Biological control of vectors: An effective component for the control and elimination of mosquitoes and tropical diseases.

Author: Dr. Roberto Sánchez Prieto

LABIOFAM

What is the role of larval control in vector control?

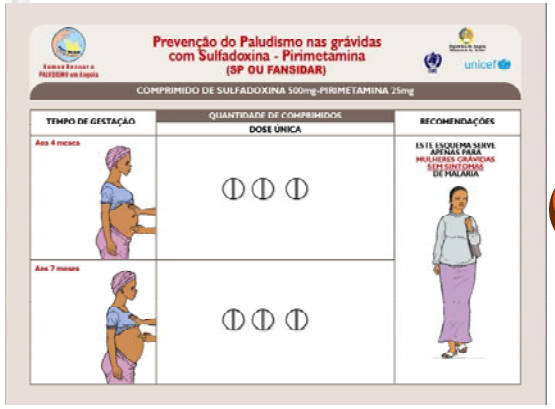
WHO

Resolution
African Committee
World Assembly

LOGO

THE POWERFUL INTEGRATION OF VECTOR CONTROL WITHIN PROGRAMS IN CONJUNCTION WITH THE EARLY DIAGNOSIS OF THE DISEASE IN CHILDREN AND PREGNANT WOMEN, AS WELL AS FREE TREATMENT IN ENDEMIC AREAS WOULD BE THE KEY TO THE PROBLEM.

LOGO



INTEGRATION OF VECTOR CONTROL WITHIN PROGRAMS

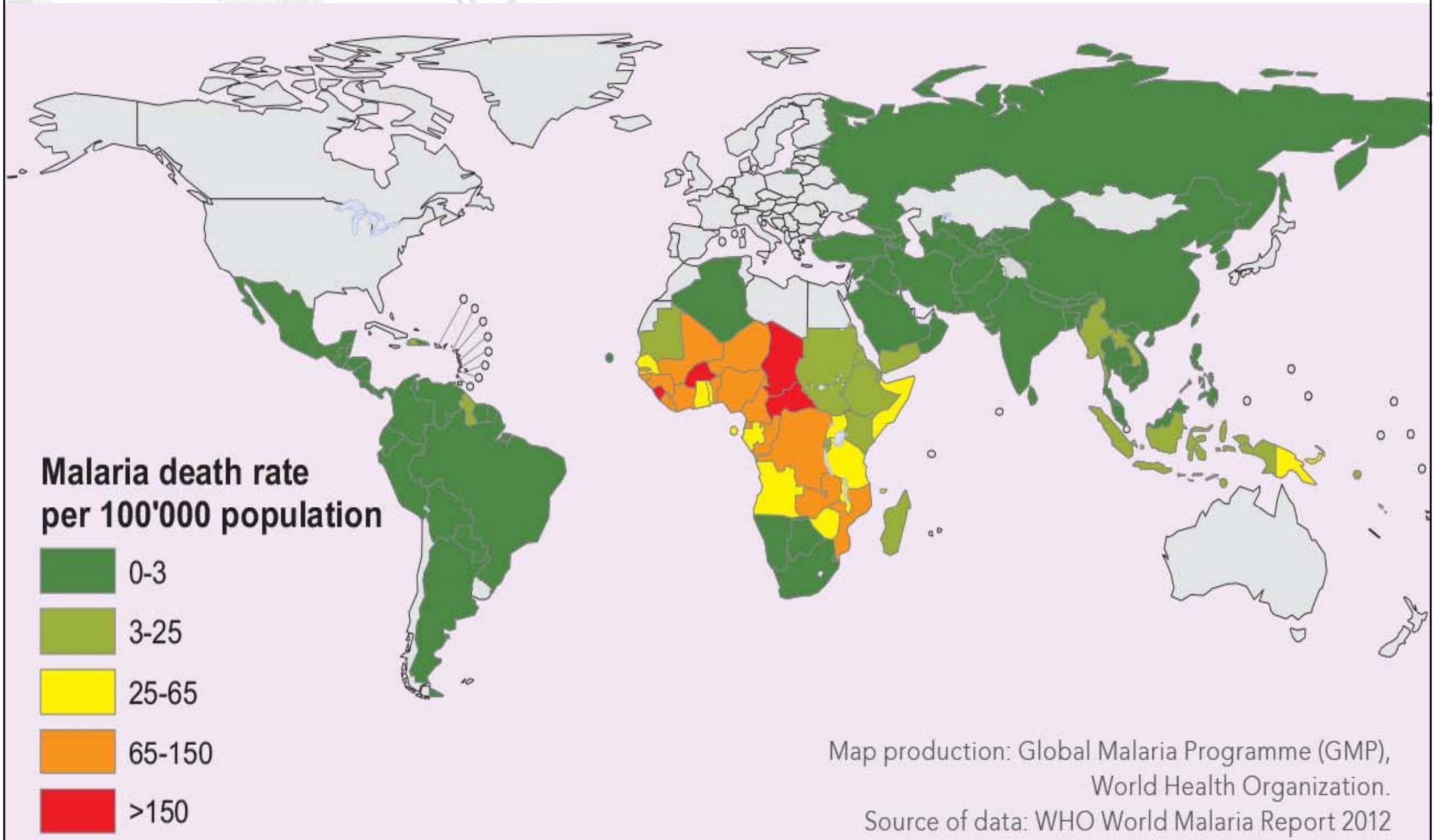
OUR EXPERIENCE IN CONTROLLING THE VECTOR OF MALARIA IN CENTRAL AND SOUTH AMERICA (AMAZONIA) OBTAINED THROUGH PROJECTS THAT ARE INSERTED INTO NATIONAL PROGRAMS AND COMBINE DIFFERENT VECTOR CONTROL METHODS AS WELL AS EXPERT ADVICE TO ACHIEVE THE CONTROL OF THE ILLNESS.

