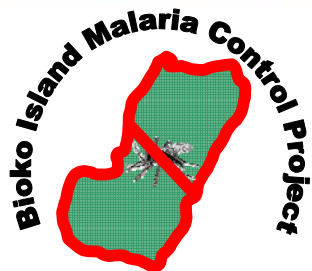


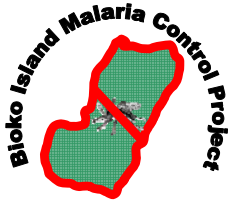
Equatorial Guinea Malaria Control Initiative

Bioko Island Malaria Control Project (BIMCP)

Partnership Framework,
Progress and Impact

Christopher Schwabe, PhD
Medical Care Development International

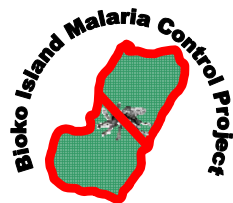




Purpose of presentation

- Nature and perceived benefits of the multi-stakeholder partnership
- Implementation progress
- Impact of 1st round of indoor residual spraying on Bioko Island

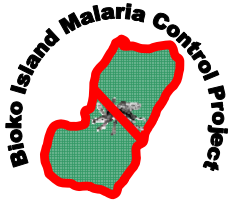




The nature and benefits of the multi-stakeholder partnership

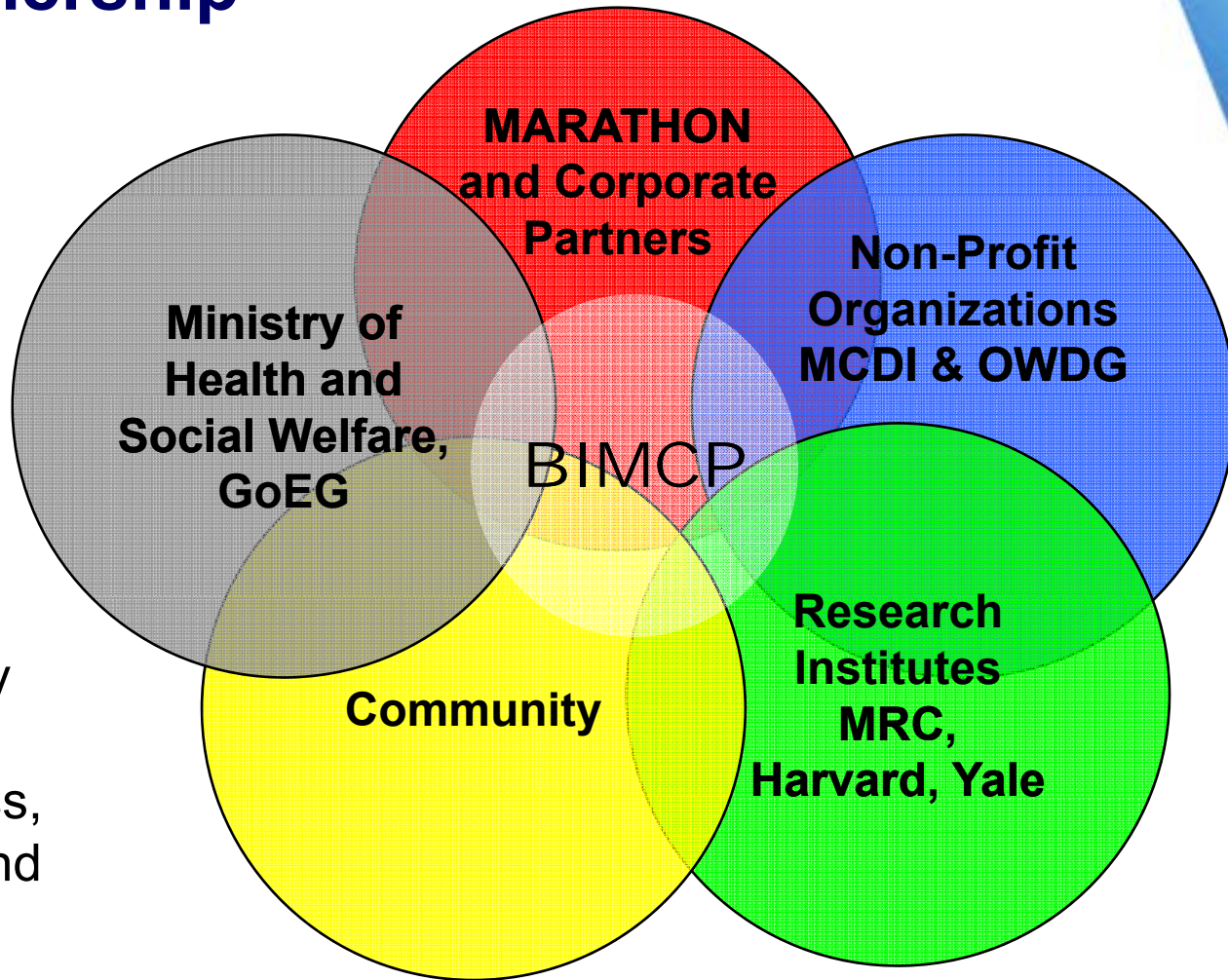


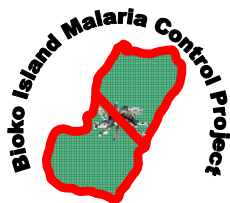
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Voluntary Multi-Stakeholder Partnership

A voluntary collaboration to promote sustainable development based on an efficient allocation of complementary resources across business, Civil society, and government



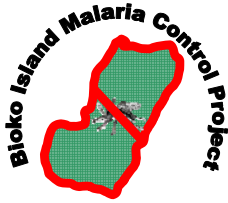


Voluntary Multi-Stakeholder Partnership



Stakeholders	Roles / Assets
Government [Equatorial Guinea]	Responsibility and Statutory Authority Policy and Legal Framework Leadership Organizational Infrastructure Access and Coverage Financing and Other Resources Commitment and Sustainability
Oil Companies [MARATHON / Noble Energy / Atlantic Methanol]	Technology / Skills / Innovation / Problem Solving Capacity Business Practice / Effective Management / Risk Assessment Political and Policy Leverage Financing Leverage (Government, Multilateral and Bilateral Donors) Financing and Other Resources Logistics
Non-Profit Organizations [MCDI / OWDG]	Knowledge of Development Context / Issues / Methods Specialized Knowledge and Practice in Social Sector Development / Poverty Alleviation Practical Country Field Experience Cost-Effective Delivery Systems Adaptability Participative, Community-Oriented Ethic and Approaches
Research Institutions [MRC / Harvard / Yale]	Technical Expertise in Research / Evaluation / Innovation Knowledge of Advanced State-of-the-Art Systems and Procedures Scientific Rigor / Methods / Credibility Education / Training Information Dissemination / Documentation
