Government of Sierra Leone
Ministry of Health and Sanitation

Integrated Vector Management

Strategic Plan

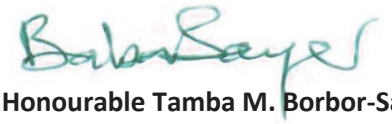
October 2012

Foreword

The ultimate goal of an Integrated Vector Control programme for Malaria and NTDs is to attain the millennium development goals and objectives set by the Abuja Declaration. To optimise the chances of achieving these objectives, it is vital to incorporate IVM in the integrated control of these diseases within the ambit of the NHSSP 2010-2015 and the IVM Policy Guidelines 2010.

The national strategic plan aims to reduce morbidity and mortality related to malaria by 50%; Onchocerciasis, schistosomiasis and STH by 80% from the 2010 level; and to eliminate LF by the end of 2015. It also aims to establish sensitive surveillance for trypanosomiasis and document its transmission status in the country, particularly in border areas.

It is expected that this national document will serve the intended purpose and stand as a road map for the direction and guidance of existing and future vector control interventions that will be planned, implemented, monitored, and evaluated in the interest of the country.



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Acknowledgements

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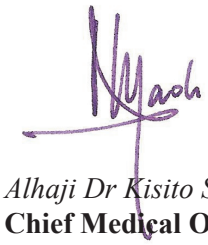
Commendation goes to the staff of the Directorate of Primary Health Care/MoHS, Environmental Health Division, National Malaria Control Programme, and the National Neglected Tropical Diseases Control Programme for their contribution and relentless efforts towards the formulation of this plan which indicate their commitment towards its implementation.



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List of Figures

List of Tables

Abbreviations

DHMTs	District Health Management Team
IRS	Indoor Residual Spraying
IVM	Integrated Vector Management
LLINs	Long Lasting Insecticide Nets
LF	Lymphatic Filariasis
MDA	Mass Drug Administration
MoHS	Ministry of Health and Sanitation
NMCP	National Malaria Control Programme
NOCP	National Onchocerciasis Control Programme
NTDs	Neglected Tropical Diseases
NTDCP	Neglected Tropical Diseases Control Programme
Oncho	Onchocerciasis
SCH	Schistosomiasis
STH	Soil Transmitted Helminthiasis
VCD	Vector Control Subdivision of the Environmental Health Programme
WHO	World Health Organization

Table of Contents

Executive Summary

The Government of Sierra Leone fully acknowledges efforts made by all stakeholders acting in an integrated fashion in recognising the burden of vector borne diseases in the country and the strategic planning of evidence based and result oriented interventions that will foster equitable distribution of our resources in the control and prevention of vector borne diseases and the associated risk factors.

The World Health Organisation (WHO) recommends a systematic approach to vector control based on evidence and knowledge of the local situation. This approach is called **Integrated Vector Management** (IVM). This is a rational decision-making process for the optimal use of resources in the management of vector populations, so as to reduce or interrupt transmission of vector-borne diseases. The approach seeks to improve the efficacy, cost-effectiveness, ecological soundness and sustainability of disease-vector control. It takes into account the available health infrastructure and resources and integrates all available and effective measures, whether chemical, biological, or environmental. IVM also encourages an integrated approach to disease control.

The formulation of this strategic plan for the Integrated Vector Control and Management followed the development of an IVM policy and will build solidarity between Government and partner organizations. This will consequently enhance and strengthen the existing systems leading to sustainable improvement in training and provision of the required logistics, supplies and human capital to accelerate the scale up for impact on Malaria and NTD control in Sierra Leone.

The IVM strategic plan is a product of several consultative and stakeholder taskforce meetings held at national, district and community levels by various organisations that include the World Health Organization (WHO), Helen Keller International, UNICEF, and the three institutions under the MoHS: National Malaria Control Programme, Onchocerciasis Control Programme and the Environmental Health Division. This holistic nature and approach will ensure implementation of interventions with appropriate cohesion, and hence high levels of participation and partnerships, while strengthening both community actions, and the capacity of the health system. Orientation of the strategic plan is therefore geared towards:

- Strengthening Inter-program and inter-sectoral collaboration;
- Strengthening the health system for a better management of disease control;
- Strengthening capacity for surveillance, monitoring and evaluation; and
- Ensuring impact orientated management of malaria and NTDs control programmes.

Purpose of the strategic plan

The purpose of this strategic plan is to elaborate country direction for implementation of IVM strategies for the control of malaria and NTDs so that all efforts by the various partners are harmonized and tuned towards achieving the set goal and objectives.

1. Background and Situation Analysis

1.1 Geography and Climate

Sierra Leone is located on the West Coast of Africa. It is situated between Liberia in the South and Guinea (Conakry) in the North and Northwest. It lies between latitudes 7° -10° N, and longitudes of 10.3° and 13.5° West. It has a total area of about 71,740 square kilometres of which 71,620 square kilometres is land and 120 square kilometres is water. Along most of the coastal areas are mangrove swamps. The rest of the country is a plateau with altitudes ranging from 300m and above. However, the countryside is characterised by hills and mountains. There are also several rivers in the country. The main ones being rivers Moa, Moro, Mano, Rokel, Sewa, Jong, The Great and Little Scarcies. The river systems have hundreds of tributaries that form a network within the country, and there are numerous lakes, the majority of which are relatively small in size. The topography of the land coupled with abundance of rivers and other water bodies contribute to the epidemiology of vector borne diseases including the NTDs in the country.

1.2 Population and demographic situation

The overall population of the country, according to the 2004 census and 2005 (projected) statistics, is about 5.4 million. Of the national population, urban centres account for 40.2% and the rural areas 59.8%. The population growth rate is at 2.4%, with a birth rate of about 45 births /1000 population. The total fertility rate is 6.5 children born per woman. The overall death rate is 20.6/1000 population.

Table 1: Distribution of population by districts

No	Districts (Provinces)	Chiefdoms	Population
1	Kailahun District (Eastern)	14	358,190
2	Kenema District (Eastern)	17	626,350
3	Kono District (Eastern)	15	415,426
4	Bombali District (Northern)	14	491,230
5	Kambia District (Northern)	7	270,462
6	Koinadugu District (Northern)	11	265,758
7	Port Loko District (Northern)	11	453,746
8	Tonkolili District (Northern)	11	347,197
9	Bo District (Southern)	16	613,625
10	Bonthe District (Southern)	12	139,687
11	Moyamba District (Southern)	14	260,910
12	Pujehun District (Southern)	12	228,392
13	Western District (Western)	12	947,122
	Total	**166**	**5,418,095**

1.3 Political and administrative organisation

The country is divided into 3 provinces (Eastern, Northern and Southern) and the Western area. There are 12 districts in the provinces and two in the Western Area. Each district in the provinces is divided into Chiefdoms; each presided over by a Paramount Chief. There is a total of 166 Chiefdoms in the country, which are further divided into sections and villages headed by section and village chiefs. In total, there are about 13,451 villages in the country. Administratively, the District is headed by a District Officer who is a Civil Servant, assisted by Assistants at lower levels. With the recent decentralisation of services to local communities, the country has been divided into 19 local councils and further sub-divided into 392 wards. Each ward is headed by an elected councillor. These Councillors play a role in advocacy and mobilisation of communities. A map of Sierra Leone showing the provinces and districts is shown in Figure 1. It should be pointed out, however, that most government services in Sierra Leone are not yet decentralised.

Fig. 1: Administrative Map of Sierra Leone

1.4 Economy and socio-economic profile

According to World Bank rankings, Sierra Leone is one of the poorest countries in the world, with 68% of the population living below the poverty line. A long civil war (1991 – 2002) had a devastating effect on the socio-economic development of the nation. Its major sources of hard currency are diamonds, gold and other minerals, which account for more than 50% of the country's foreign earnings. Fisheries and agriculture are not well developed though the potential is high. Agricul-

tural produce includes rice, coffee and cocoa among others. Industries are mainly limited to small scale manufacturing and mining (diamonds, iron ore, rutile and gold). Tourism potential is great and with political stability will contribute towards national development.

2. Health Situation

2.1 Health system organisation

The Ministry of Health and Sanitation has two Directorate Generals: one for Management Services and the other for Medical Services. There are ten professional directorates, including the Directorates of Disease Prevention and Control (DPC) and Primary Health Care (PHC), which manages the DHMTs. Under the DPC are 5 main programmes, namely: Malaria Control Programme (MCP), HIV/AIDS Control Programme, TB/Leprosy Control Programme, National Onchocerciasis Control Programme (taking care of other NTDs as well) and Maternal and Child Health /Expanded Programme of Immunisation (MCH/EPI). The PHC Directorate has several programmes including Health Education, Environmental Health, School Health and Entomology/Vector Control, among others.

At the District level, there is the District Health Management Team (DHMT) headed by a District Medical Officer (DMO). The DMO controls all the Public Health staff and also coordinates all public health activities within the district. He /She is also responsible for administration, planning, support supervision, training, monitoring and evaluation and research among others. The DHMT has focal persons for each disease Programme, for example a CHO is responsible for the Onchocerciasis Control programme at the District level. The next level to the District is the Community Health Centre (CHC), based at the Chiefdom Level and staffed by a Community Health Officer (CHO), a Public Health Inspector or Environmental Health Officer (EHO), a Senior female nurse, a Maternal and Child Health (MCH) Aide, and a Vaccinator. Below the CHC is the Community Health Post (CHP), manned by a Community Health Assistant (CHA), an MCH Aide, and a Vaccinator. Below this level is the Maternal and Child Health Post, staffed with an MCH Aide, CHA, Traditional Birth Attendants (TBAs), a Vaccinator and a support staff. All these levels and personnel have well defined responsibilities and a chain of command.

The focus of the National Health Policy has been on preventive services in the country through a Primary Health Care (PHC) approach. The priority by government is to develop PHC services to cover the whole country.

Health services are currently provided by the Government, NGOs, registered Private Practitioners and Traditional Healers. All these institutions contribute towards the Primary Health Care Package in the country. However, the majority of health services are provided at Government facilities. The health situation and services available vary from district to district. A recent (2004) health situation analysis in the country included the major health problems in each district, the existing health facilities, the resources available and the communities' awareness and willingness to participate in activities that promote health. Analysis revealed that Health facilities and manpower available in each district also vary considerably. For example some district hospitals offer all the essential health services, both general and specialized, such as surgical, paediatrics, obstetrics/gynaecology, radiology, x-ray, dentistry, laboratory technology services, blood bank, ophthalmology, pharmacy and many others. On the other hand there are district hospitals that lack some of the specialized services. The following services are found in only 3 district hospitals (not necessarily the same hospitals) – obstetrics /gynaecology, ophthalmology, dentistry, public/environmental health, blood bank, x-ray services and orthopaedics. Some hospitals in the Western area / Freetown offer the more specialized services like physiotherapy, psychiatry, pathology and ENT.

The Ministry of Health and Sanitation recognizes that provision of health care services in the

country is inadequate. Consequently, the PHC strategies adopted by government are meant to handle the health problems throughout the country and in an equitable manner.