- **LARVAL CONTROL (BIOLARVICIDES)**
- **PHYSICAL TREATMENT IN THE MAIN BREEDING**
- **ADULT CONTROL (PYRETHROIDS) WITH INDOOR AND OUTDOOR APPLICATION (LIMITED IN HIGH-RISK AREAS).**
- **COMMUNITY PARTICIPATION AND EDUCATION.**

IT HAS SHOWN THAT IT IS POSSIBLE TO CONTROL THE DISEASE

LOGO

Malaria as per WHO 2012

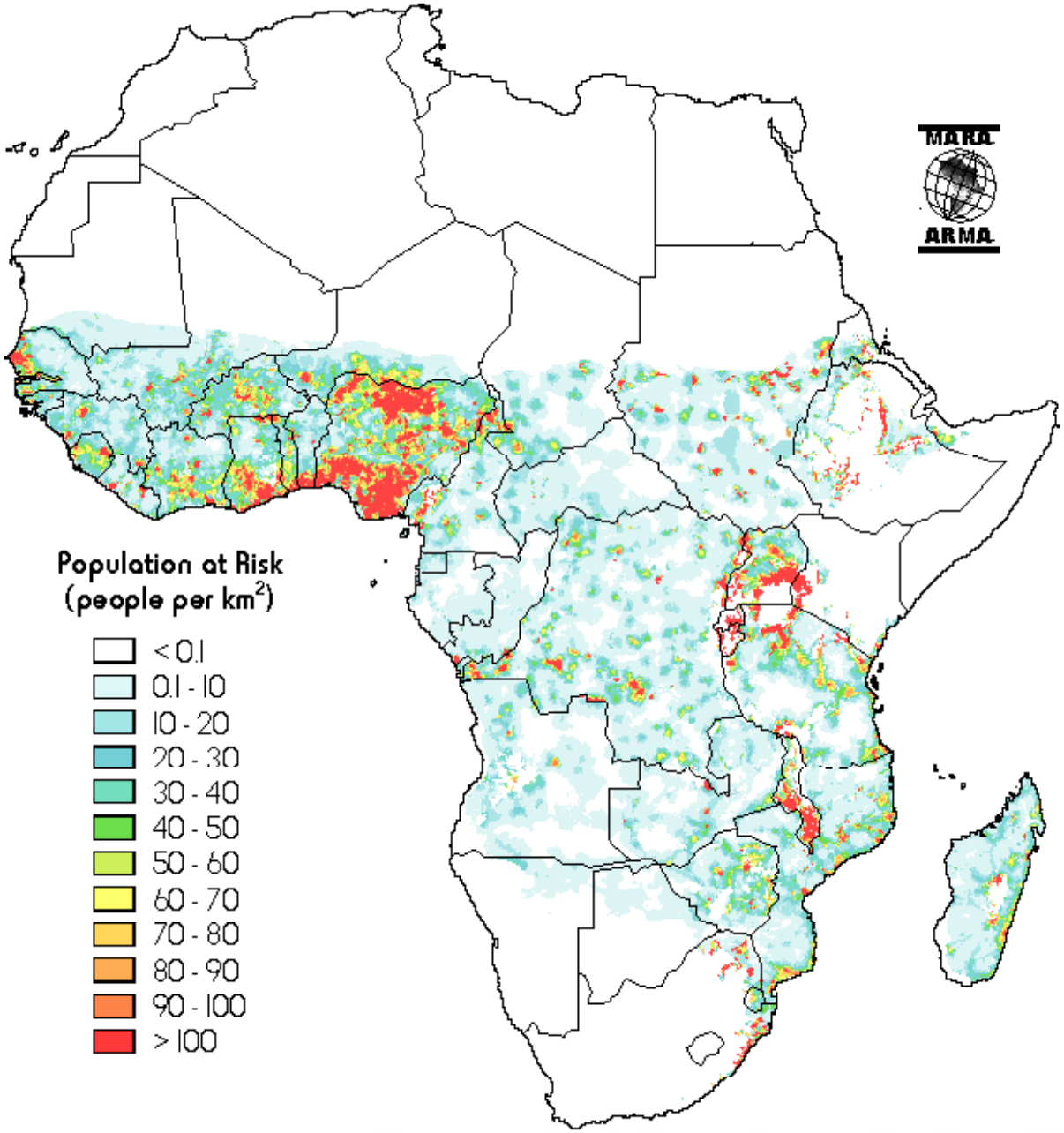


MALARIA IN THE AFRICAN CONTINENT

- 48 Countries with 550 million people in Risk areas

-75% (endemic transmission)

- 17% (epidemic zones)
- 8% (low transmission)
- 240-400 million clinical cases/year.
- More than 1 million deaths/year (mainly children <5 years and pregnant women)