Community Organizations	Knowledge of Local Context / Conditions / Behaviors Practical Community-Based Field Experience Access and Credibility with Beneficiary Population

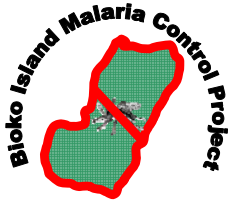




Benefits of partnering with MARATHON – A PVO Perspective

- Substantial corporate capacity / backstopping enabled rapid start-up and achievement of results
 - Effective high-level access to Government (“priority” within national strategy, “cutting through” bureaucracy, agreement to “commit” public resources, access to mass media and local political infrastructure)
 - Infrastructure (offices, warehousing, staff accommodations)
 - Management support (administrative, customs clearance, telecommunications, practical local know-how)
 - Financial commitment and budget line-item expenditure flexibility
 - Performance tracking by **MARATHON** senior management and willingness to assist where necessary or advantageous

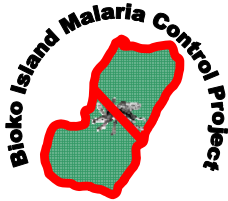




Benefits of partnering with MARATHON – A PVO Perspective

- Commitment to achieving results and strong interest in demonstrating substantive impact
 - Orientation towards the most cost-effective strategies that will yield the greatest impact (transmission reduction and disease burden reduction) in the shortest time feasible
 - Willingness to invest in IRS as core vector control strategy
 - Willingness to commit necessary resources to ensure timely, reliable and complete monitoring and evaluation to include process, output and impact performance indicators

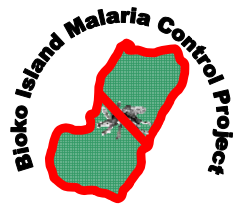




Benefits of partnering with MARATHON – A PVO Perspective

- Commitment to sustainability
 - Contractually specified progressive assumption of financial responsibility by government
 - Emphasis on early development of an Integration Strategy and Plan
 - Facilitation of Social Sector Review; Creation of Social Development Fund; Identification of Public Sector Institutional Strengthening / Sector Reform Investment Strategy to foster system-wide management improvements
 - Identification of complementary resources; Building on corporate commitment to leverage multi-lateral funds
 - Global Fund



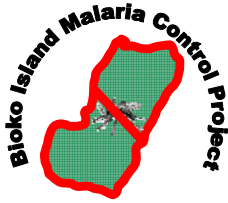


Implementation Progress

August 2003 – March 2005



[Tracking Info Here](#)