2.2 Health sector priorities

The Health Sector in Sierra Leone has identified its priorities under the PHC arrangement. The Ministry has identified several health priorities that embrace broadly three areas; namely diseases that affect children; those that affect women during pregnancy and childbirth; and diseases of adults. Priority conditions and areas that affect children include malaria, worm infestation, measles, neonatal tetanus, diarrhoeal diseases, ARI/pneumonia, anaemia, severe malnutrition, whooping cough and TB. Conditions that affect women during pregnancy and childbirth are anaemia, malnutrition, STD/AIDS, ante partum and postpartum haemorrhage and others. Adult diseases /conditions are malaria, ARI/pneumonia, cardiovascular diseases, anaemia, diarrhoea, Urinary Tract Infections (UTI), skin diseases, onchocerciasis, Schistosomiasis, Lassa Fever, Yellow Fever and others (LF not included due to lack of data). It can be seen that some of the disease conditions identified as deserving priority attention are due to NTDs or actually caused by them. A national health action plan has been put in place, with 13 technical programmes covering all the priority conditions / diseases identified under the National Health Action Plan. These 13 programmes are being backed by expanded manpower training, retraining and rehabilitation of health facilities in the country,

The health sector policy is focused on the development of preventive, curative and rehabilitative services. The goals of the national health policy revised in 2004 are:

- decentralisation of health care delivery to the districts;
- provision of adequate manpower for effective delivery of health care services;
- reduction of high mortality and morbidity among mothers and children thereby improving their quality of life;
- developing and making optimum use of potentials that drugs have in controlling common diseases in Sierra Leone;
- improving the nutritional status of the population, especially children and mothers;
- educating the general population on health matters so as to bring about behaviour changes/ impact;
- training appropriate cadres of health personnel to meet the health needs of the country;
- determining research needs and ethical acceptability in research; and
- providing relevant information for planning and management of the health service.

The National Health Policy thus embraces and recognises the importance of vector borne diseases, including neglected tropical diseases endemic in the country and the need for their control and/or elimination using available technologies and opportunities in an integrated manner.

2.3 Health indicators

In Sierra Leone, access to health services is estimated at 80%, which is an improvement from the figure of 40% for 2002. The total number of health facilities functioning now stands at 1200. The population per functioning hospital is estimated at 118,80, that per functioning health facility is 5,441 and per Peripheral Health Unit (PHU) is 7,936. It is now estimated that the population per doctor is at 59,259 which is a decline due to exodus of doctors from the country.

The population per professional nurse is 5,544; and per Environmental Health Officer is 52,235. Access to safe water now stands at 57% and access to sanitation is 40%. The prevalence of HIV/AIDs, though low, seems to be rising, from 0.9% in 2002 to 1.54% according to 2005 estimates. The prevalence of disability is at 20/1000. Contraceptive prevalence rate is still very low at 4% and the percentage of birth with a skilled attendant is 42%. Nutritional issues seem to be a big problem with 21.1% of the children being underweight and 21% having stunted growth. Stunted growth, anaemia and impaired growth are partly due to worms. Sierra Leone has one of the highest mortality rates in Africa, compounded by a low doctor to patient ratio. Over the years, however, there have been improvements in some of the health indicators. Infant mortality rate has decreased. At the same time, there have also been epidemics of yellow fever, meningitis, Lassa fever and cholera.

The other basic health indicators for Sierra Leone are not performing very well either. Life expectancy at birth is at 42 years; infant mortality rate is 89/1000 live births; under five mortality rate is 140 deaths /1000 live births; maternal mortality rate at 857 deaths/100,000 live births is one of the highest in the world. The crude birth rate is 45 live births / 1000 population and the average completed fertility for each woman is 5.9 births. The annual population growth rate is 2.4%.

2.4 Health sector financing

Sierra Leone is undergoing a period of development following the war that ended in 2002. The GoSL is not in a position to finance all programmes under the health Sector. However, there are several health sector support programmes in the country. These include the Health Sector Reconstruction and Development Project (HSRDP) funded by International Development Association (IDA) of the World Bank. The major objective of this health assistance is to restore essential health services, including the rehabilitation of district hospitals and Community Health Centres; acquisition of health sector goods and supplies; and support for programmes of high public health importance such as malaria control, TB Control, Environmental Sanitation, and the Onchocerciasis Control Programme. The other main objective of the assistance is strengthening public and private sector capacity which has several components, amongst which are promotion of decentralisation and improvement of the performance of district health management teams; strengthening the key Ministry of Health support services, including human resource development; planning, monitoring and statistics; financial management and procurement. The African Development Bank is supporting the strengthening of the district health system.

Support towards health financing in the country has also come from the Global Fund for Malaria, HIV/AIDS and TB /Leprosy Control; UN agencies (WHO, UNICEF, UNAIDS, UNFPA, WFP), German Leprosy Relief Association (GLRA), Islamic Development Bank (IDB), and other National and International NGOs such as Sight Savers International (SSI), Hellen Keller International (HKI), International Medical Corps (IMC) and Medical Emergency Relief International (MERLIN) to mention a few.

School health is one of the programmes under the Directorate of Primary Health Care. The main objective of the programme is to provide quality health care services to school going children, from pre-school to end of Secondary School. The programme has two main components, namely: curative and preventive services. Children are treated free of charge in government health facilities. For preventive purposes, both children and teachers are taught first aid techniques and administration of oral rehydration salts (ORS); sensitized about worms and de-worming, environmental sanitation, HIV/AIDS/STIs, and the role of peer educators and School Health Clubs.

School Health is headed by a Programme Manager, assisted by a Community Health Officer, a Health Educator, an Environmental Health Officer and a Monitoring and Evaluation (M & E) Officer among others. There is also an Officer assigned from the Ministry of Education, Science and Technology (MEST) to work with the School Health Programme. In the districts, the DHMT is responsible for school health. There is no policy on School Health as yet, but a protocol for the school health programme was developed jointly by the Ministry of Health and Sanitation and the Ministry of Education, Science and Technology. The protocol spells out modalities for implementing both curative and preventive health services for school children. Implementation of this protocol has commenced. De-worming of school children has also been done in some districts. Funding and other support for school health comes from WHO, UNICEF, WFP and the Government of Sierra Leone.

3. Malaria and Neglected Tropical Diseases (NTDs) in Sierra Leone

Malaria and neglected tropical diseases (NTDs) such as schistosomiasis (SCH), Onchocerciasis (ONCHO), lymphatic filariasis (LF) and soil transmitted helmiths (STHs) contribute to a significant proportion of the disease burden in Sierra Leone. Malaria, ONCHO, LF and STHs are endemic in all districts and thus the whole population is at risk of infection. In spite of the fact that these diseases are preventable and controllable, they continue to cause unacceptably high morbidity and mortality in the country. The adverse economic impact of these diseases, though it has not been quantified, is significant. Cognisant of this, the Government of Sierra Leone, has designed policies and strategies to systematically control or even eliminate these diseases. However, implementation of systematically integrated prevention and control strategies remains to be strengthened. The vicious eleven year civil war that ended in 2002 destroyed the country's economy and infrastructure and interrupted virtually all the health services. Indeed the bulk of the health budget of the country is still externally funded (see section 2.4).

Malaria is by far the most important vector borne disease. It is endemic in all areas of the country, including the cities such as Freetown. The most vulnerable groups include children under five years of age and pregnant women. According to the situational analysis in 2004, malaria is responsible for 40% of outpatient morbidity among children under five years of age and 37.6% of all hospital admissions, with a case fatality of 17.6%. Mortality attributed to malaria is 38.3% (under fives) and 25.4% (all ages). In response to this, the GoSL has been taking measures to strengthen the malaria control program at all levels.

Regarding the NTDs, in 2006, the MoHS produced a national plan of action for integrated control of ONCHO, SCH, STH and LF. The plan aims to eliminate LF by 2015 and to reduce morbidity due to ONCHO, SCH and STHs to levels where the diseases are no longer of public health significance. The main strategy is mass drug administration (MDA) through community directed treatment (CDTT) and or school based approach. However, the strategies targeting vectors of LF, oncho, and SCH have not been incorporated into the Plan of Action. MDA alone is unlikely to interrupt disease transmission for some of the NTDs (e.g. SCH) or will take a very long time to do so (e.g. ONCHO).

3.1. National Policy and Control of malaria and NTDs

In order to attain optimal health impact of chemotherapy and MDAs and also to promote chances of elimination of some of the vector borne diseases including NTDs the National Health Sector Strategic Plan (NHSSP 2010-2015) recommends integrated vector management (IVM) as a key strategic component of their control in the country. Thus this IVM Plan of Action is outlining directions to be taken to implement IVM in Sierra Leone.

3.1.1. National Policy and Performance of Malaria Control

The Ministry of Health and Sanitation (MoHS) with technical support from WHO, in the context of the health action plan, established the National Malaria Control Programme in 1994 within the Directorate of Disease Prevention and Control. Before 1994, there was no programme to coordinate malaria control activities. Hence, malaria control has become a major component of the revised National Health Plan (MoHS). The mandate is to plan, facilitate the implementation, coordinate, supervise, and monitor malaria control activities in an integrated disease control approach. MoHS has a specific budget line item for Malaria that supports the implementation and monitoring of various control interventions such as ITNs, Prompt and appropriate management of cases. To promote partnership, there is a broad based RBM Task Force Committee at the national level while District Health Management Teams coordinate at the sub-national levels.

3.1.1.1 Progress of Malaria Control Programme in Sierra Leone

The Republic of Sierra Leone is a signatory to the Abuja Declaration of April 2000 to Roll Back Malaria (RBM) Initiative in Africa. Between 2000 and 2004 significant progress was made, of which the major ones are indicated below.

- Development of malaria policy guidelines, strategic plan, treatment guidelines,
- Official launching of the Malaria Policy Document (April 2000);
- Official launching of RBM Initiative and formation of the Task Force (2001);
- Desk assessment of the malaria control program (2001);
- Approval of tax waiver on mosquito nets, insecticides, anti malarial drugs (2003);
- Drug efficacy studies (2002/3);
- Situation analysis (2004);
- Consensus meeting and approval of ACT as a 1st line drug (2004);
- Adoption of IPT (2004).

3.1.1.2. Strategies in place and outcomes

Based on the progress made in the previous years, the 2004-2008 National Malaria Control Strategic Plan was developed in 2004. The Strategic Plan had defined the following key targets to be achieved during the 5 years of its operation:

- Reduced malaria morbidity of under fives from 47% to 35% by 2008
- Reduced malaria mortality of under fives from 38% to 29% by 2008
- Reduced malaria morbidity of pregnant women from … % to …% by 2008
- Reduced malaria mortality of pregnant women from 11% to 7% by 2008
- At least 30% of U5s sleep under ITNs by 2008.
- At least 40% of pregnant women sleep under ITNs by 2008.
- At least 60% of pregnant women receive IPT by 2008.

3.1.1.3. Main achievements of the 2004-2008 strategic plan

Progress towards the set targets as well as shortcomings and challenges have been assessed through a number of surveys including MICS in 2005, by CDC Atlanta in 2007, and DHS in 2008. These, supplemented by additional data from the health system where available, form the basis of the following summary of progress for the strategies and interventions defined in the strategic plan.

i. Case Management: Treatment of Uncomplicated Malaria

According to the CDC population-based survey and malaria indicator cluster survey in 2007:

- 39.3% health facility attendance was attributed to malaria. Of this, only 42.3% were treated with ACTs;
- 42.3% of those children with fever that sought treatment received an ACT in the previous 2 weeks; and
- 28.7% of U5s affected by malaria had access to prompt, appropriate, and affordable treatment within 24 hrs at community level (through survey).

ii. Malaria in pregnancy

Intermittent Preventive Treatment for pregnant women (IPTp) using Sulfadoxine Pyrimethamine (SP) was adopted in the country in March 2004 during a national consensus meeting and began to be implemented in mid 2005. The baseline survey conducted in 2005 revealed that the IPT usage rate was low: about one in five mothers (22%) had it in the last pregnancy and about 19% took at least 2 doses. 42% of pregnant women took 2 doses of IPT (Routine data collected from Peripheral Health Units in the eight Global Fund supported districts - Jan-March 2007).