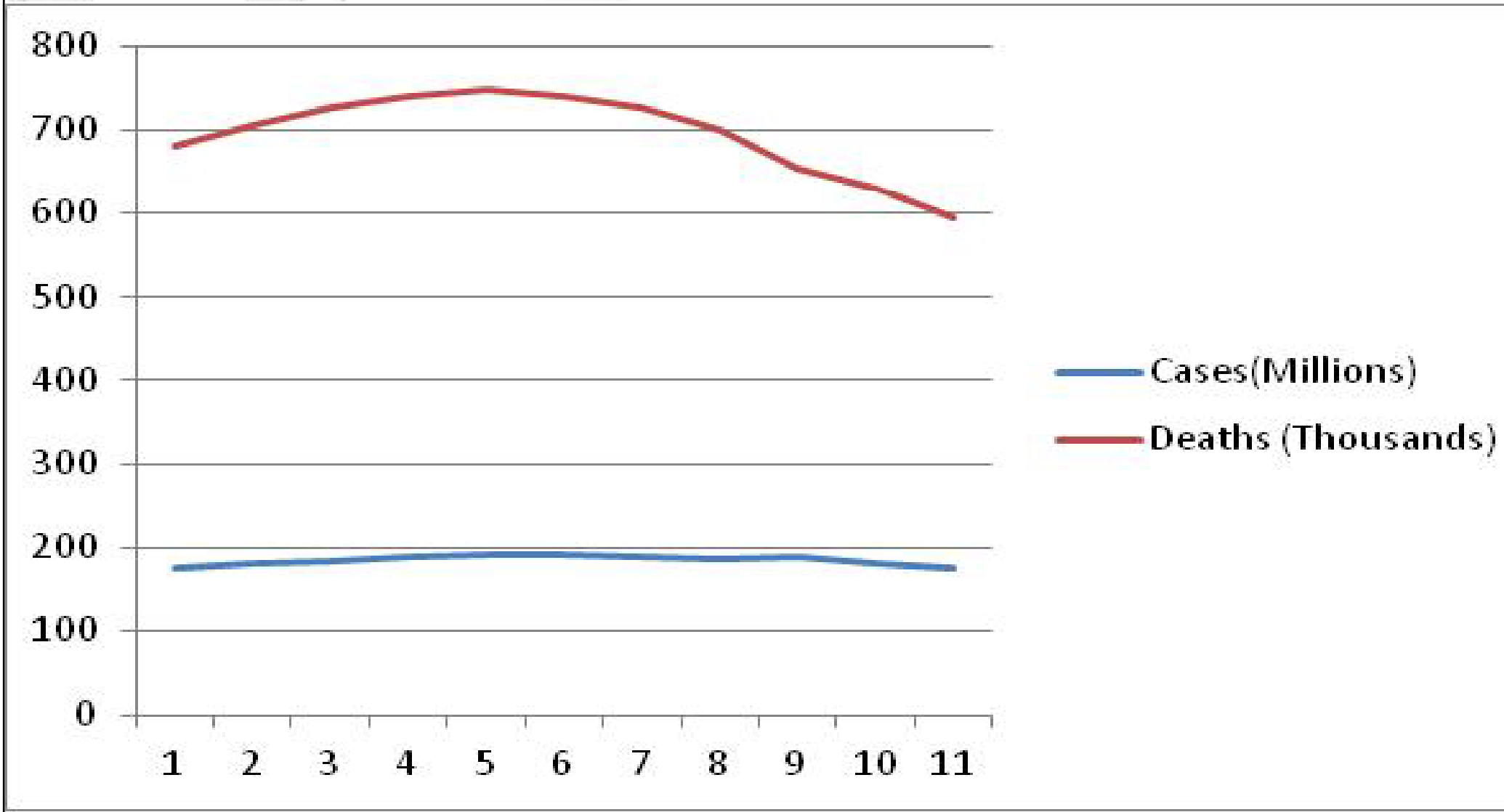
ABUJA DECLARATION

On April 25, 2000, 53 Chiefs of State of African countries signed the Abuja Declaration in which they traced as their main objective to reduce the Malaria human deaths in 50% in the year 2010, and to achieve for the year 2030 that this disease will not be the first cause of death in the Continent.

LOGO

MALARIA CASES AND DEATHS FROM 2000 TO 2010 IN THE AFRICAN CONTINENT .

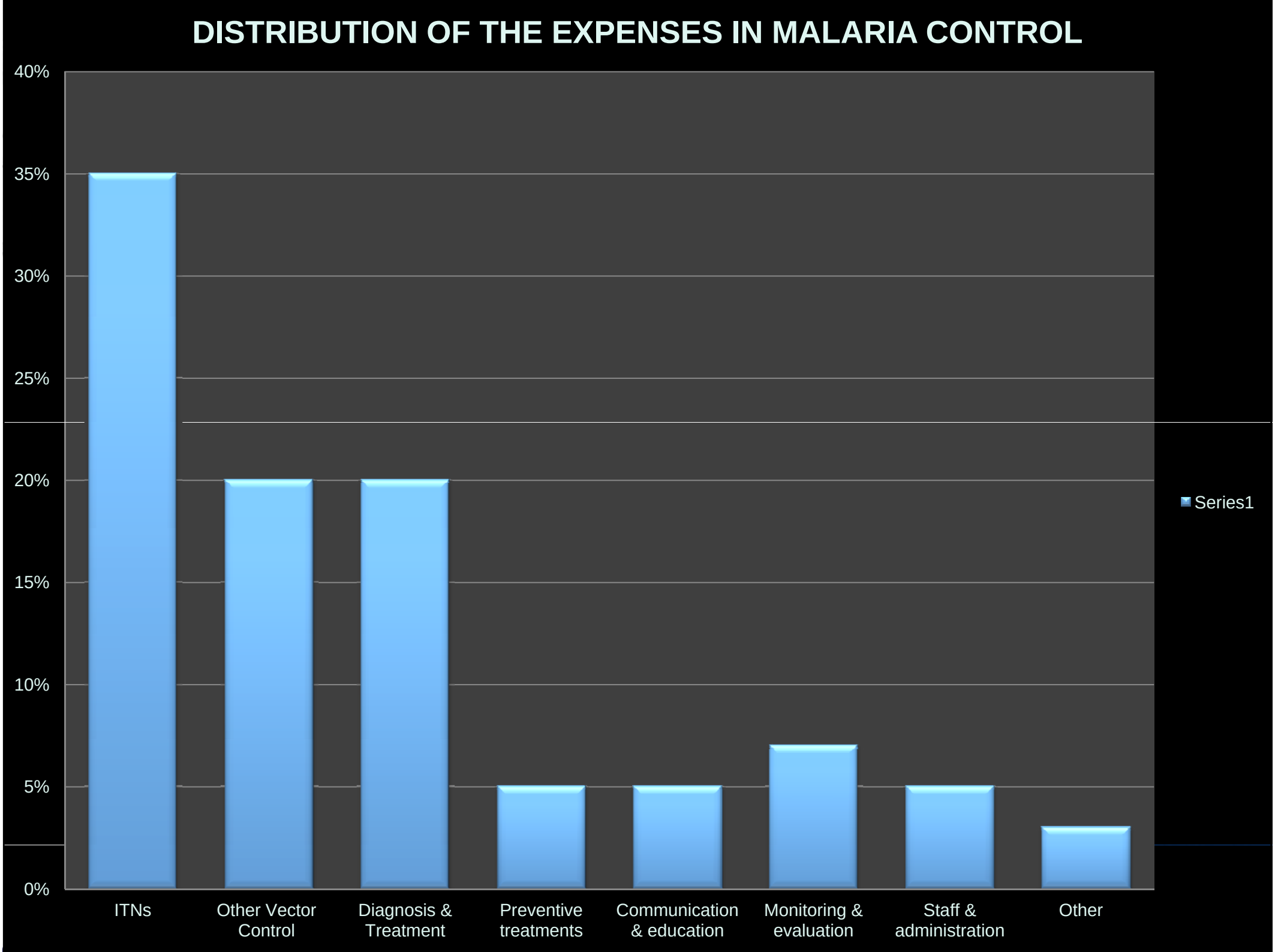
Source: WHO, World Malaria report, 2012.