BIMCP Components

■ Direct Service Components

- Transmission Reduction / Vector Control (**V**)
- Improved Case Management (**C**)
- Information, Education and Communications (**E**)
- Surveillance Systems and Operational Research (**S**)

■ General Service Support Components

- Project Management (**M**)
- Integration and Sustainability (**I**)



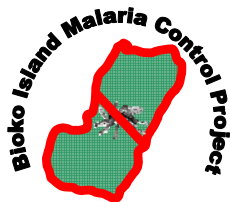


BIMCP Implementation – 2003/04 & 2005



Aug-03	Sep-03	Oct-03
<ul style="list-style-type: none"> M BIMCP launched M Reconnaissance mission to EG 	<ul style="list-style-type: none"> M Drafting detailed workplan M Workplan review with Marathon 	<ul style="list-style-type: none"> M Fielding of BIMCP field staffs M Orientation with MOH M Setting up shop S Selection of sentinel sites S Draft baseline survey instrument
Nov-03	Dec-03	Jan-04
<ul style="list-style-type: none"> M National registration of PVOs V Supplies & Equipment Procured including Deltamethrine V Warehouse renovation V Spray plan developed S GIS initiated / Satellite images S Draft baseline survey instrument pre-tested in field 	<ul style="list-style-type: none"> V Spray manual produced V Spray teams hired V/C Inventory management system C Draft treatment protocol S Window traps installed S Final performance / impact indicators defined S Baseline sampling methodology S Final baseline survey instrument S Mosquitoes sent to MRC for morphological analysis 	<ul style="list-style-type: none"> V Spray supervisors trained in South Africa / Mozambique C Draft case management manual & IEC materials produced S Drugs for baseline survey S Baseline Survey Guide S Data entry program developed S Enumerators & Advance Teams recruited S Enumerators & Advance Teams trained
Feb-04	Mar-04	Apr-04
<ul style="list-style-type: none"> V Spray team training V 1st round IRS initiated V Spray monitoring system installed S Survey Advance Teams select hh S Survey data entry program S Baseline survey conducted 	<ul style="list-style-type: none"> V 1st round IRS continues E IEC initiative to minimize refusals by households for IRS C BIMCP gets approval for new treatment protocol (OA+SP) from MOH C New treatment protocol presented to hospital physicians S Baseline survey data entry ! Detention of sprayers 	<ul style="list-style-type: none"> V 1st round IRS continues V Mid-point sprayer workshop C Laboratory assessment C RDT training for health center staffs S Cleaning of baseline survey data S RDT efficacy evaluation S Proposal for revision to patient registers as part of MIS ! National elections; restricted movement ! Impounding of project vehicles



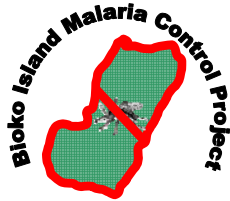


BIMCP Implementation – 2003/04 & 2005



May-04	Jun-04	Jul-04
<ul style="list-style-type: none"> V 1st round IRS continues E MOH reviews IEC draft action plan C Case management supplies & equipment procured S Cleaning of baseline survey data ! Aborted coup attempt - South Africans implicated; MRC travel curtailed 	<ul style="list-style-type: none"> V 1st round IRS continues C Pharmaceutical systems assessment conducted S Cleaning of baseline survey data 	<ul style="list-style-type: none"> V 1st round IRS continues S Cleaning of baseline survey data S Design specs for MIS reviewed with MOH; Initiate re-design process ! Change in Director General MOH
Aug-04	Sep-04	Oct-04
<ul style="list-style-type: none"> V 1st round IRS completed. 96k structures sprayed C Laboratory training curriculum / materials prepared C Clinical training curriculum / materials prepared I BIMCP assist in EG Social Needs Assessment (BSR) ! Labor relations complaint filed by several sprayers with Min Labor 	<ul style="list-style-type: none"> C Training of laboratory technicians @ hospitals and health centers C Clinical assessment of Govt health clinicians C Training of clinicians in improved malaria case management S Dr. Kiszewski visits Malabo - BRN derivation methodology; insecticide residual assay S Baseline survey analysis ! KDR isolated in Anopheles caught in window traps; Switch to 2-round spray schedule => budget adjustment required 	<ul style="list-style-type: none"> M 1st Annual Project Review Mtg V Recruitment of 2nd round spray teams V Procurement of Bendiocarb C Independent BIMCP drug warehouse set up in converted container refurbished by Marathon I BIMCP staffs help with national vaccination campaign ! BIMCP unable to come to agreement with MOH on acceptable design for patient registers ! \$ devaluation impacts cost of IRS <i>Bayer discounts Bendiocarb!</i>