Pregnant women receiving IPT at Antenatal care clinics was 42%, according to routine data in 2007. But DHS in 2008 reported 11.8%.

iii. ITN/LLIN promotion and use

LLIN/ITNs distribution significantly increased since 2005. Free distribution targeting children and pregnant women has proved successful in increasing coverage of the most vulnerable populations and there has been significant progress towards the targets set in the strategic plan. Distribution is linked to ANC/EPI, or national child immunization campaigns. LLINs were mass distributed to under five children and pregnant women through a multi-sector collaborative effort (Measles-Malaria campaign) in 2006-2007. In November 2010, more than 3 million LLINs were distributed to replace old LLNs and also to cover the adult population at risk of malaria as opposed to the previous efforts, which were targeting only children and pregnant women. According to the post distribution survey in June 2011, proportion of households with at least one ITN/LLIN increased from 36.6% in 2008 to 86.6%; the percentage of pregnant women sleeping under ITNs increased from 27.7% in 2008 to 76.7; and the percentage of children under five years sleeping under ITNs increased from 25.9% in 2008 to 72.6%.

A programme assessment was made at the end of the implementation of the operational period of the strategic plan, 2008, which revealed strengths, weaknesses, opportunities and threats for the malaria control program. The summary relevant specifically to ITNs/LLINs is presented in Table 2 below.

Table 2 - Summary of the assessment of the 2004-2009 malaria strategic plans with regards to ITNs/LLINs

Strength	Weakness	Opportunity	Threat
– A reviewed national ITN policy guideline – Availability of LLINs for the target population – Distribution of LLINs going to scale in some districts – Local council involved in LLINs distribution	– LLINs not always readily available due to delay in production & procurement – Lower use of LLINs than actual ownership – Inadequate sensitization of communities to increase use – No comprehensive national programme for LLINs distribution, hence fragmented efforts – Inadequate resources to monitor actual use of LLINs	– Existence of community structures for social mobilization – Involvement of local councils in LLINs distribution – Provision of funds (GF) for additional LLINs to achieve universal coverage	– Constraints of logistics, transport, poor network for distribution of LLINs – Misuse of LLINs – Possible vector resistance

3.1.1.4. The 2010-2015 malaria strategic plan

The results from the programme review informed the Malaria Strategic Plan 2010-2015. The major strategic shift made was in the strategy of distribution of LLINs. The current strategic plan outlines 'universal access/coverage' as the ultimate goal of its ITN programme as opposed to targeting only the most vulnerable groups, i.e. children under five years and pregnant women. In order to achieve "universal access", there is a need to provide at least 3 ITN/LLIN per household. The current National Malaria Strategic Plan sets the following goals and objectives to be achieved by 2015.

i. Goal

The Malaria control programme in Sierra Leone aims to contribute to the improvement of the health of the people by reducing the disease burden due to malaria. This goal will be achieved through scaling up of evidence based implementation of interventions.

ii. Overall objective

The general objective of the current malaria strategic plan is to reduce mortality and morbidity due to malaria by 50% and 25 % respectively by 2015

Specific objectives

- To increase prompt and effective treatment of malaria to 80% for all ages by 2015;
- To reduce severe case fatality by 80% by end of 2015;
- To increase the uptake of at least two doses of Intermittent Preventive Treatment (IPT) among pregnant women at health facility and community levels from 12.3% to 80% by end of 2015;
- To increase percentage of people protected by vector control methods such as LLINs and IRS within the context of IVM (especially children under five years and pregnant women) to at least 80% by end of 2015.
- To increase the utilization of at least one prevention method: Long Lasting Insecticide Treated Nets (LLINs), IRS and /or other appropriate methods among the entire population to 80% by 2015
- To increase the knowledge, attitude, and skills of the general population towards the use of preventive and control measures against malaria from the current levels to 80% by 2015
- To strengthen management and implementation capacity of the National Malaria Control Programme through effective coordination of partners
- To strengthen surveillance, monitoring, evaluation and operational research for effective programme management.

iv. Core Strategies identified to achieve these objectives include:

- Scaling up of multiple prevention methods within the context of IVM;
- Improvement of access to prompt and effective treatment at all levels;
- Strengthening partnerships for malaria control performance;
- Strengthening Management of the NMCP, including Monitoring/Evaluation and operational research;

- Strengthening the health system at all levels

3.1.2. National Policy and program for Control of NTDs

The burden of the different NTDs in Sierra Leone is thought to be among the greatest in Africa. The need to control these NTDs is apparent and the Government recognises that the NTDs are a major obstacle to be overcome to improve the health of its people. The MoHS has thus prioritized their control and or elimination.

3.1.2.1. Progress in NTD control

Mass Drug Administration (MDA) directed to the National Onchocerciasis Control Program (NOCP) started in 2003 but monitoring results showed that the 2003 and 2004 MDAs were very poorly implemented, achieving a therapeutic coverage of only 35% and 28% respectively. In 2005, the NOCP was given the responsibility of conducting mapping for lymphatic Filariasis (LF) using immunochromatographic (ICT). It is based on the results of this survey that the NOCP developed a 5 year control plan of action against NTDs in 2006. In 2006, the MoHS committed itself to integrated control of NTDs using preventive chemotherapy (PCT) and complementary approaches, as recommended by WHO. This approach targets STH, schistosomiasis, LF and onchocerciasis through MDA. In the same year, a pilot survey for Schistosomiasis and STH was conducted in one district with the support of the WHO Regional Office for Africa (WHO-AFRO). In 2007, subsequent surveys were done by the NOCP in the remaining 12 districts and WHO-AFRO offered funding for MDA for LF while Mectazan and GSK provided the required drugs: ivermectin and albendazole respectively. This MDA was considered a pilot phase and it was not conducted in the urban areas of the concerned 6 pilot districts. The therapeutic coverage for LF was therefore below 65% due to the exclusion of the urban areas.

3.1.2.2. Scaling up of MDA for NTDs control

In 2007, Helen Keller International (HKI) obtained funding from RTI which facilitated the NOCP to complete Schisto and STH mapping country-wide, conduct a survey for Trachoma in 5 northern districts and collect baseline data for LF in 7 districts. The Schistosomiasis mapping showed that 7 districts should be targeted for annual praziquantel MDAs. In 2009, NO/NTD Control Programme in collaboration with the National Adolescent and School Health Programme, HKI, Sight Savers International (SSI) and the African Programme for Onchocerciasis Control (APOC) conducted MDA in six districts for the control of Schistosomiasis among school going children. The Plan was to achieve a 100% MDA geographical and epidemiological coverage of the endemic communities by the end of 2010. Though no systematic situation analysis of the NTDs control programme has been conducted, assessment of the efforts in the last few years provides important highlights of its performance and the challenges it faces.

Table 3: List of the strengths and weaknesses of the current NTD control

Strengths	Weaknesses/ challenges
– Strong government commitment to control malaria and NTDs – Adequate skilled staff at national level with appropriate qualification – Availability of a National policy to control/ eliminate malaria and NTDs in Sierra Leone – Support from many Partners both local and foreign – Distribution of LLIN is going to scale, contributing to elimination of LF	– Adequate skills to implement some of the IVM activities at sub-national level still lacking – Lack of sustainable funding since over 90% of the budget is provided by donors – Inadequate logistics and transport for CDTT transport at national and district levels. – Side-effects of ivermectin decreases treatment compliance in some communities. – Ecological mapping for vector distribution especially for the *Simulium* has not yet been done – Simulium control requires devoted cooperation with neighbouring countries

4. Integrated Vector Management (IVM) for the Control of MAL and NTDs

4.1. National Policy of IVM

The Government of Sierra Leone has been making a significant effort to control malaria and NTDs and reduce morbidity in the population. However, except for malaria, the current control efforts are focused only on therapeutic interventions and remain fragmented. In the NHSSP 2010-2015, the Government outlined policy guidelines for the introduction and application of IVM for the control of malaria and NTDs. IVM is a rational decision-making process for the optimal use of resources for disease vector control.

4.2. Five Year (2010-2015) National Strategic Plan for IVM Implementation

In an effort to implement the national policy, this strategic plan outlines strategies for implementation of IVM for the control of malaria and NTDs in the next 5 years, in line with the NHSSP 2010-2015 and the IVM Policy Guidelines 2010.

4.3. Justification for the 5- year IVM strategic plan

The ultimate goal of integrated control of malaria and NTDs is to attain the millennium development goals and objectives set by the Abuja Declaration. To optimize the chance of achieving these objectives, it is vital to incorporate IVM into the integrated control of these diseases. IVM is geared to interrupting disease transmission, but unlike the approach that was formerly implemented in OCP countries, the current IVM rides on existing control programmes, thus sharing resources with other health interventions in line with the country's health sector reforms. By integrating interventions that have an impact on multi-diseases transmission with drug treatment, the approach will attain optimal health impact and also promote chances of disease elimination. The long term aim is to improve the health quality of rural poor people, eliminate the risk of vector and nuisance insect biting and improve production capacity to improve household income. Therefore IVM should be regarded as an investment in human capital as part of a poverty reduction campaign of the government of Sierra Leone.

4.4. Vision of the IVM 5-Year Strategic Plan

The vision of the strategic plan is to eliminate malaria and NTDs in Sierra Leone through integration of IVM with chemothery, including MDAs.

4.5. General Objective of the IVM 5-Year Strategic Plan

The national strategic plan aims to reduce morbidity and mortality related to malaria by 50%; mortality and morbidity related Onchocerciasis, schistosomiasis and STH by 80% from the 2010 level and to eliminate LF by the end of 2015. It also aims to establish sensitive surveillance for trypanosomiasis and document its transmission status in the country, particularly in border areas.

4.6. Specific Objectives of the IVM 5-Year Strategic Plan

The strategic plan attempts to achieve the following specific objectives during its 5 year operational period.

- By 2012 the VCU and all health districts of Sierra Leone will have adequate capacity to deliver integrated vector management to control malaria and NTDs.
- By 2013, at least 80% of the population of Sierra Leone will have adequate information and awareness on the control of malaria and NTDs.

- By 2015, at least 80% of the population of Sierra Leone at risk of malaria will be protected by LLIN and/or IRS, and other complementary interventions as appropriate and feasible.
- By 2015, all populations of Sierra Leone living in high ONCHO endemic (>30%) areas will be protected by the appropriate IVM interventions targeting the specific disease.
- By 2015, at least 80% of the populations will have access to toilets to interrupt transmission of schisto and STHs.
- By 2015, schisto and STH prevalence will be reduced by 80% from the level they were in 2010.
- By 2015, LF will be eliminated.
- By 2015, mortality and morbidity due to malaria will be reduced by 25% and 50% respectively from the 2010 level.

4.7. Purpose of the strategic plan

The purpose of this strategic plan is to elaborate country directions for implementation of IVM strategies for the control of malaria and NTDs so that all efforts by the various partners are harmonized and tuned towards achieving the set goal and objectives. Therefore, this strategic plan is intended to serve as a guide for the development of yearly plans of action by the government and partners for malaria and NTDs control at the national and district levels to achieve the targets.

The strategic plan also provides indicative figures on the resource needs for the implementation of the planned activities in a bid to emphasise the need to hasten resource mobilisation efforts. The strategic plan also emphasises the need to strengthen monitoring and evaluation activities to gauge the implementation rate of planned activities and the coverage attained, in order to ensure that the effort to achieve the goal is moving in the right direction.

4.8. Strategic Orientation

Malaria and NTDs control is part and parcel of the overall effort of the health system to reduce diseases burden. Consequently, the IVM strategic plan should be aligned to this general endeavour. Orientation of the strategic plan is therefore aimed at:

- Strengthening Inter-program and inter-sectoral collaboration;
- Strengthening the Health System for better management of disease control;
- Strengthening capacity for surveillance, monitoring and evaluation; and
- Ensuring impact orientated management of malaria and NTDs control programme.