BUDGET REQUIREMENTS FOR MALARIA CONTROL IN THE WORLD (in millions USD)

Source: Global Malaria Action Plan Estimates (WHO, RBM, Geneva, 2008)

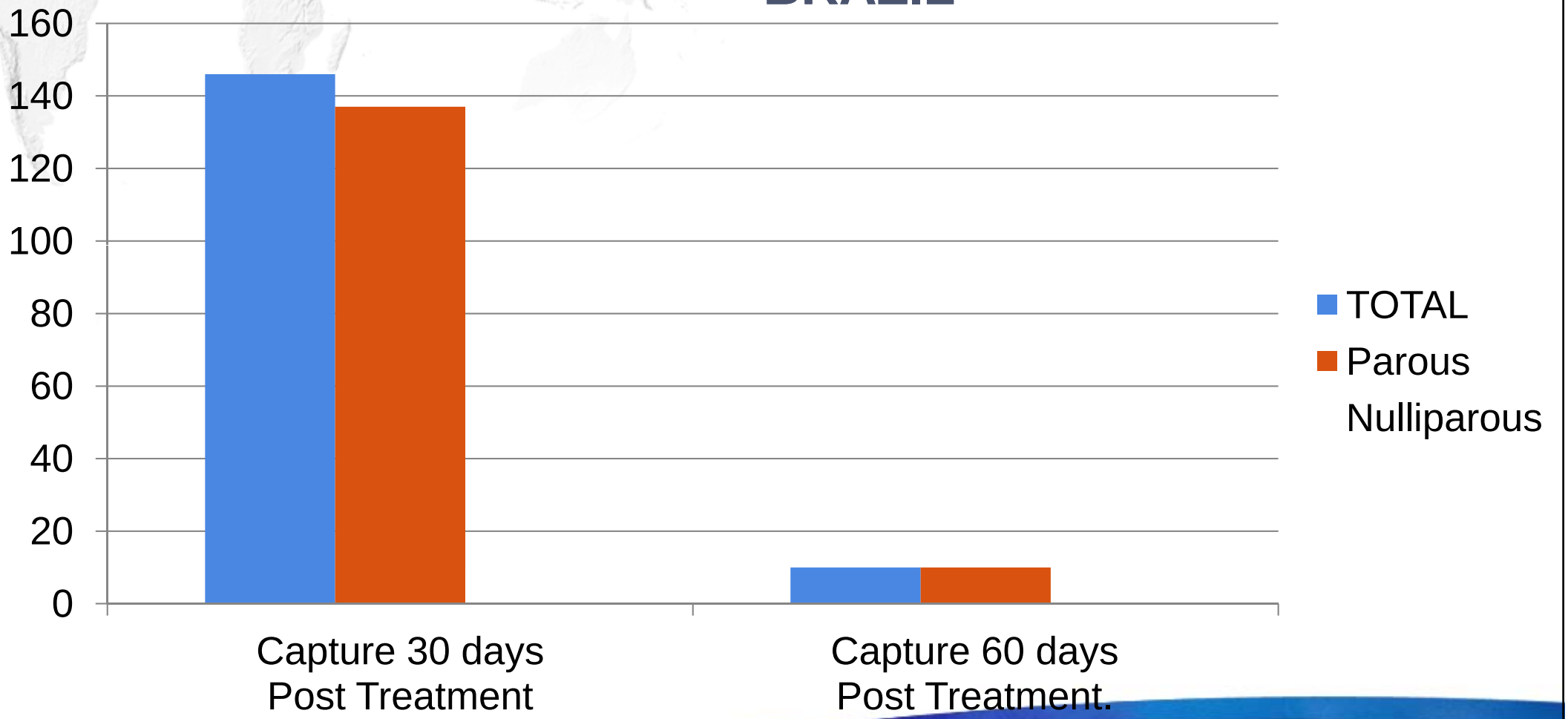
	2010	2015	2020	2025
LLINs and ITINs	2091	1689	1807	1035
IRS	1883	2026	2047	1531
Other actions	8	9	9	10
Sub Total	**3982**	**3724**	**3863**	**2576**
Case Management including treaments	1359	550	226	87
Program Support	839	764	787	714
TOTAL	6180	5038	4876	3378


DISTRIBUTION OF THE EXPENSES IN MALARIA CONTROL
40%
35%
30%
25%
20%
15%
10%
5%
0%
ITNs
Other Vector Control
Diagnosis & Treatment
Preventive treatments
Communication & education
Monitoring & evaluation
Staff & administration
Other
Series1

The Bacteriological control of mosquitoes have been in use in the developed countries for more than 30 years, these Biolarvicides effectively control the vectors of many human diseases, among them Dengue, Malaria, Encephalitis, and many other.

