothers</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ F = P. falciparum; V = P. vivax; M = P. malariae; O = P. ovale
² Indicative prices for planning purposes
Table 6. (continued) Antimalarial drugs commonly used, their action on the phases of development of the malaria parasite (sensitive strains), formulations and cost

<table>
<thead>
<tr>
<th>Drug</th>
<th>Some proprietary names</th>
<th>Chemical class</th>
<th>Sperzoites</th>
<th>Primary tissue schizonts</th>
<th>Erythrocytic forms</th>
<th>Hypnozoites forms</th>
<th>Sporogenic forms</th>
<th>Contraindications</th>
<th>Formulations</th>
<th>Packing</th>
<th>Cost US $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfadoxine/ Pyrimethamine</td>
<td>Fansidar</td>
<td>Long-acting sulfonamide/ Diamino-pyrimidine</td>
<td>-</td>
<td>?</td>
<td>P++ V+</td>
<td>Increased gametocyte count reported</td>
<td>+</td>
<td>Hypersensitivity to sulfadrys. Infants and expectant mothers</td>
<td>Tabs. 500 mg sulfadoxine and 25 mg pyrimethamine</td>
<td>500</td>
<td>10.30</td>
</tr>
<tr>
<td>Sulfalene/ Pyrimethamine</td>
<td>Metakelfin</td>
<td>Long-acting sulfonamide/ Diamino-pyrimidine</td>
<td>-</td>
<td>?</td>
<td>P++ V+</td>
<td>Increased gametocyte count reported</td>
<td>+</td>
<td>As for sulfadoxine/pyrimethamine</td>
<td>Tabs. 500 mg and 25 mg pyrimethamine</td>
<td>1000</td>
<td>not available</td>
</tr>
<tr>
<td>Mefloquine</td>
<td>Mefloquine</td>
<td>Quinoline-methanol</td>
<td>-</td>
<td>-</td>
<td>VMO+ F-</td>
<td></td>
<td></td>
<td>Arythmia, Patients under beta-blockers, Pregnant women</td>
<td>Tabs. 250 mg mefloquine</td>
<td>not available</td>
<td></td>
</tr>
<tr>
<td>Mefloquine/ Sulfadoxine/ Pyrimethamine</td>
<td>Fansimef</td>
<td>Long-acting sulfonamide/ Diamino-pyrimidine/ Quinoline-methanol</td>
<td>-</td>
<td>?</td>
<td>++</td>
<td>VMO+ F-</td>
<td></td>
<td>As for mefloquine and sulfadoxine/ pyrimethamine</td>
<td>Tabs. 250 mg mefloquine, 500 mg sulfadoxine 25 mg pyrimethamine</td>
<td>1000</td>
<td>50.00</td>
</tr>
<tr>
<td>Tetracycline (used mainly in F infections)</td>
<td>Achromycin, Ambramycina, Cyclomycin, Hostacyclin, etc.</td>
<td>Antibiotic Unknown</td>
<td>F+ F++ VMO? but slow</td>
<td>?</td>
<td></td>
<td></td>
<td>To be avoided after the 4th month of pregnancy, in infants and young children</td>
<td>Capsules 250 mg tetracycline hydrochloride</td>
<td>100</td>
<td>8.50</td>
<td></td>
</tr>
</tbody>
</table>

1: P. falciparum, V = P. vivax, M = P. malariae, O = P. ovale

2: Indicative prices for planning purposes

3: Provisional, subject to review of current studies
Table 7. Cost of various insecticides used for malaria control

<table>
<thead>
<tr>
<th>Insecticide Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDT 75% wdp (water dispersible powder)</td>
<td>US$ 4.15/kg</td>
</tr>
<tr>
<td>Malathion 50% wpd</td>
<td>US$ 3.25/kg</td>
</tr>
<tr>
<td>Fenitrothion 40% EC (emulsion concentrate)</td>
<td>US$ 4.50/l</td>
</tr>
<tr>
<td>DDT 25% EC</td>
<td>no price available</td>
</tr>
<tr>
<td>Temephos 1% sand granules</td>
<td>US$ 2.20/kg</td>
</tr>
<tr>
<td>Deltamethrin 2.5% EC</td>
<td>US$ 23.00/l</td>
</tr>
<tr>
<td>Fenitrothion 50% EC</td>
<td>US$ 4.80/l</td>
</tr>
<tr>
<td>DDT technical</td>
<td>US$ 4.15/kg</td>
</tr>
<tr>
<td>Pirimiphos-methyl (as “Actellic”) 50% EC/ULV</td>
<td>US$ 11.00/l</td>
</tr>
<tr>
<td>Temephos 50% EC</td>
<td>US$ 18.50/kg</td>
</tr>
<tr>
<td>Cyfluthrin 10 wp (wettable powder)</td>
<td>US$ 52.00/kg</td>
</tr>
<tr>
<td>Lambda cyhalothrin 10 wp (as “Icon” or “Samurai”)</td>
<td>US$ 71.00/kg</td>
</tr>
<tr>
<td>Fenitrothion 40% wdp</td>
<td>US$ 6.00/kg</td>
</tr>
<tr>
<td>Fenitrothion 80% wdp</td>
<td>US$ 8.60/kg</td>
</tr>
<tr>
<td>Fenitrothion 80% EC</td>
<td>US$ 7.80/kg</td>
</tr>
</tbody>
</table>
Table 8. Cost comparison of insecticides as applied in residual spraying, excluding operational costs

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Dosage (g/m2) (technical grade)</th>
<th>Approximate duration of residual effect on mud (6-month period)</th>
<th>Number of applications per 6-month period</th>
<th>Total dosage per 6-month period (g/m2)</th>
<th>Formulation</th>
<th>Total amount of formulation per m2 per 6-month period (US$)</th>
<th>Approximate cost/tonne (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDT</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>75% wdp</td>
<td>2.67</td>
<td>3000</td>
</tr>
<tr>
<td>Malathion</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>50% wdp</td>
<td>8</td>
<td>2100</td>
</tr>
<tr>
<td>Fenitrothion</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>50% EC</td>
<td>8</td>
<td>7500</td>
</tr>
<tr>
<td>Propoxur</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>20% EC</td>
<td>20</td>
<td>9300</td>
</tr>
<tr>
<td>Deltamethrin</td>
<td>0.025</td>
<td>6</td>
<td>1</td>
<td>0.025</td>
<td>2.5% wdp</td>
<td>1</td>
<td>25-28 000</td>
</tr>
<tr>
<td>Permethrin</td>
<td>0.125</td>
<td>3</td>
<td>2</td>
<td>0.250</td>
<td>25% wdp</td>
<td>1</td>
<td>30 000</td>
</tr>
</tbody>
</table>

---

2 WDP water dispersible powder. EC emulsifiable concentrate
3 Excluding freight costs
Learning Unit 15

Selection and definition of evaluation methods in malaria control

Learning objectives:

By the end of this Unit you should be able to:

- define evaluation in the context of disease control
- describe the general principles of programme evaluation
- list some general purposes of programme evaluation
- describe some different types of evaluation investigations
- select appropriate indicators for evaluation

Introduction

The decision-makers need to know how well the programme is meeting the purposes for which it was established and whether the programme should be continued, expanded, cut back, changed or abandoned. Many factors must be weighed, not only the results of evaluation but public acceptance, participant reaction, costs, availability of staff and facilities and possible alternatives.

Evaluation may therefore be defined as: The systematic and scientific process of determining the extent to which an action or set of actions were successful in achieving pre-determined objectives and targets.

Evaluation should answer the questions: Are the approaches achieving the objectives? Is the expenditure justified? Are the targets being achieved on time?

Evaluation can provide data that reduce uncertainties and clarify the gains and losses thereby allowing decision makers to apply their values and preferences more accurately and with a better knowledge of the trade-offs that alternative decisions involve.
Planning malaria control programmes: Learner's Guide

In malaria control, monitoring and evaluation, which are inseparable, should be a continuous process with the purposes of:

- correcting actions through planning and replanning
- improving actions through enhancing efficiency, performance and quality
- determining effectiveness, highlighting strong and weak points as the reasons for failure
- determining and controlling costs
- measuring accomplishments and needs versus time
- disseminating knowledge and techniques
- modifying programme technology
- justifying the programme technically, socially, economically and politically
- establishing priorities for resource allocation and programme activities
- developing critical attitudes among staff
- increasing job interest

The selection of evaluation methods must be based on an analysis of the malaria situation and on the objectives, operational targets and the control of measures which have been adopted. The complex epidemiology of malaria and multiple lines of approach to its control make it difficult to establish an “evaluation model” which could be universally applied. However, guiding principles can be provided for the selection of indicators in respect of specific situations. Since these situations may vary from country to country, and quite often within the same country, the final selection of the evaluation methods must be made locally, after the objectives have been defined and the measures to be applied selected.

Some useful terms

It might be useful to agree upon some basic terms used in evaluation.

*Effectiveness* is the extent to which an objective has been achieved (that is the extent to which the measures are effective against the disease problem).

*Cost-effectiveness* is the determination of the costs of a process for a given level of effectiveness and for comparison it is the change in costs for the same level of effectiveness in order to recommend the best course of action.

*Efficiency* is the relationship of input to output expressed as input/output ratios.
Performance is the time taken to complete an activity and the degree (%) to which the task was successfully completed.

**Some principles of evaluation of malaria control**

- All malaria control programmes must have an evaluation component as a permanent feature to meet changing conditions.

- Planning, implementation, evaluation and replanning must be a continuous process and an integral feature of any antimalaria programme.

- Evaluation methods and relevant data to be collected must be strictly related to the objectives, activities and expected programme outputs.

- Evaluation of a malaria control programme should take into account the status before the initiation of the plan and after its implementation.

- For quantitative epidemiological evaluation the proper evaluation tools should be selected with attention to simplicity, cost and validity of the information obtained.

- Qualitative evaluation should be routine based on proper supervision to ensure the quality of operational performance is maintained at the optimum level.

- Well trained and experience professionals should play a key role in the evaluation process to:
  - specify suitable evaluation tools
  - design forms
  - train and supervise personnel engaged in evaluation work
  - conduct field situations and surveys

**Evaluation of malaria control within primary health care**

Evaluation of malaria control fits into the evaluation of other components of primary health care. It is usually not justifiable to set up a system for malaria alone. However, evaluation of malaria control can serve as a focal point for the development of evaluation of other components of primary health care. It is difficult to evaluate in the absence of specific programme objectives and targets. Evaluation relates to programme. Otherwise scarce resources are utilized to collect data that are not useful. Evaluation is a systematic way of learning from malaria control. It yields data that are used for planning, for policy, for operations, or for other purposes. If data are not
being used then why collect them. Before setting up evaluation, it is important to look for other data sources already available in the country. There are usually many of these. The problem is that many data collection sources operate in parallel with exchange of information between those responsible for the collection of demographic data and those responsible for health.

Utilization of resources for evaluation implies that it is useful to somebody to measure something. In malaria control through primary health care where the emphasis is at the periphery, evaluation must provide useful information there, as well as at more central levels. It is recognized that information requirements are not the same throughout. Thus what the community health worker needs to collect to provide better service may not be the same as the data needed by the ministry of health for planning policy or by WHO. It may create problems if one level utilizes scarce personnel or other resources to collect data useful only at another level. Sometimes what is required by donors may not be as useful for the programme.

Comprehensive evaluation of malaria control includes indicators of health status, measure of coverage, accessibility and utilization, analysis of manpower and training, and cost analysis. Health status indicators such as mortality, morbidity, prevalence, and incidence reflect the impact on health. Measures of coverage, accessibility and utilization provide insight into how effective the programme is in reaching the target population. Analysis of manpower and training gives indication of the success in developing key personnel. Cost analysis is essential in determining how the programme is to be sustained and/or expanded and as a measure of efficiency.

Selection of indicators for evaluation should be dependent on the malaria epidemiology, the area involved, the resources available, the social, economic and political situation, and the programme objectives. Verification of the accessibility of people to diagnosis, antimalarial treatment and referral may be the best way of reducing and simultaneously evaluating the impact on mortality and morbidity. This approach to evaluation requires few additional resources to those already being used for diagnosis and treatment. Much of the information required about provision of health care is available through health services statistics if health workers in the village and rural areas are included in data collection and if adequate supervision is done. Crude information may prove very useful in identifying trends for more careful assessment.
The complexity of community development with its difficult components of primary health may make it difficult to evaluate the contribution of only one (e.g. malaria control) on health. Thus to attribute a reduction in childhood mortality rates to provision of malaria treatment or to measles vaccine may be impossible. This phenomenon can result in problems of allocation of scarce resources.

Information for action

Programme evaluation generates information for action and therefore information systems for evaluation purposes must be designed to provide information that is:

- **timely**, available for programme improvement during implementation, in particular prior to major decisions and programme reviews
- **relevant**, directly related to programme management and data needs
- **decentralized**, useful for programme involvement at all levels of the health system

For national programmes, evaluation includes four interrelated components:

- **Monitoring of programme process**: to document whether activities are carried out as planned, to ensure accountability, and to detect problems early.

- **Evaluation of programme outcomes and impact**: to document that programmes lead to expected results in terms of improved quality of services, coverage, practices, etc. (targets), and of the desired changes in morbidity and mortality (objectives).

- **Applied research**: to answer questions tied to specific interventions or services. This can include cost studies and evaluation of effectiveness that require research designs more rigorous than the tracking of indicators.

- **Periodic programme reviews**: to bring together all the information collected as a basis for replanning. This includes assessment of broader programme aspects such as the quality of the policy, the effectiveness and efficiency of the interventions, sustainability and programme management.