5. Management of IVM

Management of IVM will be based entirely on existing systems which may require minimal improvement in training and provision of the required logistics, supplies and staffing to accommodate scaling up of malaria and NTDs control with the IVM approach.

5.1. National Level

The IVM **National Steering Committee** (NSC) will oversee the implementation of IVM in Sierra Leone. The committee will liaise with the VCU, malaria control programme and NTD National Secretariat with the specific responsibilities of:

- Policy formulation
- International and national advocacy
- Coordination at inter-ministerial and inter-agency level
- Review of progress and evaluation of reports
- Mobilization of resources for IVM activities

The NSC will be chaired by the technical head of the Ministry of health (Director General of Health Services (DGHS) and the following shall be members: relevant Departmental heads and Commissioners, head of VCU, relevant managers of Disease Control Programmes such as Malaria, NTD programmes, Ministry of Education, Min. of Local Government, WHO, UNICEF, WFP, relevant bilateral organizations and NGOs.

There will be a **Technical Working Group (TWG) or IVM secretariat.** The composition of the TWG will include the Head of VCU, National coordinators of malaria and NTD Control Programmes, researchers, sociologists, educationists, parasitologists and a data manager/ statistician. The **head of VCU** will coordinate all the IVM activities and hold the overall responsibility of communication between all partners. The TWG will be responsible for the following:

- National advocacy and mobilization of resources
- Planning the implementation of IVM in liaison with the integrated MDA for NTDs and malaria programmes
- Training of trainers at provincial and district levels and ensuring quality cascade training of IVM implementers at lower levels.
- Development of guidelines and tools for different activities of IVM, based on WHO norms and standards.
- Reviewing provincial and district reports and reacting to issues raised or missing.
- Compiling quarterly updates and yearly national reports to the National IVM Steering Committee, the TWG and to all other relevant partners.
- Reviewing implementation activities, expenditure and district/provincial reports on performance, evaluation and analysis of IVM results.
- Monitoring, evaluation and supervision of technical activities at various implementation levels.
- Procurement, deployment and maintenance of IVM equipment and management of staff.
- Identification of areas requiring operational research and collaborating with research insti-

tutes to address these.

5.2 Health District Level

The District will play an operational role in IVM activities and serve as the anchor for sustainability planning. The DHMT will thus be responsible for IVM operations at this level, and an IVM focal person will be assigned by the DHMT. The DHMT will be responsible for:

- ensuring that transmission prevention interventions are implemented within the context of IVM approach;
- planning and execution of IVM in the district with full involvement of community leaders and communities;
- coordination of advocacy and mobilisation of local resources;
- health education, mobilisation and sensitisation activities in the District;
- training of supervisors, health workers and community health workers in IVM;
- receiving reports from and providing feedback to the communities, schools and health facilities;
- monitoring and supervising IVM activities at health facility and community levels;
- compilation of district reports to the VCU; and
- conducting entomological and epidemiological surveillance in collaboration with VCU.

5.3. Health Facility and Communities

The health facility will strengthen and maintain the current links and support that it provides to communities and local schools. Implementation activities in the community will be coordinated by the Supervisors in collaboration with chiefdom authorities and Village Health Committees (VHC). They will ensure that the activities are carried out according to the programme requirements. A nominated individual will preside over the VHC and will liaise with the chiefdom authorities and health facility staff in implementation of IVM activities. Health facilities will be responsible for the following:

- implementing facility based IVM activities;
- training of community volunteers;
- community mobilisation and sensitisation, health education and promotion;
- supporting schools in implementing IVM in school premises and in provision of health education;
- ensuring appropriate and safe use of pesticides, other supplies and logistics;
- compiling quarterly IVM activity reports to the DHMT;
- performing and supervising IVM implementation activities in their catchments;
- conducting basic entomological and epidemiological surveillance.

6. IVM Implementation for the Control of MAL and NTDs

The Government of Sierra Leone is highly committed to the control of malaria and NTDs, including Onchocerciasis, lymphatic filariaisis, schistosomiasis and STH. In the past several years, policies and national action plans have been drawn up to provide strategic direction and guidance in the control of malaria and NTDs, based on the prevailing local situations and also in line with the relevant regional and global initiatives such as the Roll Back Malaria, the Abuja Declaration, and the Millennium Development Goals. In order to achieve the nationally and globally set goals, the Government of SL is committed to scaling up of malaria and NTDs control and prevention interventions, in the context of IVM, to achieve universal access to all at risk communities. The IVM strategy creates the opportunity for planning comprehensive and integrated strategies targeting reduction of human-vector contact and disease transmission for malaria and NTDs. The use of human, material and financial resources can be maximised through the IVM strategy, as disease control services are systematically integrated and delivered in a coordinated manner as opposed to vertical disease based control services.

6. 1. IVM for Malaria Control

Malaria is the most important vector borne disease in the country. It is endemic in all the 12 health districts, including the cities, and the most vulnerable groups include children under five years and pregnant women. According to the situational analysis for Malaria control in 2004, Malaria is responsible for 40% of outpatient morbidity among children under five years of age, and 37.6% of all hospital admissions are due to malaria with a case fatality rate of 17.6%. Mortality among children under five years of age attributable to malaria is 38.3% while the percentage for all ages is 25.4.

Until 2005, case management was the main stay of the malaria control strategy in Sierra Leone. In 2005, the MoHS revised the national policy and stated that the malaria control effort shall be based on multiple interventions as appropriate, including vector control methods. In the last 5years, the use of long lasting insecticidal nets (LLINs) has significantly increased. To date, a significant proportion of the population at risk of malaria is protected with LLINs, with special emphasis on children under the age of five years and pregnant women. However, no other vector control strategy has been considered and implemented so as to significantly impact on diseases transmission and burden. Malaria remains a leading cause of out-patient and in-patient attendance, accounting for the highest morbidity and mortality in the country. In order to significantly reduce the malaria burden and reverse the situation, the strategic plan builds up on the ongoing efforts and defines strategies and norms to accelerate scaling up of LLINs and identify other interventions, particularly indoor residual spraying (IRS) of insecticides to be applied in a complementary manner within the context of IVM.

6.1.1. Long Lasting Insecticidal Nets (LLINs)

The national policy on LLINs was revised in 2008 to include the distribution of LLINs to the general population for universal use, as opposed to the previous policy, which supported targeted delivery to only children and pregnant women. This strategy would not have significantly contributed to the overall reduction of the malaria burden as coverage among the total population remains well below the required level of 80%. Based on the revised policy, the mass distribution in 2010 has significantly increased coverage and use of LLINs by the general population. The current strategic plan describes methods and strategies through which LLINs universal coverage of the total population of Sierra Leone can be increased to the recommended level of at least 80%, and be maintained at that level.

6.1.1.1. LLIN distribution mechanisms and channels

LLINs are delivered through various channels and outlets as appropriate under the various circumstances. High coverage will be achieved in the shortest possible time through intermittent mass distribution. Coverage is sustained at a high level between campaigns through routine distribution mechanisms using all appropriate channels and outlets such as routine EPI and NNC services, particularly for the most vulnerable group of children under the age of five years and pregnant women. LLINs are distributed free of charge to all populations at risk of malaria with a priority to < 5s, PW, refugees, IDPs, etc, in situations where resources are limited to cover the general at risk population. The following are possible delivery channels of LLINs:

a) Mass distribution to achieve high coverage (catch up) through:
   - EPI and polio campaigns at fixed posts and/or using mobile teams,
   - MDA/CDTI – during Albendazole and Ivermectin distribution,
   - stand alone, health centres, health posts, etc.

b) Routine distribution to sustain high coverage (keep up) through:
   - routine EPI and antenatal care services,
   - other routine health service programmes,
   - community based organisations,
   - any other locally suitable outlets.

c) Replacing LLINs that are older than 3 years or those that are no longer effective (keep up).

6.1.1.2. Operational indicators for LLINs

Progress towards the goal of universal coverage is monitored by measuring the following indicators mainly through MIS, MICS, DHS and any other appropriate survey:

- number of LLINs actually delivered to the user (communities),
- percentage of households with at least two LLINs,
- percentage of people (all ages) sleeping under a LLIN the previous night,
- percentage of children under 5 sleeping under a LLIN the previous night,
- percentage of pregnant women sleeping under a LLIN the previous night.

6.1.1.3. Challenges

Though availability of resources for the delivery of adequate number of LLINs so as to reach universal coverage is a major constraint, the following issues can also be mentioned as considerable challenges that need particular attention from all stakeholders:

- efficiently complementing LLINs with IRS,
- increasing retention of LLINs,
- increasing actual use of LLINs to match level of ownership,
- ensuring correct utilisation of LLINs,
- ensuring proper handling and care (cleaning, washing and repairing),
- long term sustainability of high coverage of LLINs.

6.1.2. Indoor Residual Spraying (IRS) of Insecticides

IRS is the application of long acting insecticides on the inner walls, eaves, ceilings, roofs of houses and domestic animal shelters in order to reduce the life span and kill the adult vector mosquitoes. Indoor residual spraying remains one of the most applicable and effective methods for transmission control and the most effective for obtaining a rapid large-scale impact when applied at 80% and above coverage of target risk populations and households. The method relies on the fact that most malaria vectors enter houses during the night to feed on the occupants and rest on the walls or roofs prior to and/or after feeding. If the wall, roof and other potential indoor resting sites are treated with an effective residual insecticide, the mosquitoes will pick up a lethal dose as they rest. Generally, IRS is applicable both in seasonal and perennial transmission areas and has rapid impact on transmission as long as it is feasible under the local circumstances. Although IRS has been part of the Malaria control strategy in Sierra Leone, it has never been applied. The strategic plan attempts to provide a national direction on IRS implementation for malaria control in SL and the circumstances under which the intervention can be effective and useful.

6.1.2.1. Objectives of IRS

IRS in Sierra Leone is supplementary to use of LLINs. It will be implemented in selected areas to achieve a quick and high impact on malaria morbidity and mortality. Its objectives are therefore to:

- accelerate malaria morbidity and mortality reduction in very high burden areas in the shortest possible time; and
- have quick impact on malaria and reduce its impediment to the lowest possible level in urban economic centres.

6.1.2.2. Areas for IRS implementation

IRS will be introduced in selected areas as a pilot project where experience and lessons will be learnt before taking the intervention to scale. Once experience is gained and capacity is developed, IRS will be implemented in specifically identified areas as a complementary method to LLINs for high and quick impact. The following are areas where the intervention will be targeted:

- relatively high transmission areas as a supplementary intervention to LLINs to rapidly bring down transmission to a level that can be sustained with LLINs;
- high population density and highly malaria endemic urban areas;
- economically important areas with large development projects such as industries, mines, irrigation, and agro-forestry schemes, to mitigate the impact of malaria on economic development.

6.1.2.3. Operational indicators

IRS is a vector control intervention that has a quick and significant impact when implemented at high coverage level of the target population. Unlike LLINs, IRS can make little, if any, contributions as a personal protection method when implemented at lower than the recommended level of coverage in the targeted area. Consequently, it is absolutely crucial to monitor operation achievements of IRS to ensure effective and timely delivery of the services. The following are major operational indicators that need to be monitored:

- proportion of structure/ households sprayed in the target area (80% or more);

- proportion of population protected with IRS in the target areas (80% or more);
- period and length of spraying in relation to the peak transmission season;
- quality of spraying (through the WHO cone bioassay tests); and
- susceptibility of the vectors to the sprayed insecticide(s).