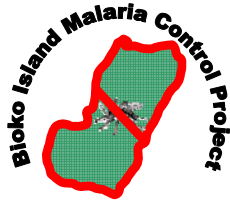


BIMCP Implementation – 2003/04 & 2005



Nov-04	Dec-04	Jan-05
<ul style="list-style-type: none"> V Spray supervisors trained in use of Bendiocarb in South Africa V Training of 2nd round spray teams E Documentary video produced for TV diffusion (Marathon/McNee) I BIMCP assist MOH in annual Action Planning process; pre-condition for release of Govt counterpart funds? I BIMCP assist MOH in organizing National HIV/AIDS Conference I BIMCP produces a draft Integration plan for review with MOH ! BIMCP compound locked-down by Govt for 2 weeks - failure to paint facade of building for visit by President Mugabe ! \$10k in drugs stolen at port 	<ul style="list-style-type: none"> C Pharmacist consultant sets up drug supplies management system and trains health facility staffs C Pharmacist consultant sets up pre-packaging production process for ACT drugs C BIMCP obtains agreement with MOH for free ACT for U15 / pregnant w. E BIMCP assists UNFPA to conduct IEC workshop - IMCI / malaria E Marathon Foundation grants \$100k for enhanced BCC interventions E IEC training session held for spray teams; 2-week IEC campaign carried out by sprayers ! Customs holds IRS vehicle ! MOH unable to identify pharmacist to co-manage BIMCP drug store ! BIMCP takes decision to print new patient registers without full agreement from all parties in MOH 	<ul style="list-style-type: none"> M WHO provides vehicles for 2nd-Round IRS M Automated drug inventory tracking system installed V 2nd Round of IRS initiated C Clinical consultant + MOH team initiates roll-out of new ACT case management in all Government health facilities C Quality assurance method for pre-packaged drugs introduced C AMPCO manufactures and donates wooden storage cabinets for drugs S New patient registers introduced; MOH likes them! S Analysis of welfare implications of 1st Round IRS conducted S Analysis of baseline survey IEC-related data conducted E IEC Action Plan updated ! Government counterpart funding for BIMCP not yet released





BIMCP Implementation – 2003/04 & 2005



Feb-05	Mar-05	Apr-05
<ul style="list-style-type: none"> V 2nd round spraying continues C Case management roll-out continues S Comprehensive supervisory protocol introduced; 1st supervision round completed S Preparations for 2nd parasitemia survey completed E IEC/BCC materials prepared for field pre-testing I MOH seeks collaboration with BIMCP for Global Fund investment in malaria control on mainland ! MIS Officer resigns; Gap in spray data impedes monitoring ! Cholera-like outbreak fo acute watery diarrhea; MOH refocuses on emergency; BIMCP assistance provided ! Anecdotal perception that refusal rate increased during 2nd round ! Complaints of higher mosquito density (<i>Culicene</i>) 	<ul style="list-style-type: none"> V 2nd round spraying continues (43k structures sprayed...) V Entomologist consultant fielded to review IRS performance C Case management roll-out completed S 2nd Parasitemia survey conducted; Data entry initiated I Planning consultant presents/reviews BIMCP Integration Plan with senior managers of MOH; Initial risk assessment undertaken ! Cholera-like outbreak continues ! BIMCP continues to have great difficulty securing visas for non-US consultants 	<ul style="list-style-type: none"> V 2nd round spraying continues C Analysis of 1st round case management supervision data completed; Feedback provided E IEC consultant pre-tests IEC/BCC materials; re-inforces MOH IEC Unit; Finalizes IEC Action Plan S Condensed supervisory protocol developed; Plans for training MOH supervisors in May 05 and subsequent roll-out completed S 2nd round parasitemia data entry completed; data cleaning initiated

