

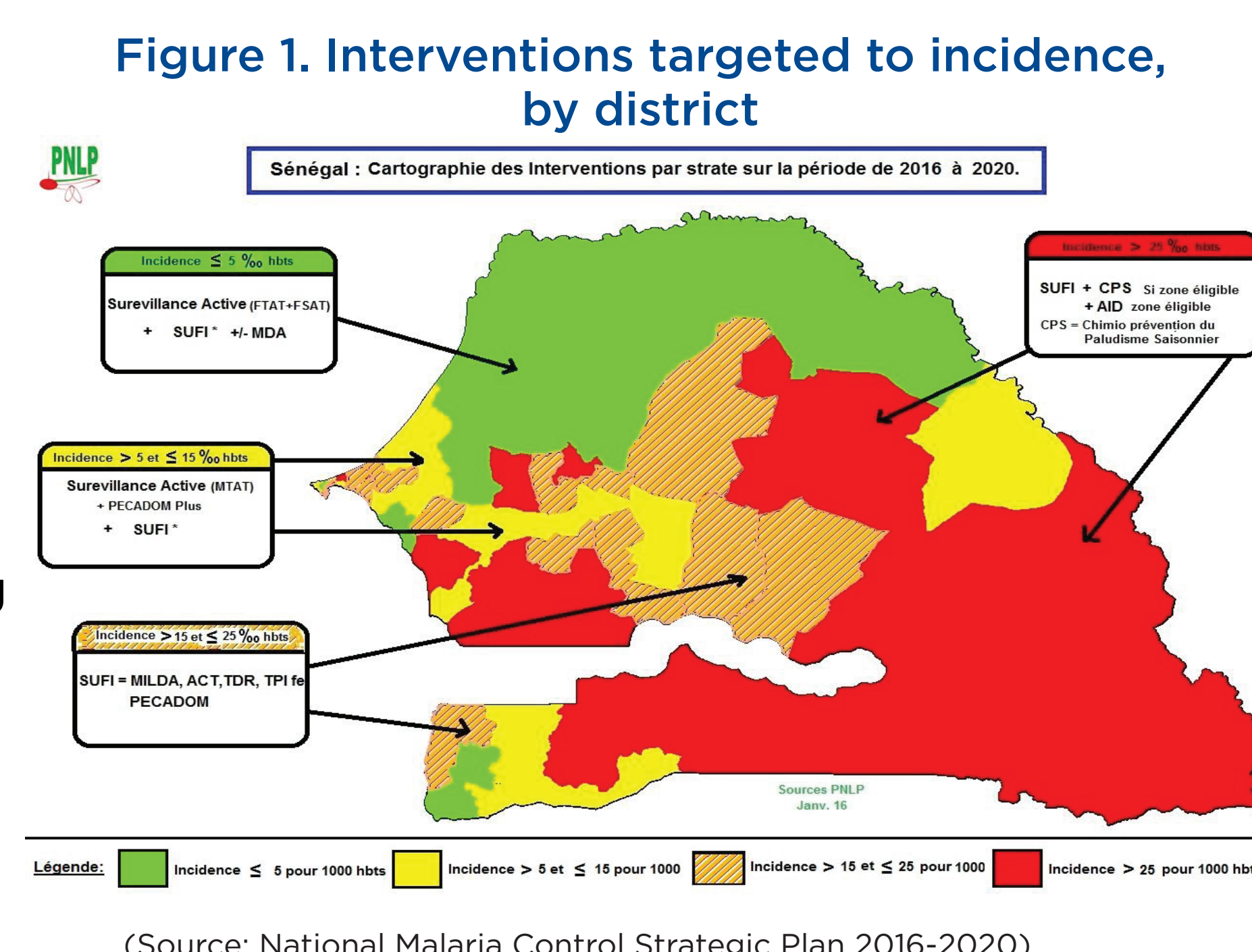
Cost and Effectiveness Analysis of “Strategically Packaging” Malaria Interventions - Evidence from a Retrospective Analysis in Senegal

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Background

- As countries strive to achieve malaria elimination in a context of limited resources, understanding the cost-effectiveness of interventions is critical.
- However, policy makers and planners lack reliable and country-specific cost and cost-effectiveness analyses (CEA) that could be used to identify efficient combinations of interventions leading to rapid progress towards malaria elimination.



Objectives

- Estimate cost effectiveness ratios (CER) for different packages of malaria interventions in Senegal using routine national program and health information system data, as opposed to modelling.
- Compare those cost-effectiveness ratios (CERs), measured as the cost per disability adjusted life year (DALY) averted, to identify potential efficiency gains and to draw lessons as malaria epidemiology continues to evolve in Senegal.