A core set of standard methods and measures should provide a starting point for programme managers to improve the quality of information. It will also increase data consistency, making it easier to compare results and share experiences.
The selection and definition of evaluation methods

Evaluation has three main components:
1) the operational aspects of the programme including a continuous and critical appraisal of implementation
2) the epidemiological status that derives from the measures applied
3) the interpretation of results in the light of the operations performed

Interpretation of the results of evaluation are important in order to judge whether:
- the measures(s) applied under local conditions is (are) sufficient to achieve the expected targets on time
- complementary or alternative actions have to be considered
- the results obtained (outcome) correspond to the efforts made and the resources used (input) - cost analysis

The latter component is an important element to judge whether:
- the measure(s) applied under local conditions is (are) sufficient to attain the expected targets
- complementary or alternative actions have to be considered
- the results obtained correspond to the efforts made and the resources used (cost analysis)

A more detailed analysis of the different aspects of the programme (e.g. its relevance, formulation, efficiency, effectiveness, and acceptance by all parties concerned) may be carried out at regular intervals (e.g. every three to five years). Such an evaluation may be carried out by independent specialists with the active participation of programme personnel.

Wherever possible, the impact that antimalaria measures may have on the social and economic development of the country should be measured and evaluated. This may require the participation of experts outside the ministry of health and due consideration should be given to this aspect during the planning process for the selection and monitoring of appropriate indicators.

Operational evaluation methods

Evaluating operational activities implies passing a qualitative and quantitative judgement on the application of antimalaria measures. A list of available antimalaria
measures and some indicators that could be used for operational evaluation are provided in Table 9.

**Table 9. Indicators for operational evaluation**

<table>
<thead>
<tr>
<th>Type of measures used</th>
<th>Indicator to be used for operational evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Against plasmodia</strong></td>
<td></td>
</tr>
<tr>
<td>Individual prophylaxis/suppression.</td>
<td>Regularity of drug intake while exposed, and continuation after exposure.</td>
</tr>
<tr>
<td>Collective prophylaxis/suppression.</td>
<td>Mean population protected according to target during fixed period.</td>
</tr>
<tr>
<td>Radical treatment</td>
<td>Percentage of radical treatment completed among the number of positives detected.</td>
</tr>
<tr>
<td>Mass drug administration.</td>
<td>Time factor, population coverage per round, mean population covered during a fixed period. Acceptance rate. Sex and age specific coverage rates.</td>
</tr>
<tr>
<td>Overall evaluation (institutional treatment of cases).</td>
<td>Inventory and periodical appraisal of the number of health institutions and/or specialized personnel entrusted with the treatment of cases.</td>
</tr>
<tr>
<td><strong>Against aquatic stages of mosquitos</strong></td>
<td></td>
</tr>
<tr>
<td>Larviciding operations by chemicals or biological agents.</td>
<td>Susceptibility of the aquatic stages to the compound used. Frequency, regularity and dosage of larviciding application (chemical or biological). Estimated percentages of areas covered and population protected in relation to the plan. Regularity and coverage of entomological monitoring.</td>
</tr>
<tr>
<td>Environmental modification or manipulation</td>
<td>Indication of the type and size of operations (large or small scale) and stage of development. Estimated percentages of population protected and areas covered in relation to the plan. Regularity and coverage of entomological monitoring.</td>
</tr>
<tr>
<td><strong>Against adult mosquitos</strong></td>
<td></td>
</tr>
<tr>
<td>Indoor residual spraying.</td>
<td>Percentage of structures totally and partially sprayed in relation to targets. Refusal rate. Spot check of dosage and date of application of insecticides. Assessing and monitoring the susceptibility of the vector(s) to insecticides.</td>
</tr>
<tr>
<td>Space spraying (cold and thermal fogging) indoor and/or outdoors.</td>
<td>Frequency and regularity of application. Dosage used. Coverage of applications, both in time and space. Susceptibility status of vectors to insecticides used.</td>
</tr>
<tr>
<td>Type of measures used</td>
<td>Indicator to be used for operational evaluation</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Biological agents (pathogens, chemosterilants, genetic manipulation)</td>
<td>Degree of programme implementation as compared to plan. Regularity and coverage of entomological monitoring. Frequency and regularity of applications. Dosage or manipulated mosquito population used. Coverage of applications, both in time and space. Population protected.</td>
</tr>
<tr>
<td><strong>Against man/mosquito contact</strong></td>
<td></td>
</tr>
<tr>
<td>Screening of houses and/or site selection.</td>
<td>Percentage of houses screened, degree of screening (partial or complete), percentage of houses built following site selection and of population protected according to plan.</td>
</tr>
<tr>
<td>Bed-nets, repellents.</td>
<td>Percentage of population protected in relation to plan. Random sampling surveys to assess whether bed-nets or repellents are properly used. Frequency used. Condition of bed-nets. Acceptability of repellents.</td>
</tr>
<tr>
<td><strong>For monitoring the epidemiological situation</strong></td>
<td></td>
</tr>
<tr>
<td>Sero-epidemiological surveys.</td>
<td>Techniques and specificity of the antigens used. Percentage population (by age groups) covered by sero-epidemiological surveys in relation to plan.</td>
</tr>
<tr>
<td>Parasitological laboratories.</td>
<td>Percentage of established functioning laboratories, number of microscopists employed and number of slides examined in relation to plan. Backlog. Time delay between slide taking and starting radical treatment.</td>
</tr>
<tr>
<td>Entomological laboratories and field teams.</td>
<td>Percentage of established entomological laboratories, number of entomological teams employed, and number and frequency of entomological surveys carried out in relation to plan.</td>
</tr>
<tr>
<td>Malarriometric surveys.</td>
<td>Frequency, regularity and coverage of malarriometric surveys carried out in fixed indicator villages and/or villages selected at random.</td>
</tr>
<tr>
<td>Malaria clinics (aid posts).</td>
<td>Distribution, coverage. Average monthly slide output, average monthly patient attendance.</td>
</tr>
<tr>
<td>Appraisal of active case detection (ACD) activities.</td>
<td>Number of house visitors, average number of house visits (monthly or fortnightly), percentage of population covered in relation to plan.</td>
</tr>
<tr>
<td>Appraisal of passive case detection (PCD) activities.</td>
<td>Distribution, coverage. Percentage of productive PCD posts, ratio of admissions or attendances to number of</td>
</tr>
<tr>
<td>Type of measures used</td>
<td>Indicator to be used for operational evaluation</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Appraisal of other case detection</td>
<td>Average number of epidemiological investigations, mass blood surveys, follow-up of confirmed cases, special surveys carried out during the reporting period.</td>
</tr>
</tbody>
</table>

To assess whether operations are carried out properly so that the set targets can be met, it is essential that appropriate, valid, objective, sensitive and specific indicators be selected. Therefore, two steps are proposed for the elaboration of the evaluation methods for operational activities in malaria control programmes.

- identification of those measures that require evaluation according to the approach being implemented
- selection of the appropriate indicators in relation to the operational targets and type of interventions adopted in different situations

**Antimalaria measures requiring evaluation**

*Measures directed against plasmodia:*

These include the use of antimalarial drugs effective against various stages of the malaria parasite’s life-cycle.

*Measures designed to decrease or kill the aquatic stages of mosquitoes:*

These include direct action through larviciding or biological methods and indirect action by environmental modification or manipulation.

*Measures designed to kill adult mosquitoes:*

These include direct action through the application of residual insecticides or space spraying.

*Measures designed to prevent mosquitoes from feeding on man:*

Principally the use of impregnated mosquito nets, repellents and screening.

*Measures designed to monitor the epidemiological situation:*

These include surveillance activities and epidemiological assessment.

*Diagnostic services:*
Flow and processing of blood films, quality of slides, adequacy of staining and efficiency of microscopists all require evaluation as do the other aspects of laboratory operation, including recording and reporting.

**Health personnel:**
The work of all the staff requires regular evaluation to determine how adequately their work is being carried out in relation to their job descriptions. In particular, the type, quantity, quality and performance of supervision at all stages and levels must be monitored continuously.

**The materials used:**
This includes the “quality control” of all equipment (sprayers, microscopes, etc.) and supplies (insecticides in relation to specifications, drug content of tablets, etc.). The use, performance and maintenance of motor vehicles should also be evaluated as transport is often one of the most expensive items of the antimalaria programmes.

**Selection of appropriate operational indicators**
The most appropriate operational indicators will have to be selected in relation to the objectives and types of intervention envisaged. Changes to the plan, following evaluation, may mean that the evaluation indicators also need changing. The approaches to achieve the objectives may imply the same methodology throughout the national territory, or different approaches may be identified for different eco-epidemiological stratum. The final selection of indicators for the evaluation of operations will have to be adjusted to the malaria control approaches adopted.

**Epidemiological evaluation methods**
Epidemiological evaluation is an appraisal of the effectiveness of an intervention or a set of interventions on the disease, expressed in terms of the attainment of the objectives, e.g. reduction of specific mortality and/or morbidity, or reduction of the prevalence of the infection. The attainment of the objectives largely depends on the effectiveness of the measures applied (e.g. susceptibility of the vectors to insecticides, sensitivity of the parasite to drugs), their correct application (operational evaluation) and the appropriateness of the methods used to measure the changes.

As in the case of operational evaluation, the epidemiological evaluation procedures need to be adapted to: the local specific epidemiological situation; the
objectives of the control programme; and the antimalaria measures used to meet those objectives. In addition, they must take into account the capability of the programme. The evaluation system must be realistic in terms of cost, applicability, diagnostic facilities (techniques, volume), supervision and management, and coverage in space and time.

**Measurement methods**

The ideal epidemiological evaluation of malaria control aiming at the prevention / reduction of specific mortality would require the recording of the total number of deaths due to malaria and comparing the results at regular intervals. This involves a complete coverage of the country by a health system, accurate reporting and efficient data processing. Unfortunately these conditions are not met in most developing countries. Under the prevailing conditions, however, sufficiently accurate data may be obtained by sampling, with substantial savings in time and labour as compared to what would be required for a complete evaluation.

The reasons for choosing a sample survey for evaluation mortality trends are as follows:

- a sample survey may be the only feasible method of collecting the relevant data
- the lower cost of a sample survey and its smaller demands on personnel are factors to be considered
- the information collected through small size surveys is often far more reliable than that emanating from a deficient universal coverage system
- the results of sample surveys are rapidly available

Sample surveys may be based on the records of representative hospitals and dispensaries. This restriction in the scale of the investigation permits a critical study of the quality of the information contained in the records which, even if biased, could be used to determine the trend.

Attention should be given to the sampling time. Most mortality and morbidity surveys have as their purpose the determination of some kind of current rate, with the assumption that this is to represent the position over a fairly long period. It follows that, if seasonal changes are believed to be important, the sample must cover the seasons systematically; further, if changes from year to year are important, the surveys
must extend over a long period. In studying changes over time, precision may be achieved by using longitudinal surveys of some sample populations.

For malaria control aiming at the reduction or interruption of malaria transmission the activities are meant to modify the malaria situation to values consistent with the desirable level of control. Epidemiological evaluation in these conditions consists of comparing the malaria situation existing prior to the intervention with that which follows it and of continuing to monitor the situation until the objectives have been met.

There are different methods whereby malaria can be measured and quantified. For example, where reduction of mortality and morbidity are the objectives, it may be decided that specific *P. falciparum* incidence or prevalence would be a more appropriate index to gauge the impact of approaches adopted than crude malaria indices. This applies especially to areas where this species is predominant and causes a high mortality.

Prevalence rate and parasite incidence, stratum-wise and country-wise, may be used to measure and compare two different malaria situations. More precise quantification requires a more refined and sophisticated mathematical approach and in this respect a number of measurement methods have been developed over the years (Table 9).

The measurement of parasite incidence requires the performance of surveillance activities. These will also attempt to evaluate the reasons for the changes. The most important of the surveillance activities is the detection of malaria infections in the community, for which different methods have been devised.

When the level of transmission approaches zero surveillance has to be more and more sensitive, embracing at this stage activities concerning the effect of antimalarial drug administration (prevention and cure of infections), the results of epidemiological investigations (origin of cases) and the judgement of whether remedial and preventive measures have to be implemented for the final achievement of malaria eradication.

However, activities which are indispensable for measuring disappearing malaria, may not be required when a certain level of transmission is still tolerated. In the latter circumstances, malaria may be more easily and economically measured and the trends assessed by sample surveys (malarriometric surveys in fixed indicator
villages or villages selected at random) and/or comparing the parasitological results obtained in malaria clinics. The size of the sample is determined by the size of the population and level of endemicity, for instance if the malaria prevalence is >10% a sample size of 1-2% of the population would suffice. Results obtained through sample surveys (parasite rates, slide positivity rates) may be extrapolated for the entire population and used to indicate the prevalence or incidence trends in the area.

Trends can also be monitored by comparing at regular intervals the results obtained in the malaria clinics. Furthermore, if antimalaria operations are restricted to specific groups (school children, border police) then random clusters of 100 may be examined and in the case of development projects 10-20% of the population. In addition, there may be borderline situations where in view of the desired reduction in prevalence and of the efforts to be made to achieve this, the functions of surveillance (case detection, parasitological and entomological observations, antimalarial drug treatment, epidemiological investigations, elimination of foci by either residual spraying or mass drug administration, case follow-up) are to be introduced either individually or in combination. Surveillance functions to be performed will have to be defined for each specific situation of the control programme.

**Epidemiological indicators**

*Selection of epidemiological indicators:*

The epidemiological evaluation of malaria control programmes both requires and allows only a limited number of relatively simple indicators, which should be very carefully selected to be closely adapted to the objectives and methods of the control programme.