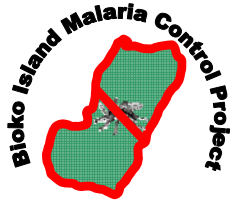




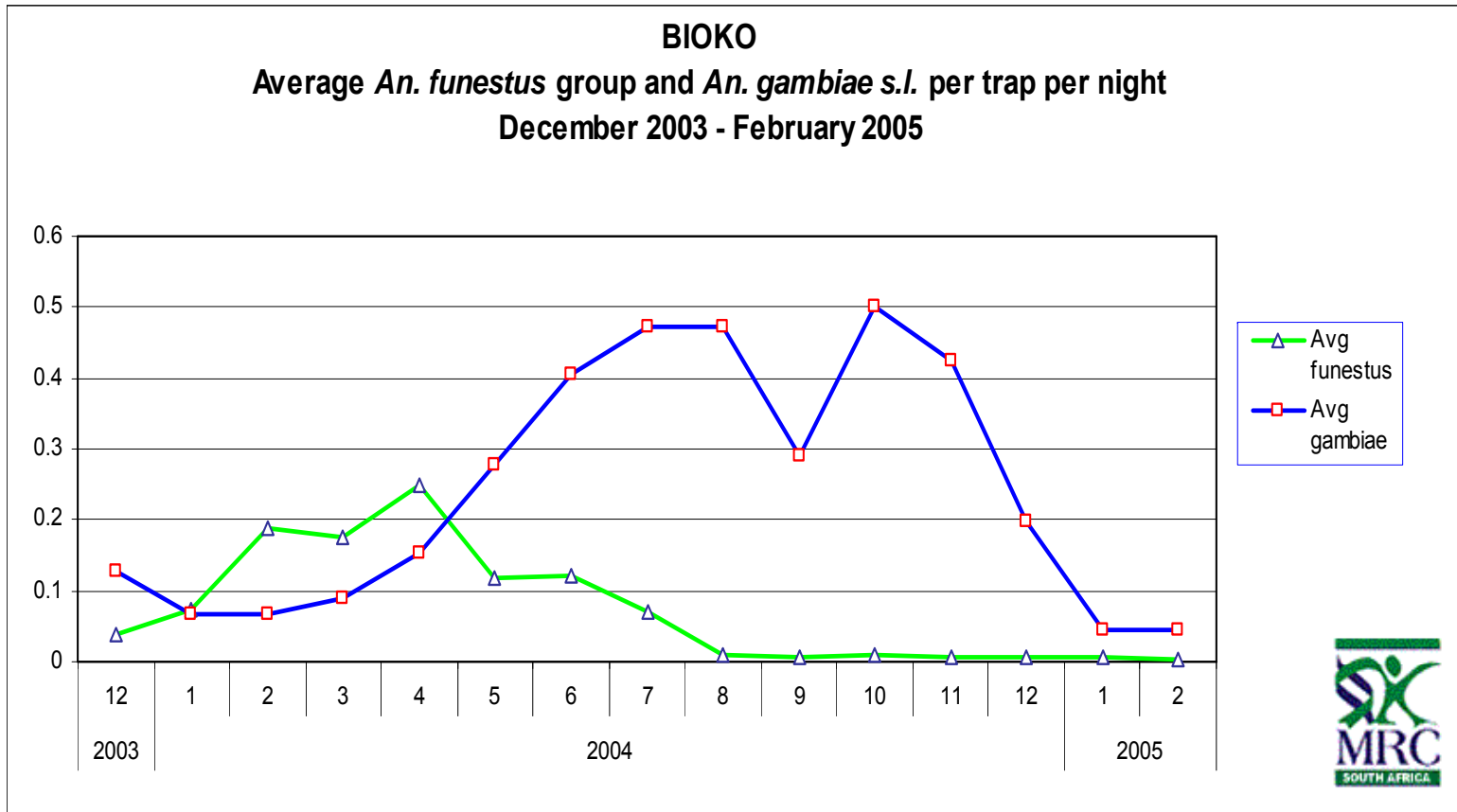
Impact of 1st Round of IRS

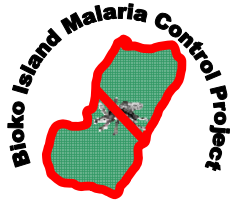


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Impact of IRS Round 1: Mosquito catch





Impact of IRS Round 1: Mosquito catch and sporozoite rates

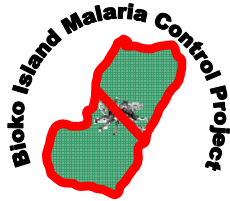
Pre-Spraying	Pre-Spraying	Post-Spraying		
		2-weeks	2-months	6-months
<i>A funestus</i>				
Average caught / 100 night per house	23.6	5.0	4.7	3.0
Proportion sporozoite positive % (n)	4.1 (364)	5.6 (72)	2.6 (154)	2.3 (217)
Estimated infective specimens / 100 nights per house	0.97	0.28	0.12	0.07
Relative change in numbers per night		0.21	0.20	0.13
Relative change in infective mosquitoes per night		0.28	0.13	0.07
<i>A gambiae sl</i>				
Average caught / 100 night per house	29.1	7.3	23.4	24.9
Proportion sporozoite positive % (n)	6.5 (705)	2.7 (112)	1.8 (386)	1.6 (696)
Estimated infective specimens / 100 nights per house	1.90	0.20	0.42	0.39
Relative change in numbers per night		0.37	0.80	0.86
Relative change in infective mosquitoes per night		0.16	0.22	0.21