Since 1970 the WHO recommended the incorporation of biological methods in all the vector control measures to be implemented in Malaria and other diseases Control Programs (WHO Resolution 23, 33;1, 1970) and especially the use of the microbial insecticides based on: *Bacillus thuringiensis, var. israelensis (Bti-14) and Bacillus sphaericus, strain 2362.*

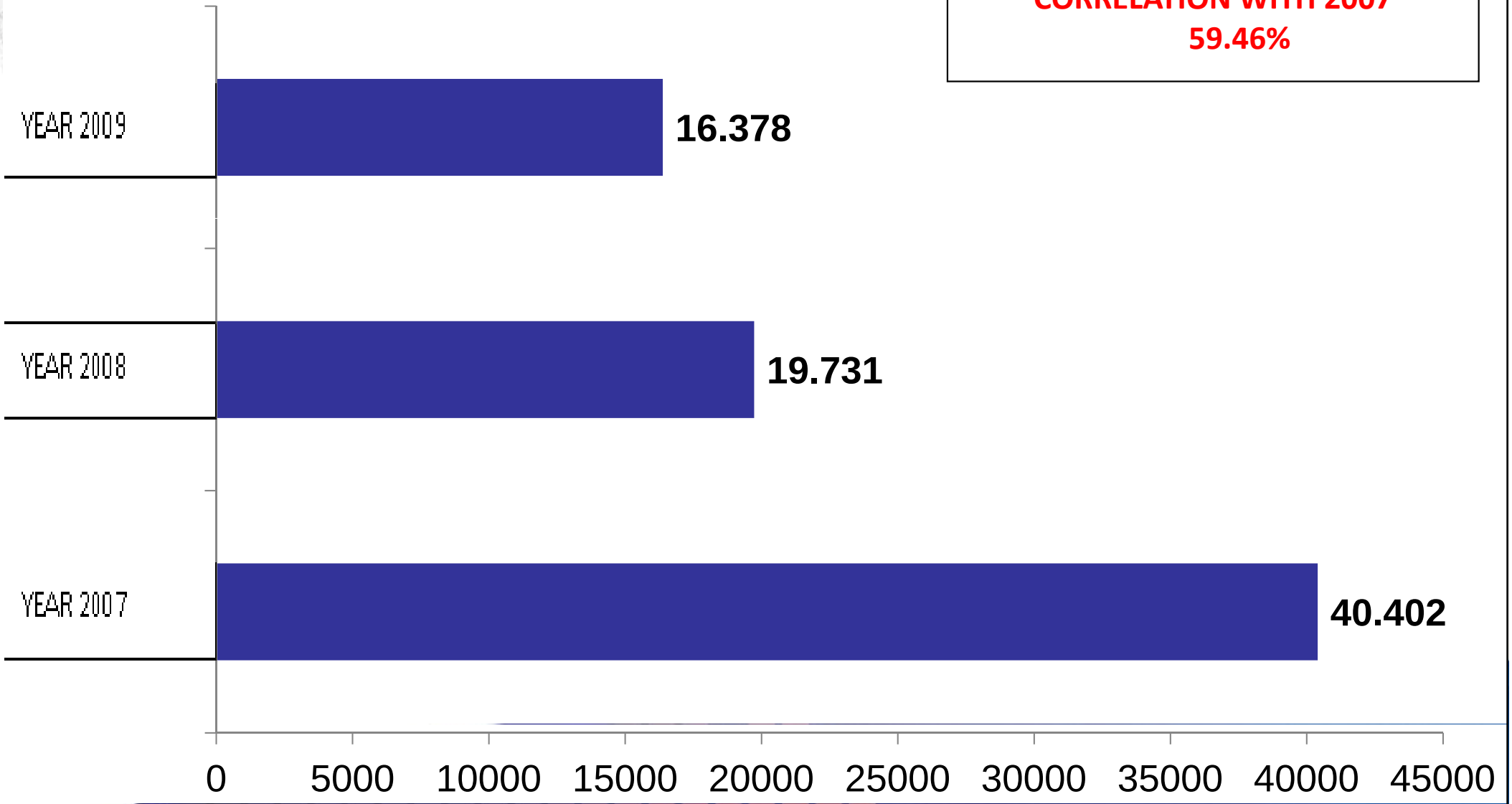
NUMBER OF ADULT *Anopheles darlingi* CAPTURED AND DISSECTED. CRISTO REY COMMUNITY (FEBRUARY AND MARCH), 2010. BRAZIL