In Tables 10, 11 and 11a an attempt has been made to indicate the type of epidemiologic indicators to be selected in relation to designated objectives and the control methods applied. In this regard the percentage of severe malaria cases among hospital admissions would provide a good indication of the absence or failure of peripheral health services and serve as a basis for the calculation of case fatality rates.
Table 10. Some important characteristics of parasitological indices

<table>
<thead>
<tr>
<th>Parasitological indices</th>
<th>Basic observations</th>
<th>Population observed</th>
<th>Levels of endemicity at which indices are particularly sensitive and economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prevalence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parasite rate (proportion positive by microscopic examination)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Incidence</td>
<td>2.1 Slope of age-specific parasite rate in the youngest age-groups</td>
<td>Cross-Sectional parasitological survey</td>
<td>Samples</td>
</tr>
<tr>
<td></td>
<td>2.2 Proportion of negatives (infants or treated children) found positive after a period of time</td>
<td></td>
<td>Samples</td>
</tr>
<tr>
<td></td>
<td>2.3 New parasitaemias detected in a population during a period of time</td>
<td>Blood examination of suspected cases collected by static health services (PCD), periodic home visits (ACD), blood surveys among contacts of cases</td>
<td>Total population</td>
</tr>
</tbody>
</table>
### Table 11. Indicators for epidemiological evaluation

<table>
<thead>
<tr>
<th>Programme objectives and targets</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevention/ reduction of mortality</td>
<td>Infant mortality rate</td>
</tr>
<tr>
<td></td>
<td>Mortality among young children</td>
</tr>
<tr>
<td></td>
<td>Percentage of severe malaria cases among hospital admissions</td>
</tr>
<tr>
<td></td>
<td>Case fatality rates</td>
</tr>
<tr>
<td></td>
<td>Specific malaria mortality rate(^1)</td>
</tr>
<tr>
<td>Protection of pregnant women</td>
<td>Infant birth weight</td>
</tr>
<tr>
<td></td>
<td>Malaria morbidity among pregnant women</td>
</tr>
<tr>
<td></td>
<td>Infant mortality rate</td>
</tr>
<tr>
<td>Reduction of malaria transmission (incidence/prevalence)</td>
<td>Direct evaluation through malarialometric surveys</td>
</tr>
<tr>
<td></td>
<td>- spleen rates and average enlarged spleen</td>
</tr>
<tr>
<td></td>
<td>- parasites rates by age groups and parasite species</td>
</tr>
<tr>
<td></td>
<td>- seropositivity rates and titres per age group and parasite species (if serological surveys performed)</td>
</tr>
<tr>
<td></td>
<td>Direct evaluation through passive or active case detection</td>
</tr>
<tr>
<td></td>
<td>- blood examination rate</td>
</tr>
<tr>
<td></td>
<td>- parasite incidence</td>
</tr>
<tr>
<td></td>
<td>- slide positivity rate</td>
</tr>
<tr>
<td></td>
<td>- number of active foci</td>
</tr>
<tr>
<td></td>
<td>Entomological evaluation in relation to vector control methods</td>
</tr>
</tbody>
</table>

\(^1\) Determination of this mortality rate and the others, may often only be made on a sample of deaths and it may not be possible to relate it to the true denominator.
Table 11a. Indicators for epidemiological evaluation - entomological indicators

<table>
<thead>
<tr>
<th>Vector control methods</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aiming primarily at reducing survival of house resting mosquitos</td>
<td>Anopheline indoor resting density</td>
</tr>
<tr>
<td></td>
<td>- by pyrethrum spray sampling</td>
</tr>
<tr>
<td></td>
<td>- by hand collection</td>
</tr>
<tr>
<td></td>
<td>Night biting densities, indoor and outdoor</td>
</tr>
<tr>
<td></td>
<td>Mortality among mosquitos captures in window traps (24 hours)</td>
</tr>
<tr>
<td></td>
<td>Sporozoite rates (if feasible)</td>
</tr>
<tr>
<td></td>
<td>Parous rates</td>
</tr>
<tr>
<td>Aiming primarily at reducing mosquito density</td>
<td>Anopheline indoor resting density (as above)</td>
</tr>
<tr>
<td></td>
<td>Outdoor resting densities</td>
</tr>
<tr>
<td></td>
<td>- natural shelters (if known)</td>
</tr>
<tr>
<td></td>
<td>- artificial shelters</td>
</tr>
<tr>
<td></td>
<td>Density in traps</td>
</tr>
<tr>
<td></td>
<td>- light traps</td>
</tr>
<tr>
<td></td>
<td>- animal traps</td>
</tr>
<tr>
<td></td>
<td>Night biting densities, indoor and outdoor</td>
</tr>
<tr>
<td></td>
<td>Percentage of positive breeding places</td>
</tr>
<tr>
<td></td>
<td>Larval densities</td>
</tr>
<tr>
<td>Activity</td>
<td>Decisions following interpretation of operational results</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Results considered satisfactory and operations up to standard</td>
</tr>
<tr>
<td>Radical treatment</td>
<td>Continue the activity.</td>
</tr>
<tr>
<td></td>
<td>End measure according to epidemiological situation (for suppressive treatment only).</td>
</tr>
<tr>
<td></td>
<td>Introduce additional measures.</td>
</tr>
<tr>
<td>Larviciding operations</td>
<td>Continue the operations.</td>
</tr>
<tr>
<td></td>
<td>End measures according to epidemiological situation.</td>
</tr>
<tr>
<td>Biological control operations (use of larvorous fish)</td>
<td>Continue the operations.</td>
</tr>
<tr>
<td></td>
<td>End measure according to epidemiological situation.</td>
</tr>
<tr>
<td></td>
<td>Extend the measures outside focus.</td>
</tr>
</tbody>
</table>

---

219
<table>
<thead>
<tr>
<th>Activity</th>
<th>Results considered satisfactory and operations up to standard</th>
<th>Results considered satisfactory and operations not up to standard</th>
<th>Results considered unsatisfactory and operations below standard</th>
<th>Results considered unsatisfactory and operations up to standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introdomiliary residual spraying.</td>
<td>Continue the operations.</td>
<td>Redefine problems and/or evaluation methodology.</td>
<td>Improve house coverage.</td>
<td>Check timing and periodicity of operations.</td>
</tr>
<tr>
<td></td>
<td>End operations according to epidemiological situations.</td>
<td></td>
<td>Improve quality of operations.</td>
<td>Check susceptibility of vectors to insecticides.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Up-date geographical reconnaissance.</td>
<td>Change insecticides.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Strengthen supervision.</td>
<td>Check identity and behaviour of vectors.</td>
</tr>
<tr>
<td>Space insecticide applications (ULV applications or thermal fogging)</td>
<td>Continue the activity.</td>
<td>Redefine problems and/or evaluation methodology.</td>
<td>Improve regularity, frequency and coverage of applications.</td>
<td>Change frequency of applications.</td>
</tr>
<tr>
<td></td>
<td>End the activity according to epidemiological situation.</td>
<td></td>
<td>Strengthen supervision.</td>
<td>Check on dosage and time of applications.</td>
</tr>
<tr>
<td></td>
<td>Extend the activities.</td>
<td></td>
<td></td>
<td>Assess susceptibility of vectors to insecticides.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Change insecticides.</td>
</tr>
<tr>
<td>Environmental modifications or manipulation.</td>
<td>Continue entomological monitoring both in time and space.</td>
<td>Redefine problems and/or evaluation methodology.</td>
<td>Bring the environmental management activities up to standard with the technical assistance of specialized agencies if required.</td>
<td>Redefine the problem for better planning.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Introduce additional measures.</td>
</tr>
</tbody>
</table>
Interpretation of evaluation results

The evaluation of operational activities and their correlation with the epidemiological situation resulting from the intervention can only be made through the use of the information provided by a specifically designed reporting system.

The analysis of the data provided by the reporting system will indicate whether or not the programme is proceeding according to expectations. The appraisal of the evaluation may also reveal whether it will be possible to attain the objectives with the measures applied or whether the objectives can be met with a reduced effort.

In order to reach any of the above-mentioned conclusions it is, therefore, necessary to evaluate and interpret the operational results and the epidemiological results, and correlate them with the efforts made for their achievement. This should provide sufficient evidence required for continuing, correcting or reorienting programme activities or eventually for redefining programme objectives.

Following the implementation of intervention measures according to the approach selected it may be concluded whether the results are satisfactory as per expectations and whether the standard of operations approached the norms set in the plan. Decisions may be taken either to continue the operations unchanged for a further specified period or to make significant changes within the resources available. Some examples of possible interpretations and decisions are presented in Table 12.

The interpretation of the epidemiological results may be made by comparing the monitoring data with both the situation existing prior to the intervention and the objectives. An analysis of this information and the ensuing interpretation may allow conclusions to be drawn which have a bearing on the implementation of the programme. Some of the possible conclusions are:

- the objectives can or cannot be met with the measures applied
- the objectives could be met but not within the fixed time-limits of plan
- the objectives could have been met with lesser means than those applied, and therefore with reduced resources

Should the results of the epidemiological evaluation be in line with expectations, then this means that, unless unforeseen developments take place, the objectives will be met according to plan. If, on the contrary, the epidemiological
results do not correspond with expectations, the analysis of the epidemiological data will indicate that some errors were made at the planning phase in the selection and definition of objectives or in the selection of the control measures.

An erroneous identification and selection of the epidemiological indicators may be due to an over-estimation of the evaluation capability of the programme or to the inadequacy of the epidemiological indicators adopted for monitoring the situation. There may be situations where the selection of the epidemiological indicators has been appropriate, but their assessment not correctly implemented. This can be considered as an appraisal of the epidemiological evaluation.

Malariometric surveys, when carried out at regular intervals, or the monitoring of the parasitological results obtained in malaria clinics, may be adequate epidemiological indicators in areas where a certain degree of malaria transmission is still tolerated. But the selection of indicator areas (fixed or at random) or the establishment of malaria clinics in localities where the problem is not comparable to the average (e.g. with regard to prevalence or incidence levels) may bias, at the source, the quality of the information they should provide.

**Small group exercise**

Working in your assigned small groups, participate in the selection of a discussion leader and rapporteur. Your group will be assigned one of the exercises below. Read through the exercises very carefully and make sure you all agree on what the output should be. Decide on how you will proceed, allocate the time accordingly remembering that it takes time to prepare an overhead or flip chart as aids to the presentation of the group work in plenary. It is therefore better if the group writes down the outcome directly onto a transparency or the flip chart. This will give you more time for discussion. You will be allocated 30 minutes to do the exercise and 10 minute to present and discuss the group’s work in plenary session.

**Topic:**

Evaluation of the effectiveness and efficiency of an approach
Activity:

As a group discuss and agree upon the methods for evaluating the effectiveness and efficiency of a malaria control approach consisting of:

<table>
<thead>
<tr>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Case detection and treatment</td>
<td>• Case detection and treatment</td>
<td>• Case detection and treatment</td>
</tr>
<tr>
<td>• Modification of human attitudes and behaviour</td>
<td>• Modification of human attitudes and behaviour</td>
<td>• Modification of human attitudes and behaviour</td>
</tr>
<tr>
<td>• Residual insecticide house spraying</td>
<td>• The use of deltamethrin impregnated mosquito nets</td>
<td>• The use of deltamethrin impregnated mosquito nets</td>
</tr>
<tr>
<td></td>
<td>• Biological control of vectors</td>
<td>• Environmental manipulation</td>
</tr>
</tbody>
</table>

All groups to suggest ways of weighting the individual components of the approach to the impact on the disease.

Outcome:

One member of each group (discussion leader or rapporteur) to present the methods of evaluation that can be used and a suggested weighting method.

Please read carefully the next Unit of this module before commencing the session to which it relates.
The research and development approach

Learning objectives:

By the end of this Unit you should be able to:

• describe a process for planning a formal operational research study
• develop a research protocol
• organize a system to document experiences
• identify subjects suitable for a research and development approach
• begin to analyze critically published research

Introduction

In developing a malaria control programme we are concerned with operational research, that is research that will help solve operational problems of immediate priority to the programme, the results of which will greatly facilitate the programme implementation and achievement of the objectives.

During the planning process, essential gaps in knowledge and information will become apparent, some of which could become the subject of operational research. The answers to these questions could, in some instances, be better obtained by a formal operational research study and in other instances through careful documentation of experiences during programme implementation and the research and development approach. In this Learning Unit you will explore these possibilities. The planning group should identify the essential questions and plan for them to be answered through one of these two approaches.

Another aspect of research which is of relevance to the planner is the use of recent knowledge provided by research. In this respect published results of research should not be read at face value and the results incorporated into the plan. It is advisable to critically appraise published research, and this is a good discipline to acquire when reading any research paper.
The role of research in malaria control programmes

Operational research is an essential component of a malaria control programme in order to
- improve the understanding of malaria in the country and to facilitate the formulation of realistic objectives and the choice of methods
- find solutions to obstacles that may arise during implementation
- obtain data necessary for evaluation which are not collected through routine monitoring
- improve the efficiency of operations
- examine costs, acceptability and effectiveness of new interventions

A competent research team should be identified. The members can be based in universities, research centres, hospitals and the malaria programme itself and called upon by the programme manager when needed. It is expensive and a luxury to have a team of researchers especially for malaria studies and in any event depending on the problem to be studied many different disciplines will be required as the programme progresses.

Close collaboration between researchers and control programme personnel is of mutual benefit. It is, however, essential that priority research topics are defined on the basis of local needs, and that the results obtained are of direct relevance to the control programme.

The research process

A logical sequence to planning, implementing and utilizing the outcome of operational research might be helpful and so such a process is sequenced below.
- Identify and prioritize the problems, the solutions to which would facilitate malaria control - listen to the periphery, brainstorm, avoid interests.
- Develop a study design which should include an outline of the study, the methodology, evaluation parameters, resource requirements and costs.
- Identify existing resources within the country - human resources, facilities, supplies, equipment, finances.
- Seek possible funding from inside the country or from outside for resources which are lacking.
• Use the study design to complete a proposal for funding according to funding agency requirements.

• When funding has been approved, prepare a detailed protocol (for guidance see the Annex to this Learning Unit) to be used by workers at all levels to implement the research study.

• Implement the study and document the results; positive and negative results are equally important.

• Analyze the results.

• Draw conclusions.

• Make recommendations based on conclusions.

• Write the final report.

• Take the necessary action to ensure that the recommendations are taken into account by the control programme in a timely manner, and disseminate the results widely (there should be no delay in using the results, publications of the results is a secondary consideration).

• Incorporate the results as appropriate into the replanning process.

