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**Cost-effectiveness of the national program  
against Malaria in Madagascar**

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This work was part of the PALEVALUT project, funded by the French Initiative 5 %—Expertise France (N° 12INI210) of which the objective was to estimate the effectiveness of the anti-malaria fight strategies.

It included researchers from different disciplines (epidemiology, parasitology, anthropology, economy, biology) and was conducted in four countries: Benin, Cameroon, Côte d'Ivoire, Madagascar.

For each discipline, the same standard methodology (framework) was applied in all the studied countries

Results from Madagascar



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## Background

- ✓ From 2000 to 2011, Madagascar has registered progress in the fight against malaria
  - the incidence went down from 9% in 2000 to less than 1% in 2013;
  - morbidity decreased from 19% to 6.5%; mortality from 17% to 10%; under five morbidity from 21.6% to 6.8%
  - was considered to be on the path of the elimination in several provinces
- ✓ However,
  - malaria remains the second leading cause of infant mortality (Ministère de la santé, 2014).
  - the downward trend was reversed in 2012 and continued in 2013.



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## Evolution of the number of confirmed malaria cases and rainfall between 2009 and 2013

- ✓ 2009 – 2011: Decrease of the number of confirmed cases (about 14.5%) and of rainfall
- ✓ 2012 – 2013: Increase of the number of confirmed cases and increase of rainfall

	2009	2010	2011	2012	2013
<b>Confirmed malaria cases</b>	299 094	293 910	255 814	<b>395 149</b>	<b>382 495</b>
<b>Rainfall(mm)</b>	1427.34	1347.92	1255.93	<b>1368.11</b>	<b>1572.61</b>

Source: WMR 2010, 2011, 2012, 2013, 2014; WB; <http://www.gadm.org/country>

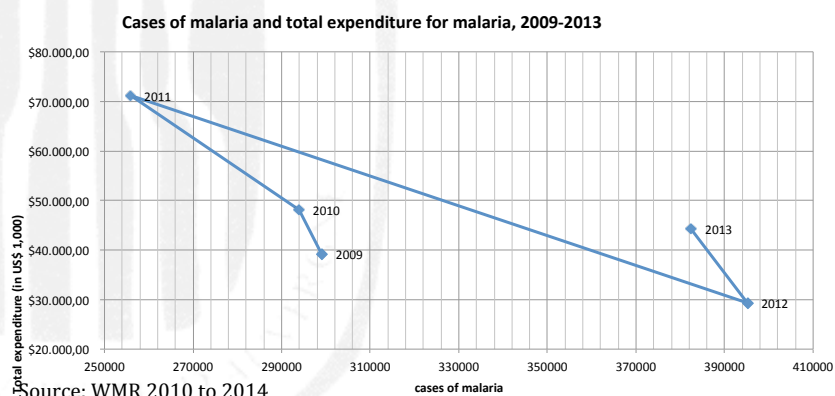


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## Evolution of confirmed malaria cases and NMCP expenditures between 2009 and 2013

There is also a high negative relationship between malaria program expenditures and the confirmed malaria cases ( $r = -0.77$ ).



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## Data and method of costs estimation

Data used for the costs estimation were from the National Malaria Control Program database and the World Malaria Reports.

The studied period, 2009-2013, was chosen as it correspond to the two NMCP strategic plans implementation: October 2008-June 2012 and October 2009-June 2013 (MSP, 2008, 2009).

The cost analysis requiring a cost breakdown per strategy, per activity and per input (Drummond, McGuire, 2001).