6.1.2.4. Issues for consideration

Successful IRS requires a high level of policy commitment; dedicated programme and health system capacity to deliver high quality and coverage of IRS in a timely manner; adequate human, logistic, transport and financial resources; and adequate organisational and planning capacity. It is also critical that adequate information on the vector, socio-economic situation and cultural practices are well known and documented. The method is most effective where:

- majority of the vector population feeds and rests inside houses;
- the vectors are susceptible to the insecticide in use;
- people mainly sleep indoors at night;
- majority of houses/structures in the target area are suitable for spraying; and
- there is a high level of community compliance.

Baseline data collection will precede implementation of IRS to document the above and other information required to make informed decisions and also needed for monitoring and evaluation of the IRS programme. IRS remains an effective method for rapidly reducing and interrupting malaria transmission where these are attained and sustained.

In order to ensure availability of aforementioned situations, sustained advocacy, community education, capacity development, surveillance and operational research will be major components of the IVM approach.

6.1.2.5. IRS cycle and number of rounds per year

The number of spraying rounds required to protect the target areas throughout the year depends on the malaria epidemiology of the area and the residual effect of the insecticide chosen. Malaria transmission is perennial in all areas of Sierra Leone. This requires a selection of insecticides with a long residual effect to limit the number of spray rounds to a maximum of two per year (please see list of WHO recommended insecticides for IRS). There will be two spray rounds in a year in six monthly cycles. The spraying rounds target seasonal transmission peaks to have a maximum impact on the disease transmission. However, if resources are scarce only one cycle of IRS targeting the peak transmission season will be conducted.

6.1.2.6. Introduction and Management cycle of IRS

The primary step for introduction of IRS is capacity strengthening within the health system. This mainly includes training of IRS managers at national and districts levels, incorporating IRS management in the existing health delivery system and strengthening the capacity for entomological operational research, including routine surveillance for monitoring and evaluation of the intervention. An effective IRS programme is based on a well-defined management cycle of operations which is linked to the six monthly (or annual) IRS implementation cycle. IRS management cycle is an effective management tool that outlines recurrent activities to be undertaken at

taken at different stages of the planning and operational stages of the spray campaign. It also provides guidance for IRS coordinators and programme managers in the timely management of the IRS operation. The major recurrent activities of the IRS management cycle are indicated below.

Collection of epidemiological & entomological profiles:

- assessment and baseline.

Selection of areas:

- stratification/re-stratification;
- geographical reconnaissance;
- determine size of area to be sprayed and population to be protected.

Planning:

- estimation of insecticide, equipment, logistics and supplies;
- determine duration of the spraying campaign;
- estimation of human resource needs;
- Prepare budget plan, which is also a proposal.

Resource mobilization:

- nationally and locally.

Organization of supplies and equipment:

- timely tendering and procurement of insecticides and spray equipments (spray pumps):
- organisation of logistics and supplies:
- organization of spraying teams.

Advocacy and community mobilization:

- preparation and dissemination of community educational messages;
- meetings with community leaders.

Preparation of detailed spraying plan:

- allocation and distribution of insecticide, equipment, logistics and supplies to districts and sub-districts.

Training:

- Field training of supervisors;
- field training of the spray team leaders and teams (mainly community members);

Spray implementation and reporting:

- Launching and conducting spraying in the planned time frame;
- Ensuring strict supervision;
- Supporting the team at the field;
- Collect information on daily bases;

- Checking and monitoring of quality of IRS implementation.

Documentation and reporting:

- Preparing and submitting reports at the end of spraying
- Documentation and assessment of the IRS implementation, identifying challenges and lessons to feedback to the programme management

6.1.2.7. WHO recommended insecticides for IRS

Public health Insecticides are under continuous review by the WHO Pesticide Evaluation Scheme (WHOPES). Currently the insecticides and formulations that are recommended for IRS are presented below (Table 3).

Table 4 - WHOPES recommended insecticides for IRS

Class	Insecticide	Concentration/ Formulation	Dosage (g/m^2)	Duration of effectiveness (months)	Insecticidal action
Organochlorine	DDT	75% WP	1-2	>6	Contact
Pyrethroid	Alphacypermethrin	5% WP	0.020-0.030	4-6	Contact
	Bifenthrin	10% WP	0.025-0.050	3-6	Contact
	Cyfluthrin	10% WP	0.020-0.050	3-6	Contact
	Deltamethrin (Ficam)	2.5% & 5% WP 2.5% & 5% EC 2.5% granules	0.020-0.025	3-6	Contact
	Etofenprox	10% WP, 2.5% EC	0.100-0.300	3-6	Contact
	Lambda-cyhalothrin (icon)	10% WP, 2.5% EC	0.025-0.05	3-6	Contact
	Lambda-cyhalothrin (icon)	10% CS		6	
Carbamate	Bendiocarb	80% WP	0.100-0.400	2-6	Contact, airborne
	Propoxur	50% WP, 20% EC	1-2	3-6	Contact, airborne
Organophosphates	Malathion	50% WP, 50% EC	11-2-2	2-3	Contact
	Fenitrothion	40 & 50% WP, 5% EC	2	3-6	Contact, airborne
	Pirimiphos methyl	WP/EC	1-2	2-3	Contact, airborne

CS: capsule suspension; EC = emulsifiable concentrate; WP = wettable powder.
OC= Organochlorines; OP= Organophosphates; C= Carbamates; P= Pyrethroids.

6.1.3. Other Complementary Interventions

These are interventions that may not be delivered as standalone control methods but can be useful in specific and limited places to supplement one or both of the above major interventions. These include larval control through environmental management and larviciding when and where they are feasible and appropriate. Nevertheless, larval control interventions for malaria control should be based on thorough understanding of the breeding habits and importance of the potential breeding sites. Personal protection methods, particularly at household level, can also be considered and promoted to protect individuals and families.

6.1.3.1. Environmental Management and Larval Source Reduction

Vector control interventions targeting the immature stage (larvae) of the vector such as environmental management, source reduction and larviciding can have a role in specific situations. Different larval vector control interventions can be implemented in urban and semi-urban areas, refugee camps, development project sites, water harvesting ponds, and irrigation scheme areas in conjunction with LLINs or IRS.

Larval control methods are considered in areas where breeding sites are few, accessible, and manageable. Communities are encouraged to participate voluntarily in environmental management activities, under the direction of the health staff, assisted by volunteer CHWs, particularly for the application of anti-larval chemicals, such as Temephos, to ensure these are applied only into vector larvae positive sites.

Development activities such as water impoundments (water harvesting ponds, dams, irrigation canals), road construction and other land development activities have been shown to enhance malaria transmission in many countries. Unplanned villagisation and resettlement of populations also have the potential for increased intensity of transmission. Hence, close collaboration and coordination between MoHS and other development agencies is considered critical in tackling the malaria problem in SL.

6.1.3.2. Personal Protection

Personal protection methods can be interventions from the use of repellents to application of window screens. Though they may not contribute significantly to the reduction of malaria transmission, personal protection methods can be very useful in reducing infection for the individuals or family members. Some of the personal protection methods that will be promoted by the Government of Sierra Leon are the following:

- screening of windows and wall eaves;
- use of repellents, particularly during high transmission season and for travellers.

6.2. NTDs Control and Elimination

6.2.1. Schistosomiasis

6.2.1.1. Distribution and magnitude of schistosomiasis in Sierra Leone:

Schistosomiasis is widely and highly endemic in Sierra Leone, especially in the north and eastern regions with both intestinal and urinary types (Doumenge et al., 1987, Gbakima and Sahr, 1995, Koroma et al. in press). S. *haematobium* seems to be more indigenous and widespread than *S. mansoni* and there is considerable overlap of the disease in geographical

distribution with other NTDs, notably LF, Onchocerciasis and STH. Country-wide mapping of schistosomiasis and STH was completed in 2008 (Koroma et al., in press). In 2009, the National Oncho/NTDs control Programme, in collaboration with the National Adolescent and School Health Programme, conducted schistosomiasis and STH mass treatment campaigns in six of the 12 endemic districts, targeting school age children and achieved 94% treatment coverage of school going children. By the end of 2010, the programme hopes to achieve nation-wide coverage and to include adults in MDA campaigns in high risk communities.

6.2.1.2 Challenges

Schistosomiasis in Sierra Leone is very much associated with swamps, open water bodies and mining pits. Safe water coverage is generally low, though improving. Thus the majority of the citizens obtain water for domestic use from rivers, streams and lakes, which are numerous in the country. There are also many water related economic or social activities such as fishing, washing of clothes and bathing. Some of the water bodies are infested with snails. Thus after the treatments, majority of the people quickly get re-infected, compromising the impact of MDAs. It is therefore vital to attempt to minimize transmission by intensively investing in sanitation improvement, behaviour change and where feasible, snail control. Historically, there is limited information on schistosomiasis control in Sierra Leone. Most of what exists is through studies done by Prof. Gbakima. Schistosomiasis control in most cases was associated with mining activities, but the sector is no longer investing in the disease control. Further discussions will be required for the mining industries to revive their interest and participation in the control of schistosomiasis with regard to sanitation improvement, health education and MDA, particularly now that cheap, effective and safe drugs for treating schistosomiasis are available.

6.2.1.3. Proposed approach to schistosomiasis control in Sierra Leone

In the control of schistosomiasis, it is important to attack the parasite at several different stages of its life cycle in order to maximize the effects. Thus chemotherapy, snail control, sanitary improvement, safe water supply and health education are all important. However, since some of these are quite expensive, it is important not to consider schistosomiasis as an isolated problem. The positive impact of improved sanitation, safe water supply and health education on several other water related diseases should be taken into consideration in an integrated approach. Snail control with molluscicides and other methods will only be explored where and when appropriate.

6.2.1.3.1. Health education, Sanitary improvement and provision of safe water

Under the IVM approach, intensive hygiene education will be promoted in all endemic communities to ensure that people are aware that the disease is propagated by man through his/her unsanitary behaviour and that it can be controlled through minimizing contamination of snail infested water with urine and/or faeces. Latrine construction, especially in public centres such as canoe landing sites, schools, health facilities, worshiping centres and markets, will be the duty of MoHS in collaboration with local government, relevant partners, specially UNICEF and the private sector. Furthermore, the MoHS shall establish inter-sectoral collaboration with the Ministry of Education to increase awareness of school children on the transmission dynamics of schistosomiasis and the role of hygiene and sanitation in its control. The programme will equally endeavour to ensure availability of communal latrines in endemic areas. In 2010, only 34% of rural communities had access to a toilet, but efforts are being made to ensure that by 2015, 80% of the households will have had access to a toilet. Massive community education and sensitization

campaigns using all appropriate media and community drama shall be launched in every endemic district to increase the use of the toilets. In addition, in collaboration with the Ministry of Local Government and relevant partners, provision of safe water sources for domestic purposes will be promoted. These measures, if adequately instituted concurrently with the regular MDA, will lead to a reduction in contamination potential of the snail infested water with schistosome eggs, ultimately reducing the risk of disease transmission.

6.2.1.3.2. Snail control

Chemical snail control was previously applied widely to control schistosomiasis. However, due to the relatively unsatisfactory results of the large-scale molluscicide campaigns; the effect on the aquatic environment, especially fish; and the increasing costs of molluscicides as well as labour input, most disease control efforts have abandoned snail control. Alternative control strategies such as focal molluscicide, and environmental snail control are nevertheless sometimes feasible. Thus one has to weigh the needs of the communities against the need for manipulation of the environment. To achieve effective snail control, it is vital to have good knowledge of the distribution of snails relative to human water contact places, snail population dynamics, and transmission periods in order to determine where and when to apply snail control measures.