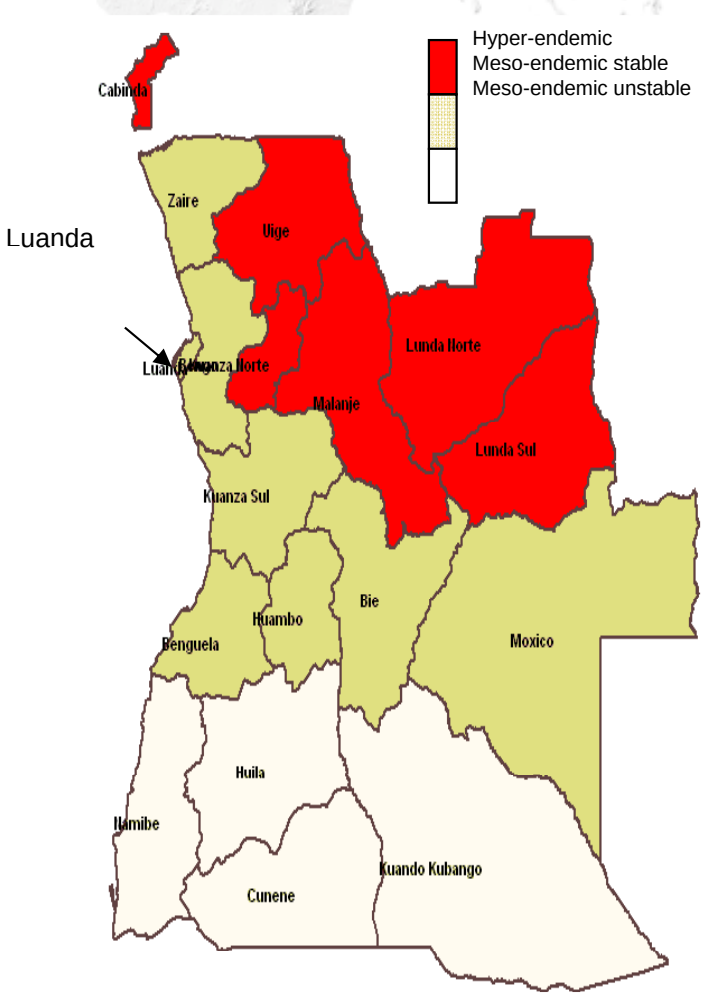
LOGO

EPIDEMIOLOGICAL HISTORY OF MALARIA CASES IN MANAUS WITH THE GENERAL PERCENT OF REDUCTION FROM 2007 TO 2009.

% OF REDUCTION 2008/2009 IN CORRELATION WITH 2007
59.46%



REPORTS IN AFRICA



ANGOLA

GHANA

LOGO

GENERAL OBJECTIVE

To reduce the Malaria vectors through an integrated strategy making emphasis on antivectorial fight by means of biological methods with the use of Griselesf and Bactivec biolarvicides, to achieve reduction in morbidity.

LOGO

SPECIFIC OBJECTIVES

- **To reduce in a significant manner the vector population densities (*Anopheles and Aedes* sp and others) in its larval and adults stages.**

- **To reduce in a significant manner malaria cases and dengue fever in the treated areas and continue working towards the elimination of the disease.**

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METHODOLOGY

The project is designed into 3 main stages

1st Stage (ORGANIZATIONAL)

1. Basic information collection related to epidemiological, parasitological, clinical and meteorologic al aspects.
2. Entomological, epidemiological surveillance and characterization of the working scope.
3. Capacity building and training of the staff of the application companies .
4. Provision of logistics for the operation.

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2nd Stage (IMPLEMENTATION)

1. Biolarvicides application (Bactivec and Griselesf) for the control of mosquitoes larval phase covering 100% of the identified breeding places.
2. Adulticide application for the mosquitoes adult phase outdoor control.
3. Actions related to Information, Education and Communication.

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3rd Stage (EVALUATION)

1.Entomological and epidemiological evaluation index.

- ❖Relative larval density (DLR), reduction per cent, adults average density /houses (DMC)
- ❖Malaria confirmed cases and other diseases (comparison between periods)

2.Evaluation of the impact of the treatment throughout the epidemiological surveys.

WORKING SCOPE

STRATIFICATION AND CHARACTERIZATION OF THE INTERVENTION AREAS.

The project areas was divided in working zones, taking into account current population density, territorial extension, breeding sites, surface to be treated and number of specialists, establishing an entomologic surveillance system, that allows the species identification, thus the larval densities determination and adults on a permanent bases.

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Entomology

Larva's Control

- ✓ Larval relative density determination techniques before and after treatment with biolarvicides using immersion technique with deeper was applied. (WHO,1982.)
- ✓ The biolarvicides residual effect determination was done .
- ✓ The application of biolarvicides in the water container inside the houses.
- ✓ Larval reduction percent.
- ✓ Sentinels breading place selection (entomological surveillance). Identification and Classification of different sp.

Adults Control

- ✓ Knock Down technique for adult mosquitoes, catching and the determination of average density/house (ADH) before adulticides treatments, as well as the taxonomic classification.

Products and equipment used.

- ✓ Biolarvicides GRISELESF ® and BACTIVEC ® were used by aspersion on the active surface.
- ✓ Knap sack aspersions were used with 10 L capacity and motorised machines with 12 L capacity, Helicopter.

LOGO

Epidemiology

- In collaboration with the National Biostatistics Centre, the Malaria incidence data was obtained.
- The morbidity epidemiological analysis was done using the chronological series of Malaria cases for the last 9 years, for the period of 2001 to 2010.
- A survey in the different population groups was carried out within the communities in approximately 1000 number of people/submetro

Promotion Activities

Health promotion activities in all communities within the treated areas, such us brochures distribution on the project and Malaria prevention leaflets, educative chats in different population groups and in dialects, relying on the community leaders and the regional application group.

LOGO

Entomological surveillance system.