Data

- Retrospective analysis focused on 2013-2014: the first two years where the described interventions packages were all ongoing
- District level data for all of Senegal 76 districts
- Costing analysis from the provider's perspective; only including direct financial implementation costs
- Data on number of malaria cases and number of malaria related deaths were provided by the NMCP
- Coverage/output and costs data for each intervention were obtained from NMCP or from implementing partners

Table 1: Output measures and data sources for each intervention

Interventions	Output Measures	Data Sources
LLINs	# of nets distributed through mass campaigns and routine distribution, % of net possession in households	DHS, IntraHealth M&E data/routine NMCP data
IPTp	# of pregnant women who received at least two doses	routine NMCP data
RDTs/ ACTs	# of cases tested / # of cases confirmed and treated (health facility)	routine NMCP data
PECADOM	# of cases tested / # of cases confirmed and treated (community)	routine NMCP data
SMC	# of children protected-who received the required 3 doses	routine NMCP data
IRS	# of structures sprayed / # of individuals protected	PMI AIRS project M&E data/routine NMCP data
RCI	# of cases tested/# of cases confirmed and treated	ATH-MACEPA M&E data/routine NMCP data

Methods

- Total annual costs for each intervention were obtained using a mix of top down and bottom up approaches. Interventions costs were then aggregated to obtain package costs
- Effectiveness of the packages was measured by the number of DALYs averted per 1000 population in the districts of implementation
- The cumulative costs of a package in its area of implementation (control or elimination areas) was divided with the number of DALYs averted to obtain its CER
- Expected logical pathway between the implementation of malaria packages and effectiveness

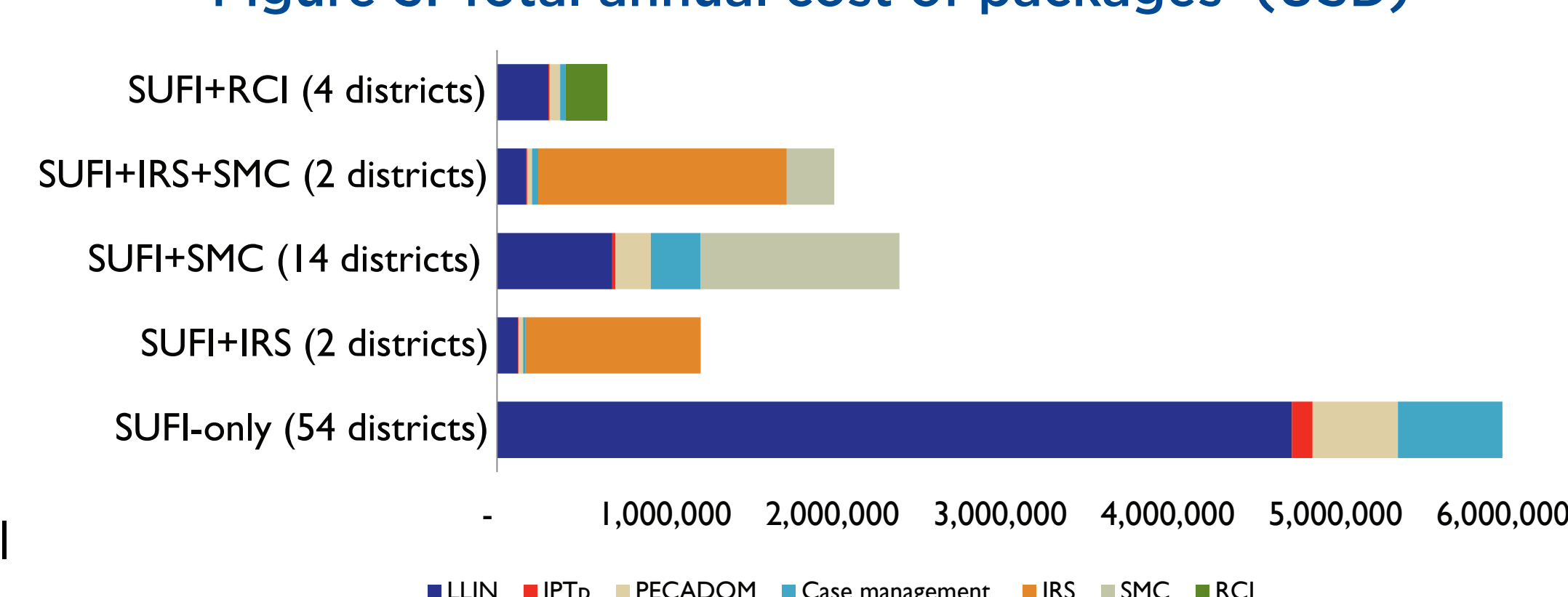


Results

Interventions/Packages Total Costs

- SUFI only has the highest total cost with LLINs accounting for almost 80 % of that costs.
- SUFI (LLINs, IPTp, case management, PECADOM) is the largest component of all other packages except in the packages with IRS.
- In the SUFI+SMC package, SUFI and SMC each account for about 50% of total costs.