**Acquisition of knowledge and documentation of experiences**

In the course of programme implementation and evaluation, much experience is gained which often goes undocumented and subsequently becomes anecdotal in nature. Planning should be based on as complete a knowledge of local epidemiology as possible and should include not only planning for control activities but also for improvement of knowledge through information and evaluation systems.

The difficulties experienced in trying to reorient malaria control programmes, the variability of malaria epidemiology itself and the problems associated with its control, point to the need to improve our understanding of local epidemiological determinants, as well as the conditions of applicability of antimalaria activities.

Seldom will a whole country follow a single malaria control approach. Guidance should be provided based on well-documented experiences not only of the effects which followed particular interventions but also of the conditions under which similar effects may be expected.
Planning malaria control programmes: Learner’s Guide

The acquisition of experience should differ essentially from the pilot project approach. Its aim is not to test whether a particular technology can achieve certain results under a set of conditions, but to improve our understanding of how these results were obtained and which of the pre-existing or developing characteristics favoured or hampered the results observed. This understanding may be obtained from the detailed observation of particular experiences but will more likely result from the comparison of various attempts in different situations.

The experience of the past indicates that, perhaps even more than the development of new and improved technology, what is needed in order to improve malaria control is a better understanding of where and how to apply the general knowledge and tools already available. This implies that acquisition of experience should concentrate on the following aspects:

- the appropriate definition, or redefinition of the malaria problem in terms relevant to its control and the feasibility of maintaining it
- the criteria for identification of realistic objectives in terms of social acceptability and affordability
- the identification of technologies which are already appropriate for application by the health systems infrastructure
- the definition of the levels of the primary health care infrastructure where control, supportive and referral functions should be established, including the deployment of drugs for first-line treatment and for the management of treatment failures
- monitoring and information systems necessary for the appropriate functioning of the control effort and the identification and management of abnormal situations, such as epidemic outbreaks or the development and spread of resistance of parasites to drugs or vectors or insecticides
- definition of the conditions under which complementary services, such as specialized vector control teams, should be established for control of epidemics or for the control of malaria transmission in areas where the intensity of the problem and the level of development of the health services require such activities
The application of experience and technology

It will be necessary to acquire experience not only in areas where malaria control has to be started as part of a developing primary health care or as one of the initial activities, perhaps even the first, of primary health care, but also in those areas where malaria control has been an organized activity for many years and, in many instances, the health activity of greatest peripheral penetration.

The evolution of the malaria problem and its links to rural development show that the control of malaria in the developing world today cannot mimic the experience of the developed world over the past hundred years. The ways of using available techniques and the development of technology of malaria control have to be evolved from the appropriate documentation of experience.

The applicability of a certain experience will depend on the social, cultural and ecological conditions influencing it. In many instances, the effect of the application of a technology will depend more on the social and ecological conditions than on the choice of the technology itself. It becomes essential to analyze and document these conditions and their possible influence. Some ecological variables may be isolated for complementary controlled observations but the majority of social variables pertaining to malaria programmes are more appropriately analyzed on a comparative basis than under experimental conditions.

The conditions of applicability of positive control experiences become a matter for exploration, which can be accomplished by comparative analysis and evaluation.

Thus plans to control malaria or to modify existing malaria control programmes should be based on the best available information and experience, but, in most instances, they will require the acquisition of complementary knowledge and experience, to be fed back into the management process in a learning-by-doing approach. This will require careful documentation of relevant experiences.

Research and development (R & D)

In other instances a research and development approach will be needed. This is a comparatively new term that is presently in favour and incorporates what is referred to as health systems research but in fact goes beyond that definition.

A range of subjects for R & D studies in malaria includes:
Planning malaria control programmes: Learner’s Guide

• improving the general and local understanding of the epidemiology of problems such as resistance to drugs and insecticides

• the influence of social, cultural, behavioural and economic processes in the epidemiology and control of malaria, including the problems associated with the dis-establishment of vertical programmes

• approaches to training non-professional workers in particular to cope with antimalarial activities, in addition to their other activities; different curricula and teaching materials may have to be developed and tested

• factors influencing community participation and intersectoral 'cooperation'. Without the communities' acceptance and active support, programmes will fail to achieve their objectives. It may be instructive to analyze the results of successful and unsuccessful efforts aimed at encouraging intersectoral action

• ways of providing guidance and supervision by the health services, and ultimately, by malaria experts; supervision needs to be approached in terms of strengthening the interrelationships between communities, the community health workers and the health services systems.

• appropriate implementation at the community level of malaria control, control of other priority diseases and other primary health care activities. It should be investigated whether (or where) such activities could be carried out by a multipurpose community health worker, (often overloaded already), or divided among a number of categories of workers, such as those dealing with disease control and those dealing with other promotional and preventive activities; or those dealing with people and those dealing with the environment

• ways of developing and incorporating into popular habits, simple, safe, cheap and effective methods which could be used by individuals and communities for their own protection against disease vectors

    Much, or even most of the R & D approach involves qualitative analysis rather than quantitative studies and thus will have to use various research techniques including questionnaire type surveys and sociological and anthropological approaches. It does not mean, however, that you necessarily have to employ sociologists or anthropologists to do it.
About assessing the value of published articles

All too often the results of research published in leading journals are taken for granted and implemented in operational programmes. The volume of literature on malaria is extraordinarily high and is ever increasing. As a planner and/or a programme manager the outcome of studies must be taken into account and to do this in a rational way requires a critical analysis of research papers. This may be difficult for many people who are not researchers themselves, but who wish to understand the value, and use, the results of research.

The purpose of critically analyzing research papers is to determine for yourself if the methods and results of research are sufficiently valid to produce useful information. The prime objective is not necessarily to assess the authors, especially since often the project is the best that could be carried out under the local conditions and unforeseen circumstances may render the results of limited value. Those closely associated with the project may be very well aware of the limitations but unless the published work is critically scrutinized the limitations may not be realized. The purpose of the analysis is definitely not to decide if the results are well presented, nicely written and well illustrated. These are minor considerations. The appraisal is concerned with assessing the hard facts of the research to enable programme managers (in the case of malaria) and planners to make evidence based decisions.

There have been excellent detailed articles published on this subject¹ which you should read if and when it is appropriate or of interest to you. However, some summary points and issues quoted from those publications may be helpful to you. In the following table you will find a guidelines and check list for appraising a medical article which has been taken from the paper by Fowler and Fulton, 1991. This will give you some idea of how to approach a clinically oriented research paper.

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### Guidelines and checklist for appraising a medical article

<table>
<thead>
<tr>
<th>Guideline</th>
<th>Checklist</th>
<th>Common design:</th>
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</thead>
<tbody>
<tr>
<td>1. Study design appropriate to objectives?</td>
<td>Objective: Prevalence</td>
<td>Cross sectional</td>
</tr>
<tr>
<td></td>
<td>Prognosis</td>
<td>Cohort</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>Controlled trial</td>
</tr>
<tr>
<td></td>
<td>Cause</td>
<td>Cohort, case-control, cross sectional</td>
</tr>
</tbody>
</table>

| 2. Study sample representative? | Source of sample | |
| | Sampling method | |
| | Sample size | |
| | Entry criteria/exclusions | |
| | Non-respondents | |

| 3. Control group acceptable? | Definition of controls | |
| | Source of controls | |
| | Matching/randomisation | |
| | Comparable characteristics | |

| 4. Quality of measurements and outcomes? | Validity | |
| | Reproducibility | |
| | Blindness | |
| | Quality control | |

| 5. Completeness? | Compliance | |
| | Drop outs | |
| | Deaths | |
| | Missing data | |

| 6. Distorting influences? | Extraneous treatments | |
| | Contamination | |
| | Changes over time | |
| | Confounding factors | |
| | Distortion reduced by analysis | |

++ = Major problem  + = Minor problem  0 = No problem  NA = Not applicable.

The summary points listed below taken from Trisha Greenhalph’s series of papers will, although clinically oriented, be of practical help and hopefully will stimulate your interest to begin regularly to criticize what you read.

- Not all medical articles are indexed on Medline, and many that are have been misclassified.
- Searching by textword can supplement a search by medical subject headings.
- To increase the sensitivity of a search, use the "explode" command and avoid using subheadings.
- Scan titles on screen rather than relying on the software to find the most valid or relevant ones.
- Many papers published in medical journals have potentially serious methodological flaws.
- When deciding whether a paper is valid and relevant to your practice, first establish what specific clinical question it addressed.
- Questions to do with drug treatment or other medical interventions should be addressed by double blind, randomized controlled trials.
- Questions about prognosis require longitudinal cohort studies, and those about causation require either cohort or case-control studies.
- Case reports, though methodologically weak, can be produced rapidly and have a place in alerting practitioners to adverse drug reactions.
- The first essential question to ask about the methods section of a published paper is: was the study original?
- The second is: whom is the study about?
- Thirdly, was the design of the study sensible?
- Fourthly, was systematic bias avoided or minimized?
- Finally, was the study large enough, and continued for long enough, to make the results credible?
- In assessing the choice of statistical tests in a paper, first consider whether groups were analyzed for their comparability at baseline.
- Does the test chosen reflect the type of data analyzed (parametric or non-parametric, paired or unpaired)?
- Has a two tailed test been performed whenever the effect of an intervention could conceivably be a negative one?
- Have the data been analyzed according to the original study protocol?
- If obscure tests have been used, do the authors justify their choice and provide a reference?
An association between two variables is likely to be causal if it is strong, consistent, specific, plausible, follows a logical time sequence, and shows a dose-response gradient.

A P value of < 0.05 means that this result would have arisen by chance on less than one occasion in 20.

The confidence interval around a result in a clinical trial indicates the limits within which the "real" difference between the treatments is likely to lie, and hence the strength of the inference that can be drawn from the result.

A statistically significant result may not be clinically significant. The results of intervention trials should be expressed in terms of the likely benefit an individual could expect (for example, the absolute risk reduction).

Pharmaceutical "reps" are now much more informative than they used to be, but they may show ignorance of basic epidemiology and clinical trial design.

The value of a drug should be expressed in terms of safety, tolerability, efficacy and price.

The efficacy of a drug should ideally be measured in terms of clinical end points that are relevant to patients; if surrogate end points are used they should be valid.

Promotional literature of low scientific validity (such as uncontrolled before and after trials) should not be allowed to influence practice.

New tests should be validated by comparison against an established gold standard in an appropriate spectrum of subjects.

Diagnostic tests are seldom 100% accurate (false positives and false negatives will occur).

A test is valid if it detects most people with the target disorder (high sensitivity) and excludes most people without the disorder (high specificity), and if a positive test usually indicates that the disorder is present (high positive predictive value).

The best measure of the usefulness of a test is probably the likelihood ratio—how much more likely a positive test is to be found in someone with, as opposed to without, the disorder.

An economic analysis should be based on a primary study or meta-analysis that is scientifically reliable, and relevant.
• When deciding whether an economic analysis has been done correctly, you should not simply check the arithmetic but consider whether all direct, indirect, and intangible costs and benefits have been included.

• In the allocation of limited resources, the comparison of different health states is unavoidable, but instruments for measuring health related quality of life are not as objective as they seem.

• A systematic review is an overview of primary studies that used explicit and reproducible methods.

• A meta-analysis is a mathematical synthesis of the results of two or more primary studies that addressed the same hypothesis in the same way.

• Although meta-analysis can increase the precision of a result, it is important to ensure that the methods used for the review were valid and reliable.

• Qualitative methods aim to make sense of, or interpret, phenomena in terms of the meanings people bring to them.

• Qualitative research may define preliminary questions which can then be addressed in quantitative studies.

• A good qualitative study will address a clinical problem through a clearly formulated question and using more than one research method (triangulation).

• Analysis of qualitative data can and should be done using explicit, systematic, and reproducible methods.

  If you begin to look at published papers in a more critical manner you will no doubt have some surprises. Unfortunately, the published works may not give the whole story. What is written may not be incorrect but sometimes what is more important to the significance of the study is what was not written. There are some clear examples in malaria. If one analyzed the early papers, in fact many papers describing studies in the use of Fenitrothion for indoor residual spraying for malaria control, you will find that many do not significantly demonstrate its effectiveness for malaria control. Another subject that should be read with great caution are published papers on field trials with malaria vaccines as the interpretation is of extreme importance.
EXERCISE

You may wish to analyze a published research paper as an individual exercise or the
tutor may ask you to do so as a small group exercise. Here is one worth trying.

i. With a view to making a critical analysis read very carefully the paper entitled “The
effect of insecticide-treated bed nets on mortality of Gambian children” by Alonso,

ii. Define the characteristics of control villages and the villages dealt with in this
study. Are they comparable?

iii. Describe what procedure was used for evaluating the overall mortality rate, and the
malaria specific mortality rate.

iv. Complete the table that has been provided to you (Table 13 of this Learning Unit)
with the results you obtain and complete the other information gleaned from the
paper.

v. What is your conclusion with respect to the use of impregnated mosquito nets?

vi. What is the effect of chemoprophylaxis combined with the use of impregnated
mosquito nets?

vii. How do you explain that the reduction in the overall mortality rate was greater than
that expected from preventing deaths due to malaria?

viii. What information or complementary study is necessary for the use of mosquito nets
in a national malaria control programme?
<table>
<thead>
<tr>
<th></th>
<th>Treated villages</th>
<th>Control villages</th>
<th>Significance</th>
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<tr>
<td>Mosquito nets</td>
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<td>- number</td>
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<tr>
<td>- % used</td>
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<td>Impregnated mosquito nets</td>
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<td></td>
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<tr>
<td>- % impregnated</td>
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<tr>
<td>- % used</td>
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<td></td>
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<tr>
<td>Chemoprophylaxis</td>
<td>Placebo</td>
<td>Maloprim</td>
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<tr>
<td>- % participation</td>
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<tr>
<td>- % with Dapsone in the urine</td>
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<tr>
<td>Overall mortality rate</td>
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<td>1-4 years:</td>
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<td>- before the study</td>
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<tr>
<td>- after the study</td>
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<tr>
<td>% reduction:</td>
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<tr>
<td>- after/before</td>
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<tr>
<td>- treated/control</td>
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<tr>
<td>Malaria specific mortality rate 1-4 years:</td>
<td></td>
<td></td>
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<tr>
<td>- before the study</td>
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<td>- after the study</td>
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<tr>
<td>% reduction:</td>
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<td>- after/before</td>
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<tr>
<td>- treated/control</td>
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<td></td>
</tr>
<tr>
<td>Chemoprophylaxis Mortality</td>
<td>Placebo</td>
<td>Maloprim</td>
<td></td>
</tr>
</tbody>
</table>
Annex to Learning Unit 16, Learner’s Guide.