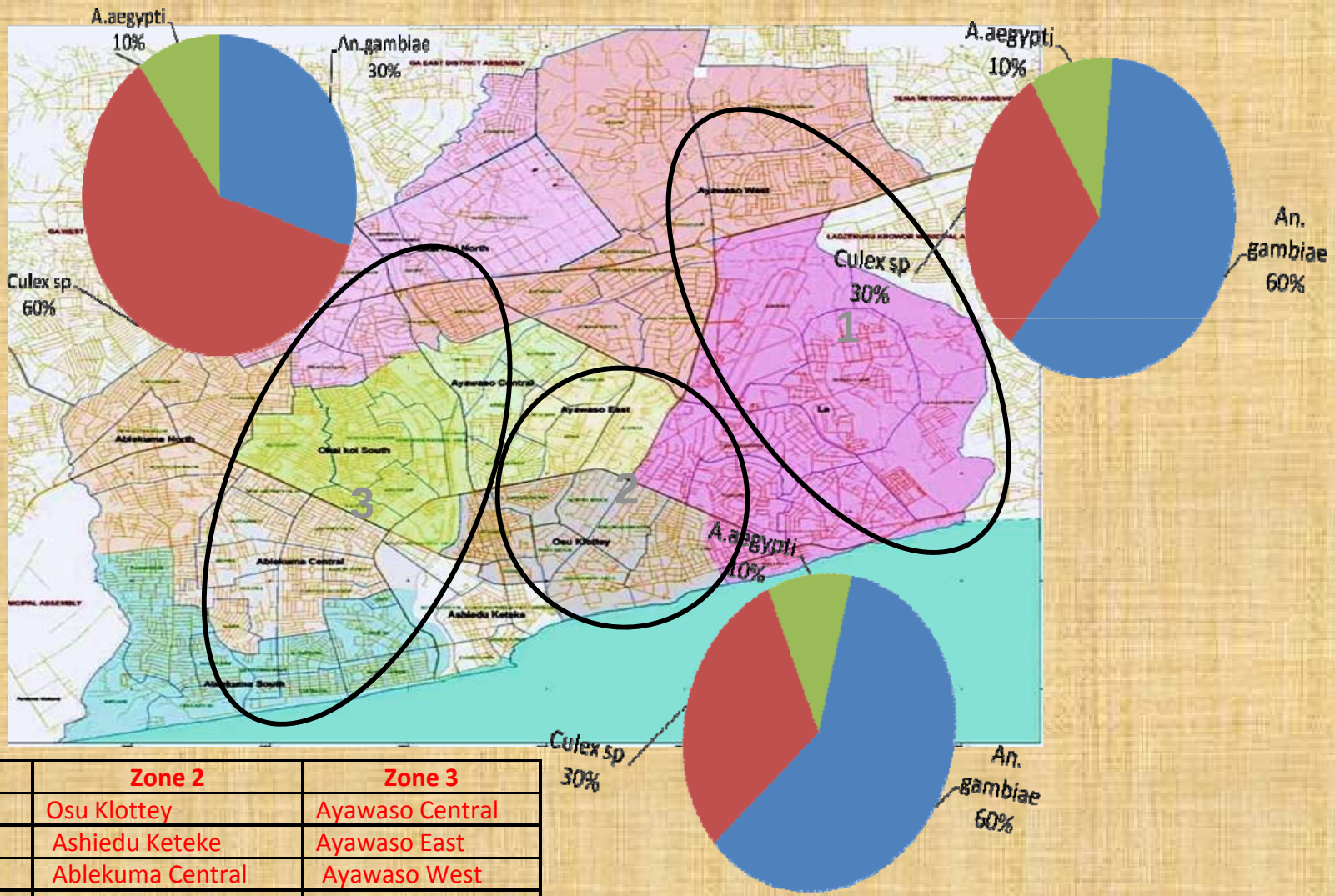




Source: National Reference Laboratory Entomological.

LOGO

ENTOMOLOGICAL AND RISK MAP OF STRATIFICATION IN ACCRA METROPOLIS 2010.



Zone 1	Zone 2	Zone 3
Nungua	Osu Klottey	Ayawaso Central
Teshie	Ashiedu Keteke	Ayawaso East
La	Ablekuma Central	Ayawaso West
	Ablekuma North	Okai Koi North
	Ablekuma South	Okai Koi South

EDUCATION AND TRAINING OF LOCAL WORKERS

EFFECTIVENNES AND RESIDUAL EFFECTS OF THE BIOLARVICIDES APPLICATION.

- In almost all breeding places treated with BACTIVEC ® and GRISELESF®, there was an average of 99.8% and 99.6 % of larval reduction, respectively within 72 hours after the treatment.

- Monthly monitoring of sentinels breeding sites show 94.6% average effectiveness in the case of BACTIVEC and 95.2% for GRISELESF from 40 to 50 days after the application (graph # 1), coinciding with the results in the application of GRISELESF and BACTIVEC in Amazons Brazil and in part of Central America (2008, 2002).

At the end of the rainy period, it was observed that there was an increase in larval relative density for a high number of temporary breeding places that were not treated as a result of the rains in treated areas.

LOGO

Development of biological and physical methods for vector control of malaria and the active participation of the population.

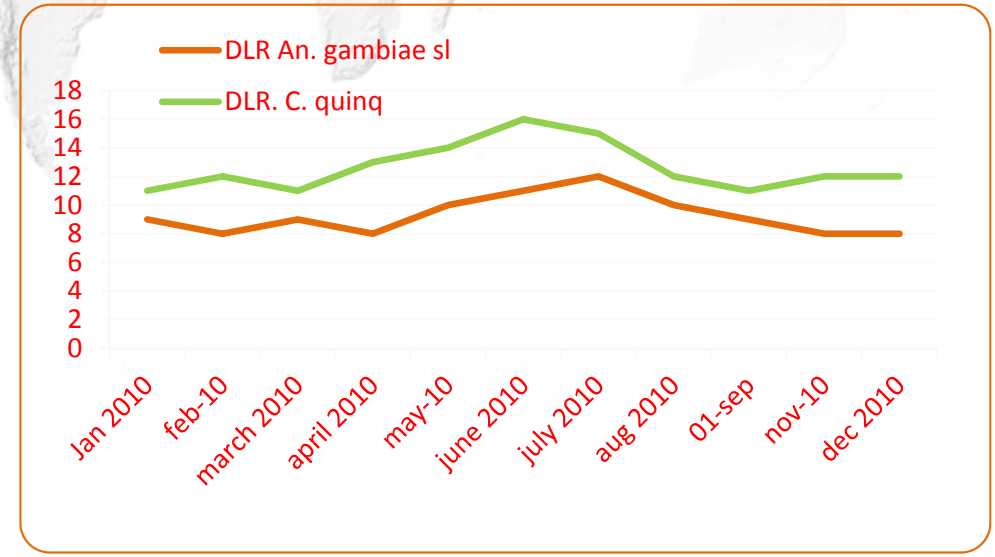
Vector control measures with environmental management implemented from community awareness.