There is no documented control of schistosomiasis vector snails in Sierra Leone. However, in areas with small unwanted borrowed pits and pools infested with vector snails, environmental manipulation will be attempted to eliminate snail breeding sites. Communities will be sensitized and mobilized by the DHMT, chiefdom authorities and peripheral health facility staff to fill or drain the unwanted small pools. Authorities in charge of irrigation schemes will be mobilized to align canals and ditches with concrete and will ensure that vegetation is regularly removed from them to minimize snail breeding sites. Canals may be dried out periodically when water is not needed for crops. Although snails will obviously survive this desiccation, it will at least reduce the number of transmission sites for a period. Other measures that can be considered in an irrigation scheme include

- elimination of hydraulic dead ends,
- designing for high flow of water,
- fluctuation of water level in storage ponds in order to strand snails,
- elimination of night storage ponds, and
- burying snails by ditch reconstruction.

On small water bodies that cannot be drained and where intensive schistosomiasis transmission occurs, focal molluscicide will be considered concurrently with MDA to significantly minimize the force of schistosomiasis transmission potential. In such small bodies of water, molluscicide is most effective when the water level is still high. When the water level is low, many snails will already be aestivating, thus assuring a rapid recolonisation of the pond during or immediately after the following rains. A great number of chemicals have been used as molluscicides in the past, but at present only one chemical: bayluscide (niclosamide), is commercially available.

6.2.1.4. Monitoring of IVM in schistosomiasis control:

Baseline epidemiological information and data on snail abundance and infection rate will be collected in selected communities and in sites on various water bodies in order to plan and launch appropriate interventions under the local circumstances. Effectiveness of the interventions on

health will be monitored through biannual population surveillance of prevalence and intensity of infection. Snail population dynamics and infection rates will be monitored monthly on those sites to determine impact of control measures on the schistosomiasis transmission potential. However, it should be noted that capacity building is required to increase local knowledge regarding snail sampling techniques, snail identification and screening, methods of snail rearing in the local laboratories, under the local setting. Further research is needed on seasonal snail density fluctuations and infection rates and on ecological mapping of vector snail distribution in the country.

6.2.2. Onchocerciasis

6.2.2.1 Distribution and magnitude of Onchocerciasis in Sierra Leone:

The history of onchocerciasis research in Sierra Leone dates back to 1926. In that year, a team of scientists from Liverpool School of Tropical Medicine discovered that onchocerciasis is transmitted by black flies (*Simulium spp.*). Since then, there have been many studies on the epidemiology and control of the disease in Sierra Leone (White et al., 1982; Gbakima, 1996). These and other studies show that onchocerciasis is highly endemic in the country, found in 12 out of 13 districts. Some areas have very high prevalence and all age groups, including children are affected. For example, in Kamba village in Kambia District and Bodu village in Kono District, microfilaria prevalence in children 0-4 years was noted to be in some cases above 17% (APOC, 2005). Prevalence above 60% has been noted in a general population survey along Gbangbaia River in Moyamba District. Annual Transmission Potential (ATP) varies considerably within the country, for example from 3,848 along Gbangbaia river to 294 on Kaba River (APOC, 2005). The transmission of the disease extends well into the neighbouring countries of Liberia, Guinea and beyond and there is unlimited movement of Black Flies between these countries.

6.2.2.2. Onchocerciasis control

Onchocerciasis control started way back in late 1974 under the OCP, mainly using aerial spray targeting the adult *Simulium* vector flies. However, during the civil war in Sierra Leone (1991 – 2002), activities of the National Onchocerciasis Control Programme (NOCP) dwindled and completely stopped by the end of 1998. Results of Epidemiological evaluations of 2002, 2003 and 2004 show that the situation had not only worsened in previously endemic areas, but transmission was occurring even in areas where the disease was previously unknown. The control resumed again in 2003 under the National Onchocerciasis Control Programme of the MoHS with support from Helen Keller International (HKI), Sight Savers International (SSI) and the African Programme for Onchocerciasis Control (APOC). The main strategy was Community Directed Mass Treatment with Ivermectin (ComDTI). The first two years of implementation did not yield the anticipated results as CDTI coverage was only 35% and 28% respectively. The programme reached a national geographical coverage in 2005, achieving treatment coverage of 56.8% in 2005 to 75% in 2008. During this period, entomological surveillance was being conducted in 19 capture points and results revealed that cumulative Annual Transmission Potential (ATP) remained well above the threshold of 100 in all the points monitored, indicating that CDTI did not make any significant impact on disease transmission.

Table 5: Result of treatment coverage targeting Onchocerciasis between 2005 and2009.

YEAR	2005	2006	2007	2008	2009
Treatment coverage	56.8%	71.8%	75%	72.2%	74.9
population targeted	1,993,123	2,023,022	2,053,368	2,084,168	2.115431

Onchocerciasis control is targeting reduction of morbidity and preventing blindness or visual impairment. It is not an elimination programme, thus treatment with ivermectin is expected to continue for 15 to 20 years, if not indefinitely. However, integrating LF elimination and onchocerciasis control will mean that areas hyper- / mesoendemic for onchocerciasis will receive two doses of ivermectin in a year. It has been found that two or more rounds of treatment with ivermectin per year has greater impact on embryogenesis (Chavasse et al., 1992) and could control onchocerciasis faster than a single annual treatment. If this happens to work, it should shorten the life span of the National Onchocerciasis Control Programme (NOCP) in Sierra Leone. Furthermore, since the whole country is endemic for LF, hypoendemic onchocerciasis areas which would not have been attended to under NOCP will also receive at least one round of ivermectin in a year, rapidly bringing down micro filarial load in humans, especially the infective larval 3 stage, thus impacting on ATP. However, with the current epidemiological data, it is clear that there is need for IVM to augment the CDTI in order to achieve elimination of onchocerciasis.

6.2.2.2.1.Onchocerciasis vector control in Sierra Leone

The main vectors of onchocerciasis in Sierra Leone are *S. damnosum ss*, *S. sirbanum* and *S. yahense*, all belonging to the *S. damnosum* complex. The NOCP has 2 Entomologists, 9 Entomology Technicians and 2 EPI Technicians. There are also 76 Vector Collectors, (who are based in their communities and are paid incentives only). The Technicians are based at Makeni Sector Base where the main NOCP base is located, and at Kabala and Bo Sub sectors. There used to be *Simulium* vector control under the original OCP of West Africa. In those days there was aerial spraying by helicopters. The insecticides used were Abate (Temephos), Permethrin, Etophenphos, and *Bacillus thuringiensis* variety H14 (B.ti var. H14). By then, vector control was very successful but was interrupted by instability in the country and control activities stopped in 1994. Since then, there has not been any vector control although entomological monitoring has continued to date. There are 35 vector capture points, all of them monitored in alternate years such that only 19 points were monitored in 2005 and 16 points in 2006. Through these surveys, the NOCP has generated a lot of data on *Simulium* vector biology / bionomics, infective rates and migration. It is hoped that this data will be utilized now that vector control activities are planned to resume through regular dosing of *Simulium* breeding streams/rivers.

6.2.2.2.2. Proposed IVM approach to augment CDTI

In order to enhance the impact of CDTI and to ensure effective transmission control in a cost effective approach, vector control interventions will be limited to focal larviciding along *Simulium* breeding streams/rivers rather than the aerial spraying. Larviciding will start along a few streams and scale up gradually to country-wide coverage after gaining the necessary experience. Larviciding will begin in 3 high burden districts, namely: Kambia, Bo and Kenema and expand to cover all by 2015. Efforts will be made to collaborate with neighbouring countries to share experience and lessons and for larviciding those foci that extend across borders in order to strengthen regional control. The trained community volunteers shall conduct weekly larvicide applications with the support from peripheral health facility staff under the supervision of the DHMTs. Only insecticides approved by government of Sierra Leone and recommended by the WHO Pesticide Evaluation Scheme shall be procured and used, with care being taken to alternate them regularly, guided by the insecticide resistance monitoring results. Collection of baseline entomological and epidemiological data in statistically representative sites shall precede application of larvicides. Impact of application of the larvicides shall be monitored on the same sites every two years to gauge the cumulative ATP. It should be noted that capacity building is required to increase local

knowledge of larviciding and for sampling procedure when monitoring progress. Further research is needed to improve monitoring and establishing thresholds for determining how often to apply larviciding to achieve elimination of *Simulium* breeding in the country.

6.2.2.3. Implementation of Simulium Vector Laviciding

Simulium vector laviciding will require baseline surveys to be conducted to establish and map vector breeding sites on all affected streams/rivers. The following activities will be carried out:

- Accurately determining the coordinates of all dosing and adult fly catching sites using Global Positioning System (GPS).
- Determination of hydrological characteristics of river systems.
  - Establishing the oxygen content, pH, temperature and conductivity of rivers using relevant water testing equipment.
  - Simulium Larva searches and examination to determine the infestation density and the species of the various larval stages collected.
- Trapping and dissection of adult flies to establish the biting rate and the infection and infective rates (transmission).
- Carry trial to determine the distance temephos (Abate®) or any other selected insecticide can be carried downstream and its efficiency on immature stages of the vector *Simulium* flies, *so as to* determine the number of dosing points.
- Ground application of temephos (Abate®) or any other suitable insecticide against the larvae of vector *Simulium* flies on a 4 weekly or 8 weekly or any other frequency depending on the stage of control/elimination
- Monitoring through *Simulium* larval searches, adult fly catches and examination of collected materials

6.2.3. Lymphatic Filariasis

6.2.3.1. Distribution and magnitude of LF in Sierra Leone

There is considerable overlap in the geographical distribution and endemicity of LF, malaria, onchocerciasis, schistosomiasis and STH in that LF has been found to be endemic throughout the country. Lymphatic Filariasis was targeted for elimination by 2010 but this could not be achieved due to poor treatment coverage with ivermectin over the years, also probably due to the absence of intervention against the vector to augment MDA in reducing transmission. The main strategy adopted in this elimination attempt is Mass Drug Administration (MDA) with ivermectin and albendazole to achieve at least yearly treatment coverage of over 80% for 5 to 6 years. A combination of the two drugs is microfilaricidal and it is hoped that the yearly treatment will interrupt transmission by clearing microfilaria of *W. bancrofti* from the peripheral blood to a very low density (below 1%) so that they are not available for the vector mosquitoes. The adult worms that produce the microfilaria have a life-span of 4-6 years and therefore will die naturally within the period of the programme. The treatment of LF is being integrated into Community-Directed Treatment with Ivermectin (CDTI). To date, 30,000 Community Directed Distributors have been trained to distribute both ivermectin and albendazole. In 2008 - 2009 MDAs for LF and ONCHO reached 3.8 million people country-wide in all the 13,451 villages in the country. The treatment coverage levels over the years are shown in Table 6 below.

Table 6: LF treatment coverage

	2005	2006	2007	2008	2009
LF Treatment coverage			65%	70.0%	74.1%

6.2.3.2. LF vector control through IVM implementation

The vectors of LF in Sierra Leone are not well known and there is lack of literature on this aspect. It is however known that in rural areas of Africa the same mosquitoes that transmit malaria are also vectors of LF (White 1989). Thus it is likely that transmission of LF in both rural and urban areas of Sierra Leone is entirely by anophelines mainly *Anopheles melas* on the coastal areas of Freetown and *An. gambiae sl* and *An. funestus* inland (WHO, 2004). *An. gambiae sl* predominates in the high rainfall, forested and low altitude areas of Bo District, Southern Province. The other vector *An. funestus* is more common in the high altitude areas and is the main vector during the dry season. The advantage of integrating malaria and LF control is that vector control methods targeted for malaria control particularly the use of LLIN and the application of IRS are quite relevant for LF control. As malaria vector interventions are targeted at the whole country, no specific effort on vector control for LF shall be considered other than monitoring the entomological impact on LF vector infectivity rate and population dynamics of the mosquitoes. All technicians at NOCP were originally trained on mosquito sampling and dissection techniques but had to be transferred to work on *Simulium* flies because the mosquito vector control section was dormant. They will only require a refresher course on relevant entomological methods so that they can monitor aspects towards the elimination of LF in the country.