Suggestions for writing a research protocol

The questions and suggestions listed below are intended as an aide-memoir for those planning a research project, whether this is to be a descriptive study, a clinical trial, or a survey. The protocol should set out the aims of the project, how these are to be achieved, how bias will be eliminated, the subjects or types of patients to be studied, the ethical aspects, and the proposed statistical analysis. It should establish that the expenditure of effort, time, and money is likely to be worth while. Planning and statistical advice should be sought at the preliminary stages of the study.

What should the title be? It should be self-explanatory describing the project, short and to the point, and should be written in capital letters.

What should the introduction contain? It should contain a statement of the problem, the need for a solution, relevant background information, possible application of the results in other areas and any other information to justify a research study.

What are the objectives of the study? These should be clearly written as they will form the basis of the study, and the method and evaluation will relate to these objectives.

Where will the study be conducted? The study site should be described as precisely as possible, carefully selected after consideration of all factors including a site visit, and should define geographical location, environment, size, population and ethnic groups if relevant.

What is the problem? What are the aims and precise objectives of the study? What questions are to be answered? Is the purpose to evaluate a new treatment, procedure, or service? To obtain new facts about the causation or natural history of a disease or for the future planning and evaluation of a service?

What is already known about the problem? What are the gaps in present knowledge? How will the proposed study contribute to our knowledge and understanding of the problem?
Is the proposal a pilot or main study?

What design will be used in the project? Will the study be basically a laboratory project or a survey? Will it be a "trial" (or "intervention") of a treatment, procedure, or service (therapeutic, preventive, or educational)? Will it be a case-control study with randomised or matched controls? If a survey, will it be conducted by questionnaire, interview, or clinical examination? Will it be retrospective, cross-sectional, or prospective (cohort)? Is a "blind" or "double-blind" design proposed?

How are the subjects of the study to be chosen? What is the population from which the subjects will be drawn (the denominator in incidence and prevalence studies)? Are the subjects of the study the total population of a community or all patients with a certain diagnosis? What are the entry and exclusion criteria for choosing subjects? How are the controls to be chosen? Will a sample of the total population or of all potential subjects be examined? How is a sample to be obtained to ensure that it is representative of the total population? Attention must be paid to the definition of the criteria for selection, to the sampling methods, and to the number of subjects needed to obtain a significant result.

What data are to be collected, and why? What factors (variables) are already thought to affect the outcome? What factors contained in the new hypothesis are being tested? What factors (if present) might distort the reliability of representativeness of the results? What are the indicators of measures of the outcomes of the trial or experiment? The amount of data collected should be limited, though measures of different dimensions of outcome should be used when possible.

What are the treatment schedules or other activities forming the "intervention" in the study, and how are the variables to be defined and measured? The techniques, dosage, programmes of treatment, prophylaxis, other activities, etc. must be standardized; this is especially important in multicentre studies. Explicit decisions must be taken about how the presence or absence of disease is to be determined, how severity and duration are to be measured, and how social and demographic variables are to be defined and measured-(for example, marital state, occupation, and social class). If possible, the proposed definitions and measurements should be consistent with those used in comparable studies; if they are not, the reasons for the differences should be stated.
How are the data to be collected and the measurements to be made? Have the methods been tested? Are they valid (that is, do they actually measure what they are intended to)? Are they reliable (that is, can they be repeated to yield the same results)? Are they sensitive (that is, can they identify all positive cases)? Are they specific (that is, can they identify only positive cases)? Will data be collected by observation, examination, interview, or from record forms? Will special recording forms be needed? Who will collect the data? What training will they need? Should an independent observer make the baseline or outcome measurements (or both)? What checks and controls will be used to maintain accuracy and objectivity?

How will the data be processed and analyzed? Will this be done by computer or some other method? Must the data be coded and punched on to cards? If so, who will do this? How will the analysis proceed? How will the data be presented? What form of publication is likely to result?

What problems of ethics and etiquette does the project raise? Are patients' rights properly observed? How are the consent and collaboration of patients, doctors, nurses, social workers, and others to be obtained? How is the confidentiality of the data to be ensured? What agreements are to be made about publication? Has the project been approved by the ethics committee?

What arrangements are to be made for treating or referring patients for whom new needs come to light as a result of the project? Can the local services cope? Or will special arrangements be needed?

What is the expected timetable for the study? In what order will the different stages of the investigation be carried out? It is helpful to set out what is to be done and by whom in chronological order with estimates of the duration of each activity. Enough time should be allowed for analyzing the data and preparing the report (that is, the presentation, synthesis, and interpretation of the raw data).

What are the human resources requirements? What are the categories and numbers of workers presently available for this study? What additional personnel are required to be recruited or assigned for this study? What are the activities to be assigned to the different categories of workers?
What are the training requirements? What are the categories and number of workers to be trained? What are the subjects to be taught and the period of training? Where will the training take place? When will it take place?

What will the project cost? What will be the cost in human resources including the time of the main investigator? What will be the cost of capital equipment? What will be the cost of additional salaries (plus pension and insurance contributions), rent for accommodation, travelling and subsistence, stationery, printing, postage, telephone, photocopying, administrative costs, and overheads? What outside help and advice will be needed, and how much will it cost? What is already available? what additional resources are required?

The following costs should be clearly identified:

- The salaries of each person to be assigned to this project by staff category, title and, if known, also be name. An estimate of the percentage of full time each year which will be devoted to this particular study must be stated and this percentage applied to the salary to determine the cost to be applied for this study.

- Costs of travel and per diem. These should be calculated on the basis of person days stating clearly the relevant amount or per diem for each category of staff, and the expected number of days travel each year, for this study.

- The estimated cost of public transportation stating the number of persons and expected journeys should also be calculated.

- Subsidies for field work, if required, should be calculated on the basis of the basic minimum daily wage and the number of expected person days. Each category of worker for which this is requested should be stated. Full justification is required for payment of this subsidy.

- All operating expenditures by category should be estimated to include separately the expected costs for each year of the study for chemicals (including drugs and insecticides), supplies, minor equipment costing between US$100-1000 (including shipping and insurance costs), gasoline, equipment maintenance, vehicle maintenance, data analysis including computer time and key punching and any other operating expenditures. When estimating costs of gasoline consider the expected
mileage each year, the cost of one litre of gasoline, and assume that for each litre of
gasoline a distance of 5 kilometres can be travelled.

- Patient costs must be itemized under the headings of cost of transportation to and
  from the institution and costs of in-patient care based upon estimates of the number
  of patients to be studied.

- Costs of major equipment, to be purchased for more than US$1000, including
  vehicles, should be itemized and 20% should be added to cover shipping and
  insurance costs.

A summary of the costs could be made under the headings:

<table>
<thead>
<tr>
<th>Personnel</th>
<th>: $</th>
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<tbody>
<tr>
<td>Operating expenditures</td>
<td>: $</td>
</tr>
<tr>
<td>Patient costs</td>
<td>: $</td>
</tr>
<tr>
<td>Travel and per diem</td>
<td>: $</td>
</tr>
<tr>
<td>Subsidies</td>
<td>: $</td>
</tr>
<tr>
<td>Other expenditures</td>
<td>: $</td>
</tr>
<tr>
<td>Sub Total recurrent costs</td>
<td>: $</td>
</tr>
</tbody>
</table>

Major equipment (including vehicles) : $

Grand Total : $
Learning Unit 17

General framework for programme management

Learning objectives:

By the end of this Learning Unit you should be able to:

- define management as it pertains to disease control
- describe a logistics cycle applicable to malaria control in your location
- list the salient features of a formal management review
- ascertain corrective action to be taken
- define management of change
- describe a process to bring about effective programmatic change

Introduction

A general framework for malaria control programme management is a complex and vast subject and an attempt has been made here to highlight certain issues that will be helpful in planning management systems and in managing a programme. This Learning Unit also summarises the planning process and key features of planning by way of reinforcement.

Perhaps the more important element of management, second only to managing people, is managing time. However, time is perceived differently in different cultures and thus it serves no useful purpose to impose alien perceptions of time on the management control process. Nevertheless, time must be managed properly. The management framework can be summarized by the pyramid in Learning Unit 1 commencing with the planning process.

If the plan is well written, then management becomes management by “job divergence”. That is actions are taken to implement the plan as written and management responds to divergence from the agreed plan.
Robert McNamara said “The job of a manager is to use resources wisely”. If one asks managers of malaria control programmes throughout the world “what is your major problem” many will reply “insufficient money” or words to that effect. The question that should be asked is “Are the existing resources being used in the most effective and efficient manner for malaria control?” There is always room for improvement and thus a careful analysis of the existing resources, their deployment and utilization is essential for good management.

Financial control tends to be the focus of attention, especially for governments - but other resources have nearly equal importance and in the case of malaria control, human resources are critical and these resources need to be properly managed independent of financial impact. Thus taking resources in its broadest sense to include human, financial and structural then one may regard management as the process by which resources are obtained and used effectively and efficiently in the accomplishment of the Organization's objectives.

A good manager will be fully aware of the total resources, both financial and human, which are available for malaria control activities. However, he or she should always be aware of what is technically feasible and sustainable under the prevailing eco-epidemiological and socio-economic conditions and should strive to bridge the gap between what is possible with existing resources and what is desirable.

The important functions of malaria control programme management are numerous. These can however be related the continuous cycle of planning, implementation, evaluation and re-planning.

**Programme Planning**

Management includes planning. Planning takes place at different levels for different purposes and takes on different forms.

At the national level 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. The development of the national plan should be carried out by an intersectoral team (including representatives from finance, agriculture, public works, hydro-electricity authorities,
and so on) over a reasonable period of time (months). Malaria is an intersectoral problem and the solutions are not only technical but also intersectoral in nature.

The national core of malaria expertise (many of whom have been trained in planning by WHO), together with other personnel concerned with malaria control need to be involved in some way or another in the planning process. They are then more likely to identify with the plan than otherwise would be the case. These people will be responsible for writing up the plan and guiding its implementation.

Depending on the administrative structure in each country, the next level at which planning takes place is at the major administrative division to which the administrative, especially financial, management of the programme has been decentralized. This may be a state, province or district depending on the size of the country. At this level an implementation plan needs to be developed, designed to achieve the objectives and targets that have been set for each of the locally relevant different epidemiological strata identified in the national plan.

Finally work plans will need to be developed for the day to day implementation of activities and tasks.

The planning process

The planning process involves identifying and analyzing problems, examining solutions, setting priorities, making choices and decisions, setting objectives, developing approaches to achieve these objectives, allocating resources and organizing them into a programme for effective and efficient delivery and measuring progress towards achieving the objectives. In an environment of scarcity, such as is found in many developing countries, planning takes on all the more importance in order to get as much accomplished with what little there is in the way of staff, supplies including drugs, equipment, transport, funds and so on.

Planning is a systematic and continuous process for allocating resources to achieve objectives. It is a way to define why, how, when, where and by whom the objectives can be achieved. Health planning is concerned with extending coverage and improving the effectiveness and efficiency of health care services. An integral part of this approach is intersectoral collaboration for programmes that will impact the total health environment. Malaria control is one such programme.
Planning the national malaria control programme

An analysis of the malaria situation (which includes an analysis of resources available to control the disease) is the essential basis for planning antimalaria action according to the local epidemiological characteristics. A complete analysis would include a description of the distribution of malaria (infection) and its consequences (morbidity, mortality, economic losses) and an explanation of that distribution in terms of its causal factors (geophysical, environmental, biological especially entomological, social, political and economical). It is clear that a really complete analysis is practically impossible and malaria control therefore will often have to be planned on imperfect knowledge. However an important component of any plan should be to collect additional, valid information necessary for re-planning purposes, thereby improving the programme as it progresses.

The second step in planning the national malaria control programme is stratification of the malaria problem and of the resources for its control (where the resources are distributed and need to be redeployed). Malaria tends to be a focal disease and its distribution may vary considerably. Very often the same degree of disease reduction cannot be achieved simultaneously all over the national territory due to administrative, operational, financial and technical constraints. Hence the necessity to proceed to a stratification of the country, with the definition of different disease reduction objectives and consequently the selection of appropriate control measures in the different strata that have been defined. Stratification is a process intended to reduce and simplify a complex problem, to facilitate its understanding and to formulate solutions. In order to simplify the heterogeneity of factors that contribute to the epidemiology of malaria it may be possible to identify common factors and to use this knowledge to delimit new areas, populations or situations which exhibit relative similarity through specific characteristics which distinguish one from the other in practical terms. Once strata have been clearly identified they can be prioritized in terms of antimalaria interventions.

The subsequent steps in planning a national malaria control programme are the analysis of major problems and identification of potential solutions; the formulation of disease reduction objectives and approaches to achieve these according to the different strata; identification of critical outputs and setting annual targets towards achieving
the objectives in the time frame established; identification of critical milestones and
the time-frame for their achievement; identification of evaluation indicators and
development of an evaluation mechanism and information system; and finally
programme budgeting within the national resources available or that can be made
available.

A well written national plan will greatly facilitate approval at the highest
levels and by outside agencies and also facilitate the development of implementation
plans at the intermediate administrative level.

The implementation plan

The implementation plan has to be much more detailed and specific. It should
clearly identify the activities and tasks that need to be carried out in each
epidemiological stratum occurring in the administrative area; the different categories
of workers who will be expected to carry them out; details of supplies and equipment;
the logistics cycle; the supervisory mechanism; the training and retraining needs and
schedules; the financial accountability; annual budgets; data collection; compilation
and analysis; reporting systems; evaluation and monitoring; personnel management;
and quality control.