4.1% -
2.3%
p=0.35

6.5% -
1.6%
p<0.001

Source: Analysis prepared by B. Sharp and I. Kleinschmidt, MRC





Impact of 1st Round IRS^a on Parasitemia Levels

Sentinel site	February/ March 2004		February/March 2005		p-value for difference
	Prevalence of infection, % (n)	95% Confidence interval	Prevalence of infection, % (n)	95% Confidence interval	
Campo Yaoude	36 (220)	28 to 44	15 (232)	10 to 21	<0.001*
Ela Nguema	39 (105)	28 to 51	30 (235)	23 to 39	0.21
Semu	54 (182)	45 to 62	35 (231)	28 to 43	0.001*
Santa Maria ¹	53 (147)	45 to 61	51 (192)	42 to 60	0.74
Central	28 (170)	19 to 38	22 (183)	16 to 30	0.34
Basacato del Oeste	62 (92)	51 to 72	44 (134)	35 to 53	0.01*
Luba	41(195)	32 to 51	38 (168)	30 to 47	0.66
Batete	51(162)	42 to 61	15 (159)	10 to 23	<0.001*
Riaba	58 (84)	48 to 68	54 (186)	46 to 62	0.53
Sampaka	40 (181)	32 to 48	36 (162)	28 to 46	0.59
Sacriba	60 (131)	49 to 71	58 (182)	50 to 65	0.7
Musola	44 (144)	33 to 55	13 (158)	7 to 21	<0.001*
Bilelipa	48 (94)	38 to 58	50 (104)	39 to 61	0.78
Rebola	46 (158)	38 to 53	21 (175)	16 to 28	<0.001*
Bakake Grande	55 (182)	47 to 63	25 (159)	17 to 34	<0.001*
All	46 (2247)	41 to 52	33 (2660)	25 to 42	0.002*
All (excluding Santa Maria)	46 (2100)	40 to 52	32(2468)	24 to 41	0.002*

Notes: (Analysis by Dr. Kleinschmidt (MRC) from data gathered by Dr. Torrez (MCDI))

(1) 2004 survey carried out in June

* change since 2004 statistically significant

These are preliminary results based on 14 of 17 sentinel sites.

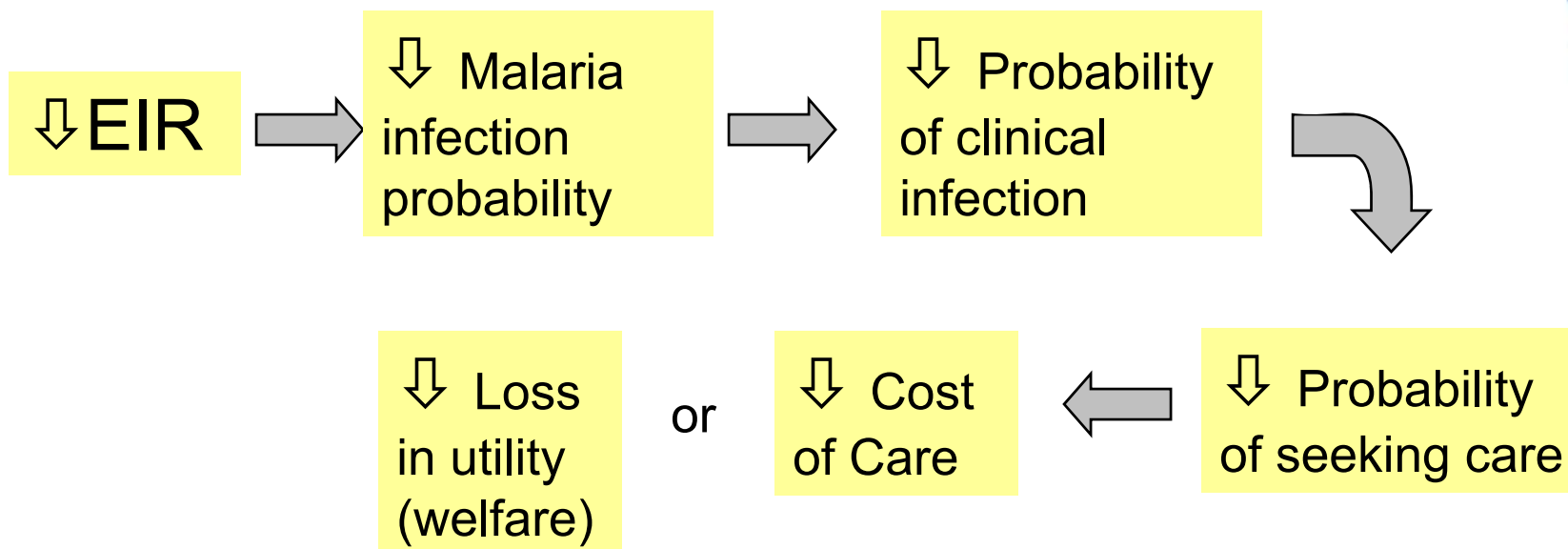
The overall Odds Ratio comparing 2005 with 2004 is 0.55 [95%CI 0.39 to 0.77]