6.2.4. Trypanosomiasis

Human African Trypanosomiasis (HAT) commonly known as sleeping sickness is a parasitic disease transmitted through the bite of an infected tsetse fly (Glossina spp). Both male and female tsetse flies take blood every 3-4 days. The females live longer than the males, usually 2-3 months, though exceptionally up to 6 months. In an endemic area, usually fewer than 1% of the flies are infected. There are two forms of sleeping sickness. An acute form which takes weeks to months for symptoms to appear is caused by Trypanosoma brucei rhodesiense and a chronic form which takes months to years for symptoms to appear is caused by T.b.gambiense.

Sierra Leone is endemic or at risk of T.b.gambiense and the vectors are the *Glossina palpalis*-group *(Glossina palpalis, G. tachynoides, G. fuscipes*). This group of tsetse flis prefer dense vegetation (e.g. on riverbanks) as a habitat where exactly the right conditions of humidity, warmth and light prevail and where there is a blood supply (near animals or humans). Humans are frequently bitten when working/standing close to the water edge.

Sleeping sickness is characterised by fever, lymph node swelling, general malaise and inflammation of the central nervous system. In *T.b. gambiense*, lymphadenopathy is typically seen in the posterior cervical nodes. The nodes are soft, mobile and not painful, and are classically referred to as *Winterbottom's sign*. The English doctor Thomas Masterman Winterbottom, who was working in Sierra Leone, first described the disease in 1803. He was struck by the abundant occurrence of swollen cervical lymph nodes in sick persons. If left untreated, the disease has a fatality rate of practically 100%. Although the disease was first described in Sierra Leone, it is currently rare in the country, thanks to previous control measures. However, HAT is not yet eliminated from the country especially since the disease is still very common in the neighbouring countries, imply-

ing that periodic active surveillance is still necessary to keep sleeping sickness out. Chemoprophylaxis is not recommended, and no vaccine is available for HAT. Thus an effective control and surveillance programme is a necessity. The two main tools available to prevent re-invasion are vector control and case finding and early treatment.

Tsetse Control Measures

Vector control makes use of impregnated traps and screens. Sterile tsetse males have been attempted and have proven quite successful in several areas but the approach requires very intensive and highly skilled labour and good laboratories before it can be instituted. Case detection and early treatment aims to reduce the human reservoir. Both measurements are incorporated in the WHO Control and Surveillance Program, which ultimately aims to eliminate sleeping sickness in Africa. Tsetse control is important especially along Sierra Leone boarder areas near where active transmission is occurring in neighbouring countries. Although aerial spraying has been used to control tsetse flies successfully, Sierra Leone could still control the disease using tsetse traps. The aim of control is to raise the death rate of the flies above the birth rate for a sustained period. If traps are being used, there is the option of whether to use insecticide treated traps or non-treated ones.

The advantages of using insecticide treated traps are:

1) Traps are not 100% efficient. Some flies will land on the traps, but will not enter. These will only be killed if the traps are treated with an insecticide. The rate of reduction will, therefore, be faster using insecticide treated traps.
2) An insecticide treated trap will work even if damaged, whereas a small hole in the cage of a non-treated trap can render it useless.
3) Traps can be much simpler and cheaper in design, the ultimate being a simple disposable cloth target, and require much less maintenance.

Although the rate of reduction may be faster, the control operation may be more expensive and dependent on the availability of insecticide. The decision on whether or not to use insecticide treated traps will depend on the trap type, the species of tsetse, and whether the objective is to control or eliminate the tsetse. Biconical traps in West Africa have usually been treated with insecticides, especially since the traps are not very efficient for G. palpalis group which is prevalent in West Africa. The main chemicals utilised nowadays are the synthetic pyrethroids, the most widely used being deltamethrin supplied as a 20% suspension concentrate (s.c.). It used to be diluted to a 0.1% or 0.05% w/v spray liquid. The present recommendation, however, is to use a more concentrated spray liquid (0.3%) in order to improve persistence at active levels to about 7 months, and thus reduce servicing costs. For application to cattle as live attractive targets, the usual formulation is an 18.75% suspension concentrate, diluted to give a spray liquid concentration of 0.00375-0.0065% active ingredient (a.i.).

6.2.4.1. Insecticide Application

Specific detail on the concentrations of insecticides to be used and their frequency of application will vary according to the product selected and the local climatic factors influencing the length of persistence. The figures given below are guidelines only and the optimum parameters for use should be determined through local field trials.

1) Hand spraying of targets. The initial application of insecticide to targets is usually at double

the strength used for subsequent applications at 2-4 month intervals applied by a knapsack pressure sprayer. The target is sprayed on each side, treating the cloth and netting similarly, if this design of target is used, to the point of runoff.

2) Immersion of targets in insecticide. There are some advantages in immersing targets in insecticide prior to deployment. This avoids the need for spraying equipment, and allows better control of dosage. To get the correct dose in milligrams of active ingredient per trap or target, first determine how much liquid a given number of traps or targets will absorb. If for example, one target absorbs 100 ml liquid, and the dose rate is 100mg per target, each 100ml of insecticide liquid should contain 100 mg active ingredient. After immersion for 15-30 minutes, remove the targets to dry. It is better to place them horizontally on the ground for this purpose, rather than hanging them up, as this will reduce run off. To prevent pollution, this must not be done close to a river or other water source. Care should be taken when using this method as laboratory tests indicate that unless all the targets are removed from the insecticide at the same time, the first removed will absorb most of the active ingredient so that by the time the third or fourth is taken out hardly any insecticide will be left.

3) Application to cattle. Dipping is the most economical way to apply the insecticide to the cattle, providing dipping facilities are already available. Animals should be dipped every two weeks, although dipping every week may be necessary in wet weather. Hand spray pumps can also be used to spray individual animals using the same formulation used for dipping, but this is usually more costly and wasteful.

6.2.4.2. Trap/target density for palpalis species

For riverine species, which are the type of tsetse flies prevalent in Sierra Leone, traps or targets are often set at regular intervals along a river. Hence the density is expressed in terms of numbers per linear kilometre rather than per square kilometre. Placement densities have generally varied from 3 to 10 traps per linear kilometre. To ensure effectiveness of the traps, gathering the relevant information, including the following, is crucial.

Tsetse Surveys:

- identify tsetse habitat using traps and set tsetse traps for 72 hours (3 days);
- establish tsetse species and density in form of flies /trap per day;
- identify other biting flies;
- identify land use activities; and
- map out the area (size and location) to be covered by the control traps.

Based on the above and other relevant local information set up control strategies, which include the following:

- review tsetse control options: traps, screens, live bait, selective bush clearing etc;
- select the most appropriate options basing on survey results;
- create awareness among the local communities;
- train entomological assistants usually selected from the local population;
- produce a costed work plan showing the duration and frequency of each activity, quantities of inputs and the supplies, fuel, allowances and personnel requirement;
- implement tsetse control activities as planned;

- carry out entomological monitoring regularly to evaluate impact of control on transmission; and
- from results of entomological monitoring, regularly review activities.

6.3. Cross cutting issues

Some of the major challenges of vector borne diseases control programmes are related to inadequate community awareness and compliance; weak coordination and consolidation of efforts by various stakeholders; the disparity between political and resource commitment from all stakeholders, including governments; implementation of actions without consideration of system strengthening for sustainability; and weak monitoring and evaluation. This strategic plan outlines some guidance in order to address these issues in a coherent manner.

6.3.1. Advocacy, health promotion, community education and programme ownership

The VCU, in close collaboration and consultation with the MAL and NTD control units, will design an integrated communication strategy for advocacy, health promotion and community education. Political commitment at the policy and management level, community awareness and compliance are among the key determinants of the success of IVM as an integrated approach for the control of malaria and NTDs. Advocacy on the advantages and added values of IVM as an approach for integrated delivery of disease vector control will be intensified to engage none health sectors such as environment, rural development, industry, mining, agriculture and other partners as well to ensure collaboration and mobilisation of adequate resources. Evidence is the strongest advocacy tool. Effective monitoring, evaluation and documentation of IVM deployment and its impact are therefore, important beyond being good programme management practices. The advocacy targeting sector institutions and partners will use the achieved successes of IVM on reduction of morbidity and mortality due to MAL and NTDs in a sustainable manner.

Information dissemination and education on the importance of personal and communal contributions in the reduction of risks for spread of vector borne diseases shall be a major component of IVM implementation. The VCU in collaboration with other implementing government and non-government partners will strengthen advocacy and social mobilisation at all levels to ensure positive behavioural change in the implementation of IVM, particularly at the community level. To ensure adequate involvement of communities in decision making processes, and in the planning and implementation of all vector borne diseases control interventions within the context of IVM, chiefdoms, local community leaders and community based organisations will be deeply engaged in community sensitisation and mobilisation. Electronic and print media will be used to widely disseminate information on the dynamics of the major vector borne diseases transmission and control, and in defining the decisive role of communities in order to achieve the set goals. The impact of community education and awareness efforts in terms of behavioural change and compliance of community members will be measured against a baseline.

6.3.2. Coordination, Partnership and resource mobilisation

One of the pillars of IVM is inter-sectoral collaboration and partnership. The VCU, in close consultation with the NTD and MAL control units, will use all available mechanisms and opportunities to collaborate with the relevant departments within the Ministry of Health, such as units of environmental health, public relations and others. The Unit, through the appropriate level of the MoHS, will continuously advocate, promote and ensure the consideration of mitigation of risk of propagation of vectors and vector borne diseases that are related to implementa-

tion of development projects by all government and non-government institutions. Negotiations and discussions will continuously be carried out to involve such development projects in the planning and implementation of IVM to control vector borne diseases in the relevant project areas and communities.

Currently, many NGOs and SCOs are involved in the implementation and/or supporting of vector borne diseases control activities such as MAL and NTDs. The challenge for the government has been coordination and consolidation of the fragmented efforts. The VCU, through the appropriate level of the MoHS will call on all partners to buy into the current strategic plan and work in a coordinated and complementary manner under the leadership of the MoHS for its implementation.

Scarcity of resources remains a major bottleneck for effective programme implementation in Sierra Leone. In helping to alleviate this chronic problem for malaria and NTDs control the following approaches will be applied.

Systematic documentation and dissemination of achievements

Evidence on success is one of the strongest advocacy materials for resources mobilization. VCU in close collaboration and consultation with Malaria and NTDs control programs will collate information on core outcomes, but most importantly, impact indicators from periodical monitoring and evaluation reports (programme reports, DHS, MICS, etc,) when possible by performing specific evaluations, and publish reports that will widely be disseminated among all stakeholders, including community leaders. This encourages partners, both locally and internationally, to invest more for the good cause of controlling malaria and NTDs. VCU in collaboration with Malaria and NTDs will prepare proposals for resources mobilisation from local and international partners.

Resource mobilisation at local level

Resources at local level are usually overlooked and underestimated. These are financial, human and material resources that are available among local industries, business community, government and non-government institutions, communities etc. VCU in collaboration with the Malaria and NTDs Control programmes will identify and mobilise available resources at national and sub-national levels. Development and industrial sectors such as mechanized farming, mining and the like will be engaged to contribute financial or logistical resources (particularly transport for time limited campaign type activities such as IRS) to implement IVM for malaria and NTDs control at least in the communities and the surroundings they reside.