Plans of work

Individual work plans may include, depending upon the category of staff, scheduling
of activities, reporting, analysis of data, local personnel management, management of
supplies and equipment including maintenance schedules and continuing education as
part of supervision.

For efficient work performance detailed job descriptions need to be carefully
developed. These will give guidance in selecting personnel with the required
experience and background, will clearly indicate the tasks that have to be carried out
and will guide task-oriented training.

Daily, weekly and monthly schedules of activities will need to be developed,
especially visiting schedules to assist in long-range planning and for supervision
purposes.
Programme Implementation

The implementation plan is the basis for management control. In order to take any follow-up management action a standard must exist against which performance can be measured. The detailed plan must therefore be explicit.

At the lowest level the plan will refer primarily to detailed technical activities - cases diagnosed, cases treated, cases referred, vector activities achieved, etc. At higher levels these technical measures become aggregated and the plan must contain more administrative elements - budget approved, expenditure, total number of treatments, amount of insecticide needed and used, and so on.

At each level in the Organization, the plan must show three elements: the anticipated technical status, the anticipated schedule of activities and the anticipated resource status financial and other resources.

It is good practice at each level to identify high risk plan elements. Risk areas are those for which successful fulfillment of the plan are in doubt. These should receive particular notice for management attention. Depending on the organizational level this could be the release of foreign exchange for importation of essential commodities, acceptance of control measures by the population and sufficient degree of development of the health infrastructure to assure sustainability.

Management reporting system

The management reporting system should not be confused with the information system needed for programme evaluation which is likely to be more extensive and which will be briefly discussed later (and is dealt with in Learning Unit 4).

For management the critical data necessary to assess performance needs to be determined. The questions that must be asked are: What do I need to know? How often must I know it? How urgent is the need?

Performance measures at each organizational level must be known to be able to know what to report. This should be available from the implementation plan (operational targets, research/field test requirements, training requirements, resource/budget requirements). Another key consideration is to report on elements which are subject to control or are necessary inputs to control decision. For example,
reporting on stock levels. If local procurement is used, usage may be a measure of performance (see Fig. 9 logistics cycle).

The question "how often and how urgent" is related to the performance measure and the time scale of reaction of the programme. For example, basic training of professionals over several years has less need for responsive reporting than epidemic control. Since reporting is an "overhead burden" the requirements should be as low as commensurate with good management.

Analysis and review

Reported data must be compared with planned performance. The analysis must extract deviations from the plan and bring these to the attention of those levels which have authority to take corrective action. Shortfalls in technical performance, falling behind schedule and excessive under or over utilization of resources must be noted for action. Reporting by exception or variance is the usual mechanism used to report the results of this analysis.

Formal management review is a critical element of management control. This review is an element of the supervision process although it is more directly related to achievement of programme operational targets. It is assumed that if the programme has been well planned then achievement of targets in time will lead to attainment of the objectives in the time frame set. However, this may not be the case but is not the concern of management control it falls in the province of programme evaluation.

These formal reviews should be pre-planned investigations into details of programme performance. They should occur at all levels and at a time natural to the life time of the programme plan (related to milestones). The review should demonstrate performance, schedule and resource use through personal inspection and satisfaction. This review has a vital positive impact on personal performance. It motivates for good performance as well as acting as an incentive for good performance in anticipation of a forthcoming review.

The review will also identify personnel training needs and allow planning of training activities. Supervision should be seen as an arm of training - continuing education. This will be much more cost effective and have a greater impact than punitive measures.
Figure 9. Logistics cycle

Planning need based on estimated morbidity data of previous year

Maintain good records of diseases and monitoring stocks of supplies

Put to good use (e.g. prescribe drugs and dispense)

District → Regional store → Distribution (move safely) → Put into central store (good environment) → Take delivery

Selection of priorities → Estimated cost

Find sources of goods

Secure budget (limited)

Procure (get best for money available)
The programme as a whole should be reviewed by an appropriate external group (external to the government department concerned) or a joint internal/external group as well as internal programme reviews.

The analysis and review process will also identify areas for special study and systems research to improve programme implementation. Some items for study could be incorporated into the programme implementation, others may need to wait for re-planning before they can be funded or implemented.

**Corrective action**

The culmination of the management control system is the corrective action taken to bring the programme performance, at all levels, to the standard set by the implementation plan. At times the corrective action taken may be just to recognize the realities of the situation and to change the plan.

To the extent possible, procedures and authority for corrective action should be planned ahead. An important demonstration of the managers' ability will be his or her performance in taking corrective action as situations demand. A major part of the managers' effort should be devoted to corrective action measures, changing personnel assignments, securing more resources, moving supplies, ensuring continuing education and when absolutely necessary disciplinary action.

The ability of the manager to successfully delegate responsibility is vital to the success of the programme and essential for the functioning of an epidemiological response capability. The ability of management at all levels to conceptualize and operate the management control system will have a significant impact on the ultimate programme success.

Global programme achievements have always been backed up by well functioning control systems which are responsive to the demands of the programme. However, much of the management process is informal - memoranda, meetings, conversation, silence and facial expression are all non-systematic means of programme control. These informal means should be recognized as being important and cannot be replaced effectively by formal processes.

The influence of cultural values and practices and cross cultural interaction greatly influences programme management practices, and the success and failure of
the management process. In some cultures, disciplinary action is difficult to take, even impossible. Recognition of the importance of family affairs are often allowed to interfere significantly with job performance and become accepted as part of every day life in some countries. The effective working hours are considerably reduced in many places by liberal attitudes regarding such matters as well as punctuality. Changing attitudes among personnel is among the most difficult task of a manager. Attitudes cannot be taught, they have to be identified and then challenged by new information. The workers then have to try out and evaluate the new attitude for themselves and discuss with their peers.

The management of change

The ability to manage change is the most important characteristic of successful leaders. This depends on seven essential skills:

- To be able to tune into the environment and be aware of the gap between what could be done and what is being done; never be satisfied with how it is today and pay more attention to what does not work than to what does work
- To be able to challenge assumptions about the current reality.
- To be able to communicate a compelling vision of where they want an organization to go
- To have the ability to create a coalition of backers and supporters
- To be able to build the necessary team that will make the changes happen
- To persist and persevere
- To share the credit and recognition for success.

The process of change is continual and inescapable but most people dislike change. Most attention is given to formal change specifically initiated by an organization's management in order to "improve" some facet of the organization's way of doing things. Such changes are generally accompanied by minor or major investments of resources in order to ensure their success. However, all organizations are undergoing continuous change through informal structures and relationships

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between people in the programme. These changes are so minute, and are regulated harmoniously between small groups of people, that they are not perceived as "change".

Formal changes are the responses of an organization to major internal forces and external pressures. The main external forces for change are:
- the economic climate and government policy in funding support
- technological change and new capabilities
- government legislation
- social needs for the future

Informal changes are the responses of an organization to local working practice needs and shifts of attitude. These forces for changes are brought about by:
- the need to harmonize inter-personal relationships in a local working environment
- personal agendas
- managerial attitudes and style
- the strength/weakness of the formal organization structure

In introducing and implementing changes, the problems of resistance by both individuals and groups are of paramount concern. When resistance exists, it is not so much the change itself that is opposed. Rather, the primary causes for resistance are both the imagined and the real effects of the change on those involved, together with the manner in which the change is being brought about. In reality, the change itself is only a symbol of what is being opposed.

A systematic approach to change is proposed in Table 14, page 252. It proposes seven phases: defining clearly objectives of the change; planning for the change; communicating the changes effectively; gaining acceptance; defining training requirements; implementing the change; and controlling it. Some possible approaches and likely problems are proposed.

In order to bring about change managers must adopt a style appropriate to the situation - not easy for most people. In order to be effective, the leader must be capable of adapting to the situation at hand.
Programme Evaluation

The evaluation of a programme as a whole relates to the national malaria control plan and the objectives, approaches and targets set therein.

Evaluation is the systematic and scientific process of determining the extent to which an action or sets of actions were successful in achieving predetermined objectives.

The manager needs to know how well the programme is meeting the purposes for which it was established and whether the programme should be continued, expanded, cut back, changed or abandoned. However, in addition to the results of evaluation the manager must weigh many other factors, from public acceptance and participant reaction, to costs, availability of staff and facilities, and possible alternatives.

Evaluation should be reviewed in its social and political context. In particular, it can provide data that reduce uncertainties and clarify the gains and losses that different decisions incur, thereby allowing managers to apply their values and preferences more accurately and with better knowledge of the trade-offs that alternative decisions involve.
Table 14. A systematic approach to making changes

<table>
<thead>
<tr>
<th>Phase</th>
<th>Positive Approach</th>
<th>Likely Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define clear objectives of</td>
<td>Define implications of the changes</td>
<td>Unrealistic goals</td>
</tr>
<tr>
<td>the change</td>
<td>Carry out a SWOT analysis (strengths, weaknesses,</td>
<td>Change is highly</td>
</tr>
<tr>
<td></td>
<td>opportunities, threats)</td>
<td>undesirable for some part of the organization</td>
</tr>
<tr>
<td>Plan for the change</td>
<td>Anticipate:</td>
<td>Unrealistic deadlines</td>
</tr>
<tr>
<td></td>
<td>- people problems</td>
<td>Lack of resources</td>
</tr>
<tr>
<td></td>
<td>- time phasing</td>
<td>Poor cooperation in preparing plans</td>
</tr>
<tr>
<td></td>
<td>- resource constraints</td>
<td></td>
</tr>
<tr>
<td>Communicate the changes</td>
<td>Communicate clearly:</td>
<td>The grapevine</td>
</tr>
<tr>
<td>effectively</td>
<td>- the objectives</td>
<td>Resistance by Management to modifications to their plan</td>
</tr>
<tr>
<td></td>
<td>- intended method of implementation</td>
<td>Failure to agree a mutual plan</td>
</tr>
<tr>
<td></td>
<td>- the benefits</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Listen to feedback and incorporate useful suggestions</td>
<td></td>
</tr>
<tr>
<td>Gain acceptance for the</td>
<td>Agree benefits</td>
<td>Negotiating gap too wide to be breached</td>
</tr>
<tr>
<td>change</td>
<td>Define details of the plan</td>
<td>Resistance too high to be overcome</td>
</tr>
<tr>
<td></td>
<td>Agree compensation for anyone negatively affected</td>
<td>Lack of trust</td>
</tr>
<tr>
<td>Define training requirements</td>
<td>Training should cover:</td>
<td>Training needs poorly defined</td>
</tr>
<tr>
<td></td>
<td>- appreciation of new methods</td>
<td>Lack of resources for training</td>
</tr>
<tr>
<td></td>
<td>- direct job training</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- technique training</td>
<td></td>
</tr>
<tr>
<td>Implement change</td>
<td>Delegate tasks to appropriate staff</td>
<td>Lack of involvement in the changes</td>
</tr>
<tr>
<td></td>
<td>Involve staff in the change</td>
<td>Low acceptance of contributions to the changes</td>
</tr>
<tr>
<td></td>
<td>Build team morale</td>
<td></td>
</tr>
<tr>
<td>Control the changes</td>
<td>Keep to the timing of plan</td>
<td>Poor project management</td>
</tr>
<tr>
<td></td>
<td>Control costs of changes</td>
<td>Cost overruns</td>
</tr>
<tr>
<td></td>
<td>Control training plans</td>
<td>Lack of resources</td>
</tr>
<tr>
<td></td>
<td>Control informal changes</td>
<td>Informal systems stronger than formal systems</td>
</tr>
<tr>
<td></td>
<td>React quickly to unforeseen problems</td>
<td></td>
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</table>
In malaria control, evaluation should be considered as a continuous process with the following purposes of: correcting actions through planning and re-planning; improving actions through enhancing efficiency, performance, and quality; determining the effectiveness by highlighting the strong and weak points and the reasons for failure; determining adequacy; determining and controlling costs; measuring accomplishments and needs versus time; disseminating knowledge and techniques; modifying programme technology; justifying the programme technically, socially, economically and politically; establishing priorities for resource allocation and programme activities; developing critical attitudes among staff; and increasing job interest.

To be complete and worthwhile the evaluation should aim at assessing how and to what extent antimalaria measures are implemented and at measuring their impact on the epidemiological situation. In the evaluation process consideration should also be given to:

- costs in relation to results
- other less expensive control methods or more effective combinations of methods

Evaluation is, therefore, a decision-oriented tool, at both policy setting and operational levels.

The selection of evaluation methods must be based on an analysis of the malaria situation and on the objectives, operational targets and the control measures which have been adopted. The complex epidemiology of malaria and the multiple lines of approach to its control make it difficult to establish an "evaluation model" which could be universally applied. However, guiding principles can be provided for the selection of indicators in respect of specific situations. Since these situations may vary from country to country, and quite often within the same country, the final selection of the evaluation methods must be made locally, after the objectives have been defined and the measures to be applied selected.

The evaluation mechanism has three main components:

- the operational aspects of the programme including a continuous and critical appraisal of implementation
- the epidemiological situations which derive from the measures applied
- the interpretation of results in the light of the operations performed
The latter component is an important element to judge whether
  • the measure(s) applied under local conditions is (are) sufficient to attain the
    expected targets
  • complementary or alternative actions have to be considered
  • the results obtained correspond to the efforts made and the resources used (cost
    analysis)
A more detailed analysis of the different aspects of the programme (e.g. its relevance, formulation, efficiency, effectiveness, and acceptance by all parties concerned) may be carried out at regular intervals (e.g. every three to five years). Such an evaluation may be carried out by independent specialists with the active participation of programme personnel.
Wherever possible, the impact that antimalaria measures may have on the social and economic development of the country should be measured and evaluated. This may require the participation of experts outside the Ministry of Health and due consideration should be given to this aspect during the planning process for the selection and monitoring of appropriate indicators.