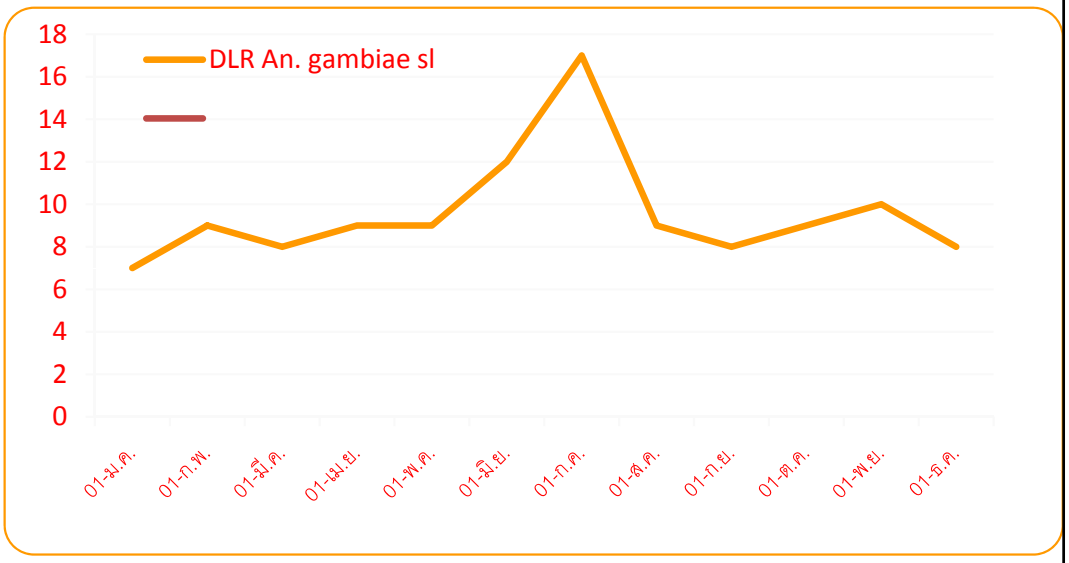
EPIDEMIOLOGICAL SURVEYS

Measuring the degree of public satisfaction as a result of the reduction of public nuisance caused by mosquito bites.

LOGO

Average larval relative density comportment in sentinels breeding places .





ACCRA

LUANDA

Application cycles were established with 2 months frequency to maintain larval control.

LOGO

Mosquitoes density/house before and after applications per submetros.

SUBMETROS	Mosquitoes Density/House before applications		Mosquitoes Density/House after applications	
	Anopheles	Culex	Anopheles	Culex
Ablekuma North	2	18.4	0.02	1
Ablekuma Central	0.8	9	0	0
Ablekuma South	1.2	10.2	0.02	0
Ayawaso East	2	10	0	0
Ayawaso Central	1	7	0	0
Ayawaso West	2.2	12	0	0.05
La	2	6	0.005	0
Osu	2.4	10.4	0.02	0.02
Okai Koi North	2	9	0	0
Okai Koi South	1	11	0	0.001
Ashiedu Keteke	2	11	0	0.005

EVALUATION OF THE RESIDUAL EFFECT OF THE BIOLARVICIDE

Monthly monitoring of sentinels breeding sites show 94.6% average effectiveness in the case of BACTIVEC and 95.2% for GRISELESF from 40 to 50 days after the application (graph # 1), coinciding with the results in the application of GRISELESF and BACTIVEC in Amazons Brazil and in part of Central America (2008, 2002).

It is very important to intensify the applications during the dry season to reduce the population density of the vector and does not increase the larvae density in the raining season.

LOGO




During the application in Accra and Luanda, we observed that the number of malaria cases started declining compaired to the same period in the previous year around to the 50-75%.

It shows how the microbial larvicide is effective and give potency to Malaria control in urban areas.

This results coincide with the application of biolarvicides combination with physical and chemical methods as vector control measures done in other region in Ghana (reported in Strategy Malaria Control Plan, Western Kenya, 2009), in the mountaineous areas with economic importance, urbans areas and other places similar to conditions in Africa.





CONCLUSIONS

1. THE USE OF BIOLARVICIDES FOR THE CONTROL OF MALARIA TRANSMITTED VECTOR IN ACCRA and LUANDA IS EFFECTIVE.

2. THE VECTOR POPULATION RATES DECREASED IN A SIGNIFICANT MANNER IN ALMOST ALL BREEDING PLACES EVALUATED.

3. THE APPLICATION OF THIS STRATEGY CONTRIBUTES TO ENHANCE THE ACHIEVEMENT OF NATIONAL MALARIA CONTROL PROGRAMME OBJECTIVES and others diseases

4. BIOLARVICIDES BACTIVEC ® AND GRISELESF ® SHOWED AN EFFICACY HIGHER THAN 90%, AFTER 50 DAYS OF ITS APPLICATION.

5. EPIDEMIOLOGICAL DATA COLLECTED IN THE PERIOD UNDER REWIEW SHOW A DRAMATIC REDUCTION IN MALARIA REPORTED CASES IN THE HEALTH FACILITIES WITHIN THE AREAS TREATED.

LOGO

CURRENTS ACTIVITIES IN OTHER COUNTRIES.

1. Nigeria. Implementation of the Malaria Control Project in River State, Pilot Test in Nasarawa and Ogun State.

2. Ouagadougou, BURKINA FASSO. Implementation of theProject for Malaria Vector Control (UEMOA).

3. Guinea Bissau. Implementation of National Project for Malaria Vector Control. signed contract.

4. Sierra Leone. Discussion about the contract.

5. Financial Support (Benin and Senegal) they have a technical decission.

6. Coté d´Ivoire: Interested in the technological transfer with ECOWAS support.

7. Guinee Conakry: Proposed the pilot project in the capital.

8. The Gambia: Task force for malaria control (Factory and Malaria Control Project).

LOGO

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MINISTERIO DE SAÚDE
DIRECÇÃO NACIONAL DE
SAÚDE PÚBLICA

Ministry of Health
GHANA

O PALU não me apanha.

PROGRAMA NACIONAL DE
CONTROLO DA MALÁRIA/ ANGOLA

LOGO


Thank You
LOGO