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Table below shows an example of the followed standard method of cost estimation

Sponsor	Total	Strategy																	
		Administration				Epidemiological follow up				Prevention									
		S/P/C	SS	RO	O	IEC		Indoor aspersions		Impregnated Bednet		IPT							
Input					RC	O	CB	O	CB	IP	O	CB	IP	O	CB	IP	O		
1	Human Resources																		
	Local HR																		
	remuneration	Σ																	
	bonus	Σ																	
	Technical assistance	Σ																	
	honoraires	Σ																	
	per diem	Σ																	
	transports	Σ																	
2	Drugs	Σ																	
3	Health products	Σ																	
4	Purchase of goods and services for	Σ																	
	Formation	Σ																	
	Distribution/Provision	Σ																	
	Medias	Σ																	

CB: Capacity building; IP: Inputs purchase; O: other ; S/P/C: Strategy, planning, coordination ; SS : supervision



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## Results: Cost of malaria program 2009-2013

Total cost of the program : 165.856.346.000 Ariary (about 43 million euros)

Decomposition per strategy:

Education-communication = 6.585.133.000 (3%);

**Indoor residual spraying (CAID) = 75.915.060.000 (46%);**

**Insecticide-treated mosquito net (MILD) = 83.158.941.000 (49,5%);**

Intermittent preventive treatment (TPI) = 197.212.000 (0.1%)



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### Cost-effectiveness of malaria program 2009 - 2011

- ✓ The cost-effectiveness of the program was calculated for the period 2009-2011.
- ✓ The number of averted malaria cases was 43,280 while the total cost of the program was \$144,922,243.

The total cost per averted case was \$ 3348.

- ✓ Between 2009 to 2011, the GDP per capita fluctuated between 420\$ to 430\$. The mean cost of each averted malaria case equals 7.9 times GDP per capita.



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### Cost-effectiveness of malaria program (2009-2011)

Cost and epidemiological data were also collected at a district level through household and health facilities survey.

It allowed to estimate the number of averted malaria cases thanks to the program while taking into consideration the increase in rainfall.

Results are in the Table below



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## Cost-effectiveness of malaria program

Tableau 17 : Cost-effectiveness of the two main strategies against malaria (cost in Ariary) in two districts

Intervention	Population nationale visée	Population du district	Coût de production niveau national	coût de production niveau District	Coût de consommation des stratégies par les ménages	Coût total	Coût cas évités	Coût net	Nombre de cas évités	RCE
District d'Ankazobe										
MILD	13218942	138272	132519222,7	1386169,8	1218,8	1387388,6	76233,2	1311155,3	4353,0	301,2
CAID	2038005	138272	79966724,3	5425481,7	0,0	5425481,7	13541,2	5411940,5	7732,0	699,9
CAID+MILD	1826942	138272	212485946,0	16081986,6	1218,8	16083205,4	62684,4	16020520,9	3579,0	4476,3
District de Brickaville										
MILD	13218942	187629	132519222,0	1880971,2	428,2	1881399,4	456478,3	1424921,1	14490,0	98,3

Sources : WMR, 2009, 2010, 2011, 2012, 2013, Enquêtes transversales, 2014, calcul des auteurs



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## Cost-effectiveness of malaria program district level 2009-2013

Results show that in the two districts:

- the use of LLINs (MILD) remains the most cost-effective strategy.
- In the district which received both types of strategies, an averted case by use of CAID costs 2.3 times more than an averted case by the use of LLINs.



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## Discussion

Several factors contributed to the malaria resurgence up to 2012

- ✓ Rainfall was abundant in 2012, and contributed to vectors proliferation.
- ✓ Program deficiencies were observed concerning preventive and curative activities.
  - Bed nets life duration was below as expected
  - Proportion of households with at least one MILD decreased from 80% in 2011 to 68% in 2013 (INSTAT, 2013).



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## Discussion

- ✓ The program strategy changed for indoor spraying:
  - the trend was to reduce the IRS only on target zones;
  - problems on insecticide supply chain occurred
- ✓ Curative strategy
  - shortcomings were noted in the coordination of the medicines allocation and distribution;
  - deficiencies were also noticed in the treatment of patients who have joined the health facilities late.



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## Conclusion – point of views

- ✓ On external donors : despite recent increase in malaria cases (due to climate) and some deficiencies in the NMP program, it deserves to be financially supported by external donors in contributing to help Madagascar to achieve malaria elimination (considered in the path)
- ✓ On a national level, important challenges including a good coordination of actions of the different entities by the NMCP need to be addressed. In fact, we faced to a multitude of actors on the field who do not always cooperate, which has at least three disadvantages: waste of resources, lack of transparency and incomplete data



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Thank you for your attention



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