Priorities for management control
It would not be unfair to say that management is a weak area in most antimalaria programmes. Applying the above principles, which have only been briefly outlined, there are certain priorities that need to be addressed to improve programme implementation and the better use of existing resources.
The first and probably the most difficult management decision to be made is to recognize that everything that needs to be done cannot be done everywhere at the same time to the standard required. Resource allocations do not permit this. The experience to date has shown that reducing standards and quality of implementation and materials in order to maintain total coverage has led to major problems of resurgence of disease and death and evolution of technical problems such as parasite resistance to antimalarial drugs. If this is accepted then priority areas will have to be selected for efficient and effective programme implementation within the limited resources available. This has far reaching managerial (and political) implications especially concerning the management of people in terms of redeployment of human
and financial resources to priority areas. It is in these circumstances that managerial skills will be taxed to the extreme.

Within the course of programme implementation and programme development, there are certain areas that need special attention some of these are candidates for a research and development approach. These are: effective epidemiological response capabilities; referral systems that really do work; antimalarial drugs use policies which are practiced and monitored; career structures; continuing education and other structures which truly motivate workers so that no outside stimulation is necessary for the job to be done effectively and efficiently; and supervision as part of evaluation, continuing education and work motivation.

Summary

Managing people is one of the most difficult tasks of a programme manager and linked to this is retaining well qualified and experienced workers in service. In many malaria endemic countries, there are no career structures to entice workers to stay on and the attractions outside of government are often sufficient to lure employees away from the job for which they were trained. However, one way that a manager has a better chance of retaining staff is to improve job satisfaction.

It should be remembered that the factor that produce job satisfaction and motivation are separate and distinct from those which lead to job dissatisfaction. Therefore, the opposite of job satisfaction is not job dissatisfaction but no job satisfaction and the converse is true. Motivation is the accomplishment of tasks without the necessity of outside stimulation (the employee wants to do it). Motivational factors which are intrinsic to the job (job content) are achievement, recognition of achievement, the work itself, responsibility and growth (advancement). Extrinsic to the job are the job environment factors which can cause dissatisfaction or avoid job dissatisfaction depending on their quality, these are policy, administration, supervision, interpersonal relationships, working conditions, salary status and security. The manager may be able to monitor some of these but some are virtually fixed.
The motivational factors are a primary cause of job satisfaction, the dissatisfaction avoidance factors are the primary cause of unhappiness in the job. The manager can take steps to find ways of job enrichment.

Do this with jobs in which:

- investment does not make changes too costly
- attitudes are poor
- dissatisfaction avoidance becomes too costly
- motivation will make a difference to performance

Begin by brainstorming a list of changes with employees, but not with employees whose jobs are to be enriched. Screen the list of proposed changes to eliminate dissatisfaction avoidance suggestions, generalities and job (horizontal) loading suggestions. Job loading merely enhances the meaninglessness of jobs such as:

- demanding increased productivity
- adding one more meaningless task to those already existing
- rotating assignments of a number of jobs that are in need of enrichment.
- removing the most difficult parts of the assignment to force the worker to accomplish more or less challenging assignments.

The list should now only contain motivational (vertical loading) factors such as responsibility, personal achievement, recognition, internal recognition, growth, learning and advancement. Some principles of vertical job loading to improve job satisfaction are:

- removing some controls (motivator is responsibility and personal achievement) while retaining accountability
- increasing accountability of individuals for their own work (motivator is responsibility and recognition)
- giving a person a complete natural unit of work (motivator is responsibility, achievement and recognition)
- granting addition authority; job freedom (motivator is responsibility, achievement and recognition)
- making reports directly available to the workers rather than supervisors (motivator is internal recognition)
• introducing new and more difficult tasks (motivator is growth and learning)
• assigning individuals specific or specialized tasks enabling them to become experts (motivator is responsibility, growth and advancement)

It is recommended that in any initial attempt at job enhancement a controlled experiment be set up. However be prepared for a drop in performance in the first few weeks in the experimental group. Expect first line supervisors to experience anxiety and hostility over the changes you are making. Remember the change itself must be managed.

Conclusion

Effective management depends on three basic personal skills - technical, human and conceptual. The manager needs:

• sufficient technical skill to accomplish the mechanics of the particular job for which the manager is responsible
• sufficient human skill in working with others to be an effective group member and to be able to build cooperative effort within the team the manager leads
• sufficient conceptual skill to recognize the interrelationships of the various factors involved in the manager's situation, which will lead the manager to take action and which is likely to achieve the maximum for the whole organization.

The staff are a manager's most valuable assets and staff relationships are paramount for effective programme implementation. Two aspects of good management that are worth perfecting are skillful listening and feedback.

Skillful listening means that the manager hears the meaning behind the words that are said, and this makes the person feel understood which can turn emotional energy into motivation (and neutralizes negative energy) and contribute to a good working relationship.

Feedback to the staff is essential but this should be facts, not opinion, and refers to actual results, events, critical incidents and significant behaviour. It should be timely and specific and should be descriptive and not judgemental. There are many adjectives to describe feedback, the essential being appreciative and constructive feedback.
Appreciative feedback is used freely by a manager to show appreciation of a job well done and like other feedback is a timely description of specific incidents and indicates the impact and/or consequences of behaviour. Whilst effective appreciative feedback contributes to a good working relationship and informs the receiver what exactly he or she is doing that is appreciated and makes the receiver want to do better still.

Constructive feedback is used sparingly when a staff member needs, but has not been able to self-generate, accurate feedback. It is a timely description of specific incidents, does not pass judgement and indicates the impact and/or consequences of the behaviour. This can be further qualified as effective constructive feedback which does not harm the working relationship but actually contributes to it. It informs the receiver what exactly he or she is doing that needs improvement and makes the receiver want to improve performance.

Exercise

It is useful for a manager to build a management “balance” sheet. Like any balance sheet on one side are listed the assets of the programme and on the other side the liabilities. The job of a manager is to increase the assets as much as possible and reduce the liabilities. Some liabilities might be eliminated, others lessened so that their impact on the programme implementation is minimal.

An exercise you will be asked either individually or working in your assigned small groups, to build a management balance sheet based on your knowledge of the malaria control programme in the country where you are presently working. When you have gone as far as you can, compare the assets and liabilities and draw some conclusions and think about how the assets could be increased and the liabilities reduced. Be prepared to share the outcome from this exercise with your peers, facilitators and tutors.

Please read carefully the next Unit of this module before commencing the session to which it relates.
Guidelines for developing an implementation plan

Learning objectives:
By the end of this Learning Unit you should be able to:

- define an implementation plan
- list the elements of an implementation plan
- develop lists and tables enumerating the detailed operations necessary for implementing the programme
- establish operational evaluation mechanisms
- calculate precise resource requirements
- calculate costs of implementation

Introduction

Developing an implementation plan is a very exacting and time consuming task which is the first step beyond the process of developing a national malaria control plan. Before embarking upon this the national plan should have been written up, submitted to the Ministry, received approval and the budget allocation assured. The national plan sets the framework for the control programme. To be able to implement the programme as planned will require a translation of the plan into action by the peripheral management units. This will depend upon the organizational structure in each country, but it will probably be the health district or a province. The components of the implementation plan should therefore be developed in cooperation with those responsible for implementation at this level, with guidance and coordination from the centre.

The starting point is to identify which of the strata described in the national plan occur in each administrative unit. The objectives and approaches have already been set for each stratum during the planning process and so have the operational targets and evaluation indicators. These need to be stated clearly in the
implementation plan to ensure that the further development of the fine details for implementation is in line with the national plan. Thus all the elements have already been worked out during the planning process to enable the implementation plan to be developed. When each administrative unit has made its contribution they can all be combined into one implementation plan for the country. Each administrative unit can retain its elements as a plan of action, from which the staff can develop planned activities for their day to day work in implementing the programme in line with the plan.

The implementation plan should be presented in a way that would facilitate budget allocation decisions, implementation and evaluation and should include a detailed operational stratification of each politico-administrative (territorial) subdivision, describing the organizational structure, the allocation of resources and time schedules for the various operations.

The plan will comprise a description of the organization responsible for the implementation of antimalaria action. It will also include manpower requirements by categories and numbers, organizational charts, the assignment of responsibilities and the relationships between the various organisational levels responsible for the execution of the programme.

**Elements of an implementation plan**

The plan should preferably include the following:

- description of the strata
- objectives set by stratum
- approaches formulated to achieve the objectives
- antimalaria measures involved and the justification or philosophy for their selection
- the relationship of the antimalaria approaches to the national health care approaches
- the operational targets
- the resource/budget requirements

**The strata**

The following details should be given for each stratum:
• surface (square kilometres)
• localities, number and average size (urban and rural)
• population (number, age and sex distribution)
• households (with average number of persons and whenever relevant average surface of internal walls per household)
• mosquito breeding places within or in the vicinity of dense human settlements (type and extent in hectares or in length)
• number of hospitals
• number and type of health centres
• number of primary health care stations

A description should be made of the accessibility by different means of transport of the areas during the various seasons of the year. Other factors having an operational implication have to be described and possibly quantified, such as:

• population movements, place, periodicity, magnitude
• artificial changes producing or modifying breeding places (irrigation, road construction and other practices)
• temporary seasonal shelters (type, places and season)
• population habits and behaviour which may have an influence on programme implementation
• types of crops grown

Detailed operations

The next step will be to prepare lists and tables showing the locations under control, the type of intervention measures, dosage, number and time of application or administration. This will allow the required resources to be calculated. A list of pertinent data needs to be provided for each control measure. A non-exhaustive list is given below as an example.

Disease management

Number of diagnosis and treatment posts, estimated population served by age group, number of malaria cases per post and per year, estimated blood samples to be
examined and number type, formulation and standard doses of drugs to be administered.

Prophylaxis for high risk groups

Number of expectant mothers, drug to be used and dosage per person, dose interval, number of administrations per person, and expected total duration of prophylactic coverage per person.

Residual insecticide spraying

Localities, households, surface to be treated using various insecticide formulations (emulsion concentrate, wettable powder), insecticide dosage per surface unit (g of active ingredient/m²) and the number of rounds per year.

Ultra-low volume space spraying

Number of hectares to be treated, the insecticide and formulation to be used, millilitres of insecticide per hectare, time of day of application, length of time of application and number of rounds per year.

Chemical larviciding

Number of vector breeding sites, area-size of each breeding place to be treated or, in some instances, the length of the water course, the insecticide and formulation to be used, the dosage per hectare or kilometre and the number of rounds per year.

Larvivorous fish

Number of vector breeding sites, area-size of the breeding places to be seeded, number of fish to be released per hectare, periodicity of release, number and size of breeding ponds required and species of fish to be used.

Environmental management

There are various methods of environmental management each requiring different means and approaches (e.g. cleaning canals, filling water-collections, drainage, flushing, drying). Some require a single intervention (e.g. filling), other repeated and periodic interventions. It is necessary to describe the action and its extent (e.g.
kilometres of canals to be cleaned), the means required (e.g. a mechanical digger), the number of person hours of work for each unit (e.g. for 1 km of canal) and the number of times (e.g. cleaning rounds required per year).

The technical details of various types of intervention can be found in specialized manuals and textbooks.

The evaluation procedures should also be described, such as the technique of searching for adult mosquitoes resting indoors, the number of hours per search and the periodicity of searches; the technique used for inspecting surface breeding places in order to determine the larval densities and periodicity of inspection.

**Evaluation mechanisms**

As already noted, each approach will consist of antimalaria measures organized and delivered in such a way as to contribute to the achievement of the objective. Each of the measures included, as well as the organizational and delivery system involved, will be associated with specific operational targets (quantified operational outputs). In general, there may be a set of targets whose relationship needs to be logically established. Starting from the desired end result (objective) the planners need to work through the assumed contributions of the different measures being proposed and link outputs with each other accordingly.

For example, if the objective set is the reduction of mortality due to malaria in patients seeking care in the health services system, an appropriate target could be the proportion of suspected or confirmed malaria cases that have presented themselves for treatment. In spite of its limited nature, to achieve this objective there are obvious operational implications, ranging from the actual taking of the drugs prescribed, to whatever means are to be implemented to improve diagnosis (e.g. taking blood slides, improving diagnostic skills of health service personnel) and to improve patient compliance (e.g. through 'packaging' of daily dosages, follow-up visits). The operational outputs that are identified could include at least the following:

- the percentage of microscopically confirmed malaria cases amongst those seeking health care
- the percentage of patients completing the radical treatment prescribed
- the percentage of treated cases returning for follow-up
• the percentage of positive cases classified as severe malaria
• the percentage mortality of malaria cases
• the number of health workers trained in the management of severe malaria

How these outputs are seen to relate to each other (and to the objective set) clearly will depend upon the particular approach that has been outlined, i.e. on the relative importance to be given to the different activities envisaged.

A comprehensive evaluation should cover the operational and epidemiological aspects of the programme, and must be based on the designated objectives and the control measures to be applied.

In view of the differences between the various countries it is not possible to produce a standard evaluation model which could be applied everywhere. The designated and quantified objectives and targets will guide the planner in determining:
• the amount and periodicity of data needed for the evaluation of the activities performed
• the degree of accuracy of the information required
• the efforts required for the collection of information

At this stage it is necessary to define the following:
• the institutions entrusted with the measurement of the mortality, and their coverage
• the distribution of indicator villages and the sample size, if malariometric surveys are going to be carried out
• the situation of peripheral health posts and malaria clinics and their coverage, if appropriate
• the infant population to be monitored and intervals of surveys
• the household and population coverage by house visiting for case detection
• the number of blood slides expected to be collected every year by health posts, clinics and institutions which should be entrusted with this activity
• the number of clinical cases of malaria expected to be seen every year
• the annual blood examination rates aimed at and required for monitoring annual parasite incidence

This 'quantification' of the operational and epidemiological evaluation activities is indispensable for estimating the requirements in terms of human resources, material
and logistic support. For each type of data needed, one should specify the techniques and procedures to be used for collection and the number of sampling units and size of samples.