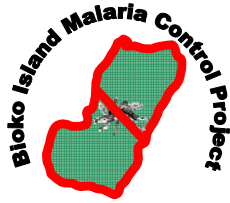
(a) Includes 1 month of ACT





Methodology for assessing impact of IRS on household welfare

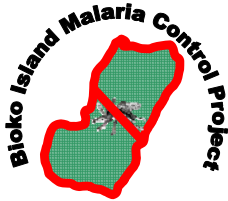




Methodology for assessing impact of IRS on total welfare of population

$$\begin{aligned} \text{Total Impact} &= \text{Total Net Benefit from IRS} = \text{Total Net Reduction in Economic Burden} \\ &= \text{Total Economic Burden of Malaria Pre-Spraying} - \text{Total Economic Burden of Malaria Post-Spraying} \end{aligned}$$





Impact of IRS on EIR

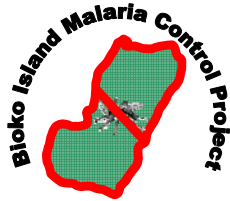
Relative Δ in EIR $\left| \begin{array}{l} \approx \text{Relative } \Delta \text{ in} \\ \text{Sporozoite} \\ \text{Rate} \end{array} \right. \times \text{Relative } \Delta \text{ in} \left| \begin{array}{l} \text{Number of} \\ \text{mosquitoes} \\ \text{trapped per} \\ \text{night} \end{array} \right. \left. \begin{array}{l} \text{Proxy for} \\ \text{ma (human} \\ \text{biting rate)} \end{array} \right.$

0.22 | 0.13 \approx 0.27 | 0.63 \times 0.8 | 0.2

	A g	A f	Weighted Average
<i>Pre-Spraying</i>			
Mean daily EIR	0.795	1.405	1.069
<i>Post-spraying</i>			
Relative Δ in EIR	0.22	0.13	
Mean daily EIR	0.175	0.183	0.176

Source: Pre-spraying: Cano et al (2004); Post-spraying: BIMCP - MRC





Impact of Δ in EIR on Malaria infection probabilities

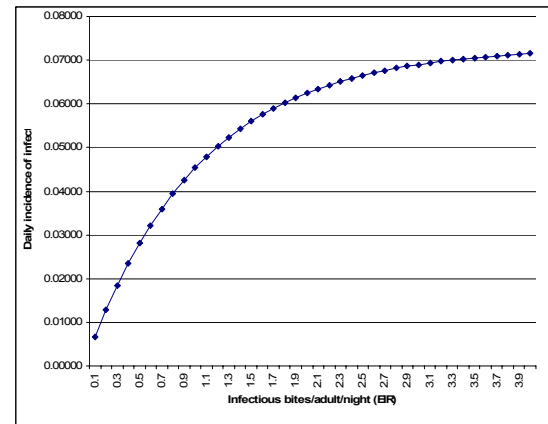
Smith et al (2004) propose estimating daily malaria infection probabilities from daily EIR as follows:

$$h_{0.5-6} = g [1 - \exp (-\beta \times \text{Daily EIR}_{20-25})]$$

$$h_{0-6} = 0.073 [1 - \exp (-0.97 \times \text{Daily EIR})]$$

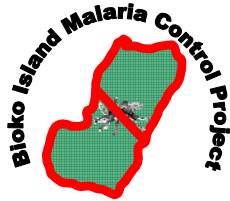
$$h_{7+} = h_{0-6} \times (m_{7+} / m_{0-6})$$

$$h_{7+} = h_{0-6} \times (0.06 / 0.17)$$



	Daily EIR	h_{0-6}			h_{7+}		
		Mean	95% CI		Mean	95% CI	
Pre-spraying	1.069	0.047	0.021	0.075	0.017	0.007	0.027
Post-spraying	0.176	0.011	0.004	0.021	0.004	0.001	0.008
Relative Δ	0.16	0.24			0.24		





Impact of Δ in Malaria infection probabilities on probability of clinical infection

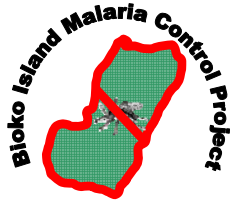
The impact of a change in the probability of an infection on the probability of a clinical infection* :

$$c_i = 1 - (1 - h_i)^{\text{(Daily EIR X 365)}}$$

	C_{0-6}			C_{7+}		
	Mean	95% CI		Mean	95% CI	
Pre-spraying	1.000	1.000	1.000	0.999	0.947	1.000
Post-spraying	0.512	0.229	0.741	0.229	0.090	0.385
Relative Δ	0.51			0.23		