6.3.3. Capacity Building

Capacity strengthening at all levels for effective management of IVM is an important component of this strategic plan. In order to guide the capacity building interventions, a situation analysis and needs assessment on the existing technical, logistics, equipment and capacity will be conducted both at national and district levels using the WHO IVM needs assessment protocol (WHO, 2003).

Based on the outcomes, initial training will be provided for core group of staff in the VCU on the overall management of the IVM program. Formal and informal hands-on training sessions will be organized by the VCU with the support of WHO to create the necessary core technical capacity at national level. Similarly, number of staff in each DHMT will be trained both formally through workshops and informal hands=on training. DHMTs with support of VCU, will train community health workers and volunteers who will be supporting implementation of IVM at the community level. Technical capacity building will be a continuous process particularly at the district and community

level to compensate for attrition of the trained staff and community members through time.

6.3.4. Monitoring and Evaluation of IVM Performance and Impact

Monitoring and evaluation of all programme components are an integral part of the IVM management, monitoring measures, processes, inputs and outcome of the programme implementation. Monitoring of the process determines how implementation of the various interventions was done to accomplish what has been achieved (inputs). The outputs are the results of what has been achieved. Evaluation determines the impact of the outputs in terms of disease morbidity and mortality. Monitoring of process, input and output indicators will be conducted periodically in relation to the implementation cycle of the specific intervention. However, some indicators, such as LLINs coverage and use, and access to safe sanitation may be difficult to monitor on a routine basis as they require household/community surveys. Proper documentation and reporting at all levels will be used to monitor progress of IVM.

IVM program evaluation (impact assessment) will be carried out to determine the success in terms of reduction in morbidity and mortality due to the targeted diseases. Key indicators for each disease will be measured and compared with the baseline and in relation to the set targets. This evaluation will be conducted periodically, in 2 – 3 year intervals.

Integrated, standard and uniform tools that are in line with the existing integrated disease surveillance (IDS) system will be used for the monitoring and evaluation of implementation, progress and impact of IVM and also for baseline data/information collection. In order to ensure that monitoring and evaluation is informative, baseline information/data will be collected on the relevant indicators.

Evaluation of performance of integrated programmes will be carried out periodically at a recommended frequency. This could be every three years or every two years initially, in view of the new integrated approach. The interval could be adjusted if necessary. The evaluation will look at all the indicators, including process, outcome, and impact indicators.

Supervision of implementation of interventions is an element of the monitoring exercise. Supervision is a guarantee for a success of any program. Supervision at all levels ensures timely and quality delivery of interventions to the target populations in line with the designed plan of action. For some interventions, such as IRS, supervision is a major determinant factor in programme success.

6.3.5. Vector resistance monitoring

Vector resistance is a threat to all insecticide-based IVM interventions, including LLINs, IRS and others. Susceptibility of the vectors to the commonly recommended range of insecticides will be established before choosing insecticides for an intervention. Sentinel sites will be selected for monitoring of vector resistance. Thereafter, vector susceptibility status will be monitored for all insecticide-based interventions every two years to inform decision making and planning. Sentinel sites will be selected considering their representation in a number of districts. In a situation where tests indicate susceptibility less than the recommended level, according to WHO protocol (WHO-AFRO, 2011), consultation will be held with research institutes and/or WHO for further investigation and decisions on the way forward. Staff in the district health teams will be trained and be responsible, with the support of the VCU, for conducting routine susceptibility tests. Reports of tests will be shared with WHO, to be included in the existing regional vector susceptibility database within the framework of the African Network for Vector Resistance (ANVR).

7. Expected Roles of Government and its Partners

7.1. Government institutions

7.1.1. Central Government and particularly MoHS

The Government of Sierra Leone is responsible for tendering and importation of pesticides, equipment and other supplies. It will make all necessary arrangements for clearing of the pesticides and supplies, including payment of any verification fees, taxes or tax waving, clearing agent fees, and any other accruing fees. The government will provide transport to deliver the supplies up to peripheral levels, offer storage facilities at all levels and ensure their security by tracking their inventory at each level. MoHS shall strengthen inter-sectoral and inter-country collaboration, including sharing experience and lessons and synchronising timing of interventions to promote effective cross border and regional cooperation in IVM implementation.

7.1.2. The NTD Secretariat

The Government of Sierra Leone, through its MoHS and specifically the Vector Control Unit (VCU) of the Environmental Health Programme shall be the lead partner and beneficiary of the IVM as part of comprehensive malaria and NTDs control. The VCU shall ensure close collaboration, including joint planning and implementation, with the Malaria and NTD Control Programmes, both of which will join the VCU to compose the National IVM Secretariat. The secretariat shall work closely with partners to develop yearly plans of action and budgets. The VCU Head will be the secretary to the IVM secretariat and will compile quarterly and annual reports to the National IVM steering committee. The MoHS shall reorganise and strengthen the existing VCU for effective leadership and management of IVM activities.

7.1.3. The DHMT and VCU

The necessary VCU structures and systems for managing IVM shall be established at national and district levels to ensure efficient planning, implementation, supervision, monitoring and reporting, following existing MoHS reporting channels. The VCU shall support DHMTs in the planning, implementation and supervision of all IVM interventions in their districts and will advocate with the central government and local authorities for revision of existing legislation and by-laws that will ensure that people clean their homes to get rid of cans, empty containers and others that provide suitable vector breeding sites. The DHMTs shall collaborate with all stakeholders and coordinate local partnership for planning and implementation and shall mobilise local resources at that level for IVM implementation purposes.

In collaboration with DHMTs, health facilities and chiefdoms, the VCU will ensure timely adverse event monitoring, management, investigation and reporting. The VCU shall establish a system and capacity for effective vector resistance monitoring and management as part of the routine IVM implementation. The Unit shall put in place all necessary mechanisms and effort to optimise use of all locally available resources and capabilities to comprehensively manage all IVM activities, including ensuring timely application of the interventions.

7.1.4. VCU and Public Health Pesticide Management.

Through its VCU, the MoHS shall establish the necessary systems and mechanisms to build capacity at all levels for safe and appropriate management of pesticides used in public health interventions and in particular in IVM implementation. The ministry will endeavour to meet financial requirements for this purpose. It shall ensure that, in the application of pesticides, the norms and guidelines set by WHO, with regard to the management of public health pesticides, are adhered to by all involved in IVM interventions.

7.1.5. Inter-sectoral collaboration

The MoHS shall continuously advocate, promote and ensure the consideration of policies and legislation by all government and non-government institutions in all actions that may involve the risk of propagation of vectors and vector-borne diseases in the environment. In collaboration with Ministries of Agriculture, Lands and Country Planning and Environment, the Sierra Leone Environment Protection Agency, the Food and Agricultural Organisation, the private sector and all other relevant institutions, the MoHS will endeavour to minimise importation of sub standard pesticides and misuse of those meant for public health use. The Ministry will establish strong collaboration with local and international research institutions and universities in the area of vector surveillance, vector resistance monitoring and operational research on diseases, vectors and vector control in general.

7.1. 6.Health Education Programme

The Health Education Programme of MoHS in collaboration with other implementing partners will strengthen advocacy and social mobilisation at all levels to ensure positive behaviour change in the implementation of IVM. Information dissemination and education on the importance of personal and communal contributions in the reduction of risks for spread of vector-borne diseases shall be a major component of IVM implementation. Chiefdoms and local community leaders and community based organisations shall be engaged by the health Education Programme to ensure full involvement of communities in decision making processes and in planning and implementation of IVM activities within the context of malaria and NTDs control.

7.2. NGO, CBOs, CSOs and Religious institutions

7.2. 1. Potential IVM implementation partners

Potential partners in this group include, mining companies and agricultural establishments, especially those in inland valley swamps and irrigation schemes. Others include Helen Keller International (HKI); International Medical Corps (IMC); World Vision Sierra Leone, the Danish Bilharziasis Laboratory (DBL) – Institute for Health Research and Development based in Denmark; West African Centre for International Parasite Control at the Noguchi Institute in Accra, Ghana; Sight Savers International (SSI); and National Eye Care Programme. Continuous partnership building will be an objective of the government of Sierra Leone through exploring various opportunities as they arise.

7. 2. 2 Financial Support

The major obligation of this group of partners is to provide financial support to the MoHS so that it can meet obligations of IVM implementation as planned. For accurate planning, partners will be required to declare their financial commitment to the MoHS. Those partners wishing to participate directly in IVM implementation will be invited to be members of the National IVM Steering Committee and other partners will even be part of the IVM secretariat and will assist the VCU in development of IVM implementation guidelines and tools, monitoring and reporting and management of IVM implementation adverse events. Such partners will provide relevant data summaries to the IVM Secretariat and will even participate in overall data entry, data analysis and in compilation of quarterly and yearly reports to the IVM National Steering Committee.

7.2. 3. Training, Planning, Development of communication strategy,

Those partners with the required facilities and experience will provide support for appropriate training of VCU staff and other relevant personnel through international institutions, on job training, workshops, reviews, orientation meetings, and technical assistance in order to develop local skills and experience for delivering IVM interventions. Some will provide technical input and consultation with the MoHS for estimation of pesticides and logistics required and will assist the ministry in procurement for timely shipping and receipt and in-country distribution to peripheral level to ensure timely implementation of IVM interventions. Those with the required skills will support the MoHS in adequate planning of IVM implementation and will assist the Health Education Programme in the development of an IVM communication strategy, including the use of public media to ensure broad awareness of the programme. Community based organisations shall be engaged by the Health Education Programme to ensure full involvement of communities in decision making processes and in planning and implementation of IVM activities within the context of malaria and NTDs control.

7.3. Research Institutions and Universities

The MoHS will establish strong collaboration with local and international research institutions and Universities, including the University of Sierra Leone in Freetown, Njala University in Moyamba District in the Southern Province and any other for training of local personnel in IVM planning and implementation skills, and operational research. The services of entomologists from the Universities or institutions will be invited to examine 5 – 10% of baseline and monitoring samples for quality control. Prof. Gbakima's Laboratory will be instrumental in this respect. They will be invited to conduct vector ecology mapping, environmental impact assessment and to participate in the area of vector surveillance, vector resistance monitoring and operational research on diseases, vectors and vector control in general, in order to obtain evidence needed for informed policy formulation. The University of Liverpool, School of Tropical Medicine, which pioneered research on onchocerciasis, schistosomiasis and STH in Sierra Leone and any other interested University will be requested to train local researchers in proposal writing and to collaborate with local staff in compiling relevant research proposals for funding. In the past, Mining Companies were also involved in research on schistosomiasis control and effort will be made to revive their interest in this area and in the research and control of malaria and other NTDs,

7.4. UN and bilateral Development agencies

Some of the UN agencies will be offered membership in the National IVM Steering Committee. UN agencies and bilateral organizations supporting the government in health service delivery include WHO + APOC, UNICEF, WFP, ADB, European Union, International Development Association (IDA), UNAIDS, UNFPA, World Bank, Islamic Development Bank (IDB) and others. Requests will be made to some of these for technical support, but all of them will be asked for financial support to the implementation of the IVM interventions. A few of them will be asked to provide support for procurement and shipment of equipment and supplies. Where and when required, some of them will be consulted in the establishment and management of an efficient integrated logistic supply chain and in the development of appropriate IVM implementation tools and guidelines.

7.5. Private Sector

The private sector will be mobilised for financial or logistical support and where appropriate for participation in IVM activities. Their roles could include improvement of the performance of DHMTs; strengthening the key MoHS support services, including human resource development, planning, monitoring and statistics, financial management and procurement. The private sector can assist in latrine construction, especially in schools and other public centres such as canoe landing sites, health facilities, worshiping centres and markets.

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