**Resource requirements**

**Facilities**

The facilities needed or repairs and renovations needed should be assessed at each level. It should be stated whether facilities are to be built, purchased or rented. Full justification will have to be made. In determining facilities always bear in mind the additional running costs for utilities, maintenance and repairs.

**Personnel**

This could be calculated when the list of functions assigned to each level of the operational structure has been prepared.

These functions comprise basic tasks, each task consisting of the application of a standard technique for a specific purpose, e.g. diagnosis, prevention, treatment. To implement tasks, it is necessary to estimate the required input in terms of human resources which is defined in terms of the number of each category of staff and the time spent by individual persons to perform the tasks. For any antimalarial action, the main basic tasks must be identified and an analysis of these tasks has to be made, in order to identify correctly the human resources needed, as described below.

**Component activities**

For each malaria control measure to be applied as part of the approaches adopted, the component activities (tasks) should be identified and listed, as illustrated by the examples in Table 15.

Once the main basic tasks have been identified, it is necessary to proceed with the analysis of the tasks which will indicate for any of the tasks under consideration, the activities to be performed and, therefore, the categories of personnel required.
### Table 15. Examples of malaria control or assessment measures and related component activities (tasks)

<table>
<thead>
<tr>
<th>Control measures to be applied</th>
<th>Component activities (tasks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug distribution</td>
<td>Chemosuppression in pregnancy; radical treatment; mass drug administration</td>
</tr>
<tr>
<td>Chemical control application</td>
<td>Larvicide; residual house spraying; ULV or fogging</td>
</tr>
<tr>
<td>Environmental management</td>
<td>environmental modification; environmental manipulation</td>
</tr>
<tr>
<td>Biological control</td>
<td>Distribution of larvivorous fish; entomological monitoring</td>
</tr>
<tr>
<td>Blood specimen collection</td>
<td>Parasitological surveys; active and passive case detection; epidemiological investigation</td>
</tr>
<tr>
<td>Blood examination</td>
<td>Staining; microscopic diagnosis; recording; serological tests.</td>
</tr>
<tr>
<td>Anopheline studies</td>
<td>Larval surveys; pyrethrum spray collection; bait collection; resting behaviour; window-trap observations; identification; dissection (adults); recording.</td>
</tr>
</tbody>
</table>

### Analysis of basic tasks

The analysis is to be based on the time and motion study of each individual task. Each task is broken down into the jobs to be undertaken by different categories of personnel. Jobs are classified as main, supporting and supervisory.

When this work has been accomplished, post descriptions should be prepared for those categories of personnel which will be involved full time in the antimalaria operations, and to include specific antimalaria tasks in the post descriptions of those persons involved only on a part-time basis. This will be done not only for positions within the health sector but also for those in the other concerned sectors.

At this stage, other categories of personnel have to be identified for some other activities not yet considered. This refers inter alia to general planning, epidemiological evaluation (reporting, tabulation, analysis and interpretation of data), administrative support and logistics. These activities are usually carried out at the central and intermediate levels. To make adequate provision, a critical review has to
be made of the personnel already selected and of jobs considered indispensable for the implementation of the programme.

Supplies and equipment

An estimate of the supplies and equipment required during task analysis has already been made. Additional examples of resource estimation are given below.

A description should be made of the type of equipment necessary for the operations, such as portable pressure sprayers and microscopes. The calculation of the quantities needed should be based on: the units to be treated or examined; the duration of the specific activity for which the equipment is required and the output of work per unit of equipment per day. The consumable supplies should also be estimated e.g. for spraying/larviciding operations on the basis of the units to be treated, the average dosage per unit, and the number of treatment rounds per year.

Manuals are available which indicate the equipment and supplies required in a parasitological laboratory, in an entomological laboratory, and for larval control operations, and the equipment for vector control.

The transport needs at all levels of the programme should be identified with precision. Transport should be chosen to fit particular functions considering the nature of the terrain. In lacustrial (lake) areas, boats may be needed, while in mountainous areas, mules and donkeys may be required. Four-wheel drive, heavy duty vehicles are often indispensable. Vehicles should be as much as possible multi-purpose and in use for most of the time throughout the year; for example, a station wagon could be used for both supervision of disease management and for entomological activities, and a pick-up car could be used for transporting squads engaged in residual spraying and for ULV spraying. The hiring rather than the buying of vehicles should be considered if a great number of vehicles are needed for a short period (as for a single round of spraying for two months per year) and are not to be fully utilized for other purpose during the rest of the year.

Allowances should be made at the time of purchase, amounting to 15 - 20% of the fleet value, for spare parts to repair vehicles during their expected life span. Adequate provisions must be made for regular vehicle maintenance.
Finally, items such as office equipment, especially computer equipment for the different structures at central, regional, provincial, district and sub-district levels, should be duly considered.

**Recruitment and training of personnel**

The personnel requirements may be assessed on the basis of an inventory of the various categories of staff needed and of the posts to be filled. From the list of posts, it is possible to evaluate the number and categories of professional, sub-professional and auxiliary personnel to be trained or retrained. Although training can take place in the country concerned, some categories of staff may require further development in training centres or institutes abroad and this applies not only to some professional and technical staff of the health services, but also to selected personnel of the general health services, such as public health administrators.

In assessing the training needs, it is essential to remember that, although training must be appropriate to the functions to be assumed by the trainees it should be broad enough to enable them to relate their own activities to the rest of the programme and to adjust themselves to different situations as they arise. Depending upon the size and nature of the programme it may or may not be necessary to set up a central training unit. This may be a separate institution, e.g. a national malaria training centre or, in some cases, may be incorporated into a malaria / public health institute. Neighbouring countries with similar training needs may find it economical in terms of staff and other resources to organize combined training of certain categories of staff. Service delivery staff will be required to carry out training. They may therefore have to be prepared for this task with regard to both training content and training techniques.

Training will also be required at a peripheral level under the direction and supervision of a national or inter-country centre.

Prior to initiating any training course, trainees must be recruited. Potential candidates are selected on the basis of their qualifications, experience, language, job requirements and other criteria decided upon for admission to the course.

For each training course, learning objectives will have to be established based on an analysis of functions and tasks. The curricula would be developed accordingly.
In addition to staff requirements for training, the required teaching materials (manuals, visual aids, etc.) have to be identified and reflected in the programme budget. Field demonstrations will also be needed for training some categories of personnel and adequate provisions must, therefore, be made in advance for the organization of training areas, transportation, allowances, and other essential support.

Once the training needs for the different categories of personnel have been identified, a calendar will have to be established so that different training activities can be organized according to priorities of the programme and availability of tutors and facilities. An example is given in Table 16.

The needs for retraining have to be considered. Some staff members may need retraining to prepare them for additional duties, for a new activity to be introduced into the programme, or for reassignment to other posts with different duties. Health education should always be included in the functions and tasks assigned to various categories of personnel. Allied to this the subject of public relations. In some situations, it would be advantageous to stress the questions of human relationships and a suitable anthropologist/sociologist would be useful in this area of training. When planning training activities, one should always take into account the losses of trained manpower. After the training needs have been defined, an estimate should be made of resource requirements (e.g. personnel, facilities, equipment, supplies, transport).

**Costing and budgetary estimates**

Programme related costs must be quantified and presented in the format specified by the funding bureau. A major effort is required to ensure that the budget is as detailed as possible and that contingency funds may be made available. In preparing the budgetary estimates one may follow the line suggested so far. Costing figures may be elaborated for each of the operational strata and then totalled to arrive at the budget required at the central level.

Relevant budgets should include the following items.

- salaries and expenses of field personnel, technical and evaluation personnel, administrative supporting staff, consultative or contractual services (if required) and allowances
• expenses for organization activities such as purchase or rental of office space, including laboratories, stores, garages and workshops; office supplies and equipment (purchase or rental); telecommunications, water, electricity, postal and freight, information collection and data processing, miscellaneous

• supplies and equipment for field operations, including transport maintenance and running costs; laboratory equipment and supplies; insecticides, larvicides, drugs, and other operational supplies; equipment for vector control operations

• training costs will be calculated at the central level where the requirements for the whole country will be considered and a calendar for training courses will be established. It is to this level, however, that the identified local training requirements have to be communicated

• miscellaneous costs for publications, travel within and outside the country and expenditure that is not covered under the other headings

In preparing the relevant services and programme budget, consideration should be given to factors of inflation and depreciation. Particular attention should be made to personnel costs as they are the most expensive items. In order to estimate, as precisely as possible, the personnel requirements and relevant costs one should take into account the number and types of tasks to be performed. An estimation should then be made of the number of person hours per year for each category of workers. Using the salary scales, costs can be calculated for each health worker and then the total cost for the human resources required.

The cost of a programme depends on the control methods selected. Given the great variation in the application of measures and in the evaluation and maintenance of operations, this cost may vary considerably from one country to another. As stated previously, each country is to select the objectives according to the resources available and, therefore it is not possible to give standard costs as targets may be different from country to country. However, the ratios shown in Table 17 may serve as an indication. The cost of environmental measures such as biological control, drainage, filling, land reclamation and house improvement have not been included, in view of the numerous cost factors involved and types of equipment used. The costs for application and evaluation largely depend on labour and transport costs which vary from place to place.
Table. 15  EXAMPLE OF A CALENDAR OF TRAINING ACTIVITIES FOR YEAR ....

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<td>CLINICIANS AND NURSES</td>
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<td>ENTOMOLOGICAL TECHNICIANS</td>
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<td>LARVICIDING AGENTS</td>
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<td>FIELD SUPERVISERS</td>
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<td>REFRESHER COURSE FOR MICROSCOPISTS</td>
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</table>

- Theoretical training
- In-service training or field demonstration
Table 17. Example of the relative weight of major budget components for intradomiciliary residual spraying

<table>
<thead>
<tr>
<th>Type of programme</th>
<th>Insecticides</th>
<th>Labour and supervision (wages and salaries)</th>
<th>Transport</th>
<th>Equipment and other costs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaria vector control</td>
<td>35%</td>
<td>39%</td>
<td>22%</td>
<td>4%</td>
<td>100%</td>
</tr>
</tbody>
</table>

The time schedule

The chronological sequence of events can be shown in different ways in tables, flow diagrams or PERT charts. The simplest way, however, is to list on one side of a chart the various activities envisaged during a given period of time (biennial, annual) and opposite each item the expected duration (weeks, months) of the activity. The schedule indicates only the activities of limited duration and those which are sequential; it does not show the activities which are to be carried out on a continuous basis, diagnosis, treatment of malaria cases, stimulation of community participation, entomological evaluation and vehicle maintenance. Specific schedules will be needed for each activity, such as lists of villages to be surveyed, calendar of village meetings, plan of the utilization and maintenance of vehicles and itineraries for spray teams. This part of the organization of the operations is done at the peripheral level in the context of each specialized service. The preparation of these detailed schedules is therefore a further step in the programme implementation process.

Conclusions

When planning malaria control it is necessary to take into account the totality of the experience gained in the past and to draw upon a wide variety of disciplines that are available in the country. To effectively implement the programme will require a nucleus of well trained personnel experienced in all aspects of malaria epidemiology and control.
The development of a malaria control programme needs to give due regard to the overall concepts governing health protection and trends in socioeconomic development. Single disease control may no longer be politically and ethically acceptable. The awareness of health administrators and political decision-makers that health is an integral part of the economy and the adoption of a resolution on the subject by the General Assembly of the United Nations opened a new avenue in organizing and implementing health programmes.

A Ministerial Conference on Malaria was held in Amsterdam in 1992 presided over by the President of the Republic of Congo, Professor Pascal Lissouba. This historic conference endorsed a Global Malaria Control Strategy which has the four main elements:

- 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.

This demonstrated the political will to control malaria globally, and without the political support your malaria control plan and programme will not be viable.

The planning process in this module, by design, has not pre-empted the global strategy but has allowed you to learn how to develop objectives and approaches according to the local circumstances in your country, the starting point being a very careful analysis of the malaria problem, the population, the health services, the environment and the means available to control the disease. If the process has been carefully followed, it is with confidence that your plan will be in line with the Global Malaria Control Strategy.
Malaria control must be planned and implemented within the overall trend of health and socio-economic development of each country affected by the disease. Due consideration has to be given to:

- the various levels of endemicity and intensity of transmission under different ecological conditions
- the potential of the tools and methods available for malaria control (chemical, biological, environmental for vector control and drugs for treatment and suppression of malaria)
- the differences in health infrastructure development
- the differences in the status of social and economic development
- the financial and human resources available or that can be positively mobilized.

In planning and replanning antimalaria activities, flexibility and an epidemiological approach should be the guiding principle. The same applies to the selection of control methods. However, those responsible for malaria control activities at the country level should recognize that even well conceived technically oriented malaria control may not succeed without the total involvement of health administrators, politicians and the community as a whole.

In this training module an attempt has been made to inform the learner of the different techniques available to evaluate the intensity of endemo-epidemicity (analysis of malaria), the elements and procedures to be considered in planning malaria control, other techniques for epidemiological evaluation and various aspects that may help malaria workers and health administrators in the management of malaria control programmes. There is no overall prescription applicable to all ecological situations. From that point of view malaria 'control is a far more difficult task than malaria 'eradication ', even though this may sound contradictory.

It is hoped that this training module will assist those responsible for malaria control to perceive their programme as part of the national health programme and that in implementing it they succeed in mobilizing the community as a whole, in achieving multisectoral cooperation at all levels especially with those involved in social and economic development, and in assisting the population to understand, accept and participate in the control approaches. Planning malaria control programmes is a complex process that cannot be accomplished through a single sequence of isolated
steps. On the contrary, the procedures described will have to be carried out both concurrently and interactively. Nevertheless, an attempt has been made to organize and present the subject in such a manner as to permit a familiarity with the principles of planning for malaria control. It is not intended to be a straight-jacket of hard and fast rules and any statement that may appear to be relatively dogmatic is so formulated for didactic purposes only.

The planning process necessarily extends over a considerable period of time, and allowance must be made for this. Additional information and experience gained during the implementation of any antimalaria programme should invariably be fully utilized to improve upon the original effort, through the replanning process.