Figure 3: Total annual cost of packages (USD)



Interventions/Packages Unit Costs

- The prevention interventions have a lower unit cost than the treatment ones.
- IRS has the highest unit cost among preventive interventions and RCI has the highest one among treatment interventions.
- The packages with IRS have the highest unit cost.
- SUFI only have the lowest unit cost.

Table 2: Unit Costs by intervention

Intervention Type	Unit Costs per Beneficiary (USD)	Intervention Type	Unit Costs per Beneficiary (USD)
Prevention			
IRS	3.57	PECADOM	9.25
LLIN	0.91	RCI	9.82
SMC	2.38	Case management	1.43
IPTp	0.56		

Table 3: Unit Costs by package

Packages	Unit cost per capita* (USD)
SUFI+SMC+IRS	4.55
SUFI +IRS	4.19
SUFI +SMC	1.52
SUFI +RCI	1.09
SUFI only	0.54

*Unit cost is calculated using the population of the areas where a package is implemented

Package Effectiveness

- There was a decrease in malaria burden over the period 2013-2014 for all indicators
- Packages with SMC had the largest decrease in incidence

Table 4: Malaria burden changes over study period by package

Package	Number of districts	Average baseline incidence rate*	Change in average incidence rate	Average baseline mortality rate*	Change in average mortality rate	Average baseline DALYs rate*	Change in average DALYs rate
SUFI only	54	36.1	-31.9%	0.07	-33.4%	4.61	-33.3%
SUFI + IRS	2	29.2	-37.6%	0.11	-78.8%	6.84	-78.3%
SUFI + SMC	14	264.1	-52.6%	0.46	-73.7%	28.30	-73.1%
SUFI + SMC + IRS	2	79.8	-52.2%	0.29	-88.9%	17.68	-88.3%
SUFI + RCI	4	35.9	-52.0%	0.03	-7.6%	1.99	-9.8%

*Incidence, mortality, and DALYs rates are respectively in number per 1,000 population. The comparison is over the period 2013-2014.

Package Cost Effectiveness

- Using the WHO guidelines, we conclude that all packages are “very cost effective” (CER less than the country GDP per capita of \$1,067) except for the SUFI+RCI package which is just “cost effective” (CER less than 3 times the GDP per capita).
- Relatively to packages in control areas, SUFI+SMC is the most cost effective.

Table 5: Cost effectiveness ratios by malaria package

Packages	Cost per DALY averted	Sensitivity analysis*	
		Lower value	Upper value
Sufi only	130	103	235
Sufi+IRS	582	456	836
Sufi+SMC	76	61	113
Sufi+SMC+IRS	272	217	376
Sufi+RCI	1,591	1,119	3,237

- The results of this study suggest that Senegal's strategy of deploying interventions in packages based on area incidence is effective because malaria burden decreased for all packages during our study period (2013-2014). Moreover, our study findings show that all packages used in Senegal are cost effective according to the WHO threshold
- The cost per DALY for the SUFI+RCI package provides insights into the short term costs and corresponding outcomes of malaria interventions targeting elimination areas
- Strong systems for collecting data on disease surveillance and intervention outcomes (like the one in Senegal) are needed for conducting such country specific studies and inform decision making, especially as a country moves towards elimination

Acknowledgements

We would like to express our sincere gratitude to the staff at the National Malaria Control Program and the Ministry of Health. We also like to thank the staff from the Pharmacie Nationale d'Approvisionnement (PNA), the Institut de Recherche pour le Développement (IRD), and the Institut de Santé et Développement (ISED) at Université Cheikh Anta Diop, for their kind collaboration. As well as the staff of various malaria implementing partners in Senegal (IntraHealth, PATH/MACEPA, ChildFund, ADEMAs, Abt Associates/AIRS). We are very grateful to Moussa Dieng, and to the Abt Associates staff in Senegal, without whom data collection would not have been possible.

