



# **The Integrated Malaria Management Consortium (IMMC)** in cooperation with The Tr-Ac-Net Organization **The Cost Accounting Dimension of Integrated Mosquito and Malaria Control**

## **Integrated Malaria Management (IMM)**

Integrated malaria management aims to control both the mosquito and the malaria parasite. The goal is to reduce the prevalence of the malaria parasite in both the mosquito and the human host and to reduce the burden of malaria in society.

Integrated malaria management can be as much as five times more cost effective than any single intervention in almost any circumstance.

## **Cost Accounting**

Good data and cost accounting are a missing dimension in the international relief and development sector, and especially in the health sector and the malaria sub-sector. Because these are missing, management information is compromised, and decisions cannot be optimized.

### **Cost accounting**

Good cost accounting is simple and it is powerful. There is no good reason for not knowing clearly what things cost. A good start is simply a list of money spent, and some data about what the money was used for and what was accomplished by spending the money. This is not complicated, and the fact that it does not always exist is a disgrace.

In accounting, experience shows that when there are missing data, there is usually also missing resources. When there is no cost accounting, standards of performance are always less than optimum ... good things go unrecognized and bad things are allowed to continue.

### **Value analysis**

Good decision making is not about reducing costs to the minimum but getting the most value from using resources. The African socio-economic crisis results in large part from poor decision making and policies that have funded value destruction. Malaria interventions have most value when they reduce the burden of malaria and improve socio-economic condition.

### **Data manipulation**

From the perspective of an accountant, the information being used for decision making in the international relief and development sector is neither clear, reliable nor verifiable. There are indications, but little easily accessible management information, that some of the prevailing portfolio of interventions are costly and ineffective. Without good accounting, nobody will ever know.

## **Elements of IMMC**

The elements of IMMC are the following:

1. Data: mapping, surveillance, data analysis, modeling, cost accounting, planning,
2. Interior residual spraying (IRS),
3. Source control,
4. Mosquito control (ULV spraying),
5. Medical: drug therapy, drug prophylaxis,
6. Personal protection: bed-nets (ITN).

## **Data Driven Decisions**

Good data and timely analysis are drivers for optimized performance. Data for operations are best obtained from people on the ground feeding detailed information into a well-designed system. Data are needed about science, operations, and costs. Data are needed in detail in time.

Local decisions are made along the lines of decision making in US vector control districts. In the past malaria and mosquito control has been successful where there has been strong local data driven decision making, going back to Gorgas and the Panama Canal.

Data available from satellite imagery, combined with local teams doing mapping and surveillance is cost effecting for building up information rapidly.

A system of data logistics gets data from local operations into data stores that serve both the local need for operational data and an international need for analysis. Data logistics is done in cooperation with local telecentres and others with access to the Internet.

In the IMMC approach the local data are also used in a multivariate malaria model that combines experience from different locations. This model (cyberenvironment) helps understand the complex behavior of the underlying mosquito and malaria science, and to optimize the cost effectiveness of each of the area programs.

The single most valuable intervention of IMMC is data collection that is integrated into system for management analysis and decision making that takes cost effectiveness into consideration.

## **Physical Interventions**

### **Interior Residual Spraying (IRS)**

Interior residual spraying (IRS) is an effective way to reduce malaria transmission. The repellent effect is important, because it diverts the mosquito before a blood meal. After a blood meal the mosquito may rest and be killed by the pesticide toxicity, but this may be too late

to prevent malaria transmission. DDT is the most cost effective pesticide available for IRS because it has strong repellent properties, it is low cost and is effective for twice as long as other chemicals. Manipulation of data and lack of concern about performance has meant that DDT is no longer universally used even though it is the most cost effective.

### Source control

Malaria transmission is reduced if the mosquito vector is controlled. The mosquito can be best controlled before it flies while it is still in the larval stages. There are larvicides that are effective and safe. With good data, source control interventions can be very precise, the use of larvicide optimized and cost minimized.

### Adult Mosquito control – ULV spraying

Where the mosquito population is out of control, it can be reduced rapidly and at low cost using aerial ultra low volume (ULV) spraying. This technique is used in the USA to control mosquitoes where West Nile Virus has been located, or merely to control “nuisance” mosquitoes. ULV is very cost effective for large areas that are difficult to access. ULV spraying creates very small droplets that attach to the hairs on the mosquito. This intervention provides for a quick knock down of the mobile adult population. Pesticides used today like Dibrom are safe but very toxic to mosquitoes.

### Medical Treatment

Drug therapy and drug prophylaxis are costly and increasingly ineffective. As long as there is endemic malaria and massive reinfection, medical treatment as a standalone curative treatment does not produce sustainable progress. Medical care that focuses on children and pregnant women may reduce mortality in the focus groups, but not reduce morbidity affecting the vast bulk of the population. Worse, it must be expected that resistance development will accelerate as long as there are ineffective programs to reduce the rate of malaria reinfection.

### Bednets (ITN)

Bednets work for the people sleeping under them, but that is as far as it goes. Bednets help to reduce mosquito bites and the transmission of malaria to and from the individual. Bednets are expensive and do little to reduce the prevalence of the mosquito parasite in the population at large unless there is widespread use of nets by all the population.

## Integration

### Exponential performance improvement

In an integrated program, the expectation is that there will be an exponential improvement over a single activity approach. There is a multiplier effect when interventions are combined in a manner that is mutually

supportive to disrupt the transmission cycle and make the improvement permanent.

### The value dimension

Data drives decisions. The interventions are selected so that there is maximum value impact with the least cost:

1. socio-economic performance,
2. reduction in the malaria parasite in the mosquito and the human population,
3. total cumulative cost of the interventions,
4. achieving long term sustainable low costs.

Research and development (R&D), including vaccine, new drugs and new pesticide development, is expensive and only has value if the R&D is successful and the developments are deployed. It is not cost effective in situations where presently available techniques are not being used and future product use will not be funded.

### Cost performance exponentials

Human resource costs are optimized when the majority of the staff are local, well trained and there is strong oversight and management data. There is exponential improvement when there is widely shared knowledge and experience.

The effective use of management information alone can improve performance significantly, probably by as much as 100%, perhaps significantly more.

### Projected Optimum Program Costs

The estimated costs to reduce endemic malaria to almost nothing for a community of one million people and an area of 50,000 acres is \$32 million with a five year timeline and resource allocation optimized as follows:

\$ million						
Item	Yr1	Yr2	Yr3	Yr4	Yr5	Total
Investment	5.0					
Data	1.0	1.0	1.0	1.0	1.0	5.0
IRS	2.0	2.0	1.0	0.5	0.5	6.0
Source control	2.0	1.0	0.6	0.4	0.4	4.4
ULV spraying	3.0	2.0	0.5	0.2	0.2	5.9
Drug therapy	1.0	1.0	1.0	0.7	0.3	4.0
Bednets	0.5	0.5	0.4	0.2	0.1	1.7
Total	14.5	7.5	4.5	3.0	2.5	32.0

The investment includes equipment cost, development of the cyberenvironment, and initial operating supplies. The outcome aims to be a sustained reduction in the prevalence of the malaria parasite in both mosquitoes and the human host, a reduction in the burden of malaria and socio-economic progress in the community.

A continuing expenditure of around \$12.5 million per five years is projected to maintain the improved status. This compares with a 5 year cost for, for example, 100% bednets and 100% drug therapy, of perhaps \$50 million.