* As suggested by Dr. Kiszweski, Harvard School of Public Health





Estimating economic burden from the treatment of malaria

■ Cost-of-illness methodology

■ Direct costs

- Private costs of seeking care/diagnosis/treatment + private cost to family members accompanying and caring for patient + *Government subsidies*

■ Indirect costs

- Foregone income to patient and family + *foregone income due to death + monetary equivalent of pain and suffering*

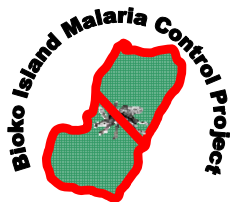
■ Willingness-to-Pay (Compensating Variation)

- *Amount of income an individual would need to be compensated to maintain utility at same level after having borne the direct and indirect costs of illness*

- *Small and Rosen (1981)*

	Cost-of-illness method (\$ per hh per month)				Willingness-to-pay (\$ per hh per month)	WTP as % hh Inc
	Direct Cost	Indirect Cost	Total Cost (TC)	TC as % hh Inc		
Mean	\$ 33.33	\$ 3.09	\$ 36.42	4.42%	\$ 40.43	5.94%
Median	\$ 17.67	-	\$ 17.67	3.47%		



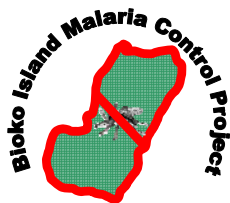


Distribution of income

- 10% live in absolute poverty (nutritionally evaluated @ \$1.08/day)
- 30% live in relative poverty (nutritionally evaluated @ \$2.01 per day)
- Not “severe” (>50% of population living on less than \$1 per day)
- Not “moderate” (>75% of population living on less than \$2 per day)

Deciles of Per Capita Income	Mean Annual Household Income	Share of Total Annual Income	Mean Annual Income Per Capita
	US \$		US \$
Poorest 1	2,501	0.03	283
2	3,355	0.04	464
3	3,985	0.05	603
4	4,806	0.06	730
5	5,452	0.06	868
6	5,875	0.07	1,023
7	7,020	0.08	1,213
8	7,693	0.09	1,422
9	9,308	0.11	1,855
Wealthiest 10	36,180	0.42	6,830
<i>Total</i>	<i>8,589</i>		<i>1,524</i>
Legend:	Households below the absolute poverty line		
	Households below the relative poverty line		



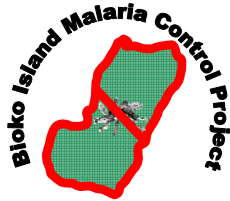


Incidence of malaria burden

- Malaria has a negative impact on welfare of all households but particularly the poorest
- The burden from malaria is “catastrophic” for households in the bottom 40% of the population

Quintile of per capita household income	Cost-of-illness method (\$ per hh per month)	TC as % of hh Inc	Willingness-to-pay (\$ per hh per month)	WTP as % of hh Inc
Poorest 1	\$ 28.22	10.9%	\$ 23.10	9.0%
2	\$ 31.16	8.2%	\$ 31.15	8.2%
3	\$ 26.18	5.4%	\$ 21.69	4.5%
4	\$ 40.31	6.2%	\$ 30.74	4.8%
Wealthiest 5	\$ 43.42	2.4%	\$ 57.51	3.2%





Impact of 1st Round Spraying on welfare of Biokans

Estimated Benefit Incidence of 1st Round IRS

Quintile of per capita household income	Estimated Reduction in Malaria Cases per Year			Estimated Net Reduction in Economic Burden (\$ millions)			Net Burden Reduction as % of Total Annual Income		
	Mean	95% CI		Mean	95% CI		Mean	95% CI	
Poorest 1	32,420	23,284	41,969	1.60	1.18	2.02	6.1%	4.5%	7.7%
2	34,184	22,453	47,463	1.73	1.16	2.35	4.5%	3.1%	6.1%
3	27,669	19,498	36,392	1.51	1.11	1.90	3.0%	2.2%	3.8%
4	30,617	22,326	39,118	2.00	1.65	2.29	3.1%	2.6%	3.6%
Wealthiest 5	37,715	28,622	46,471	4.32	5.35	3.21	2.3%	2.9%	1.7%

Benefit-Cost Ratio of 1st Round IRS

Total Cost 03-04: \$2.29 million

Total Benefit 03-04: \$10.8 million (95% CI: \$9.29m - \$13.16m)

Benefit-Cost Ratio: 4.1 (95% CI: 4.0 - 5.7)

