

# World Malaria Report 2010 and The Global Plan for Artemisinin Resistance Containment (GPARC)

RBM Board Meeting  
Lusaka, Zambia  
6 December 2010



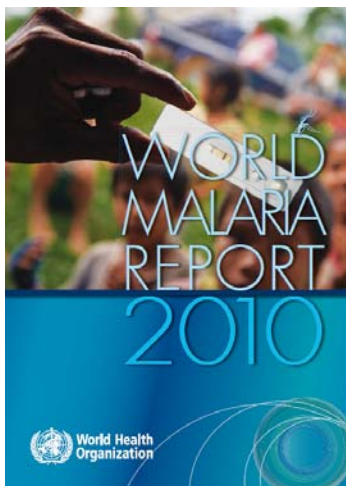
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Robert D. Newman, MD, MPH  
Director, Global Malaria Programme



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## World Malaria Report 2010



- Comprehensive annual reference on the status of global malaria control & elimination
- Principal data source is national programs in 106 endemic countries with support from: WHO Regional offices, ACT Watch, CDC, Global Fund, IHME, IRI, JHU, RBM, Tulane University
- Summarizes key malaria targets & goals
- Documents trends in financing, intervention coverage and impact (malaria burden)
- Provides country-by-country summaries
- 2010 Report due for release on 14 December
- Completely updated from 2009 report
- Updates malaria burden estimates for entire decade: 2000-2009

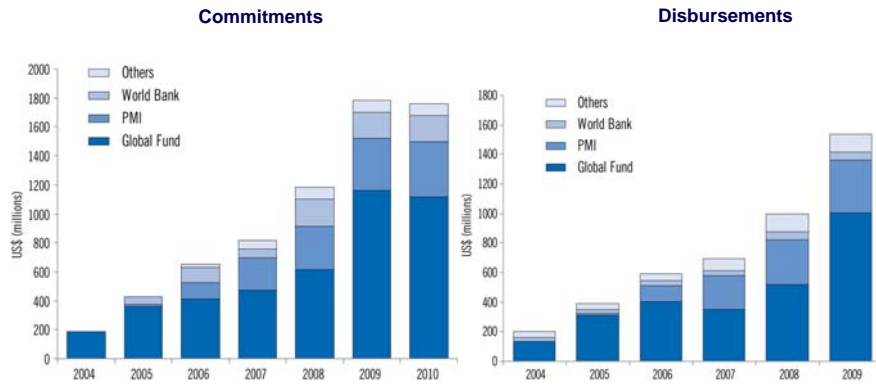


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## International funding for malaria (millions)



Source: GF, PMI, OECD

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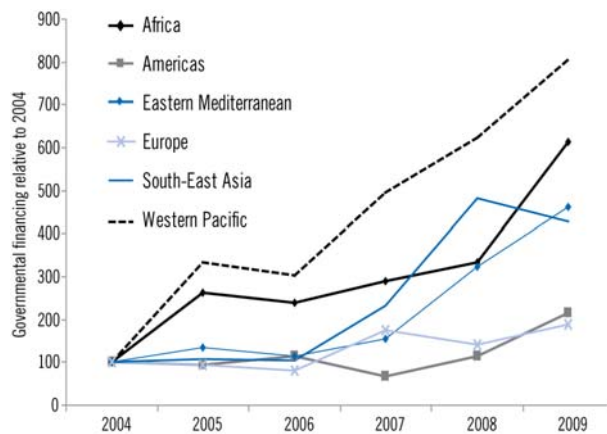


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## Trends in domestic funding for malaria



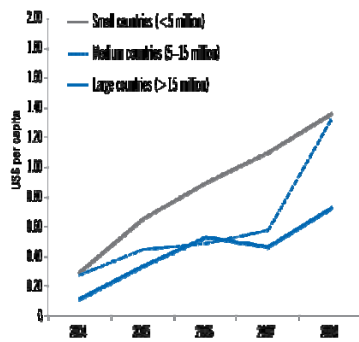
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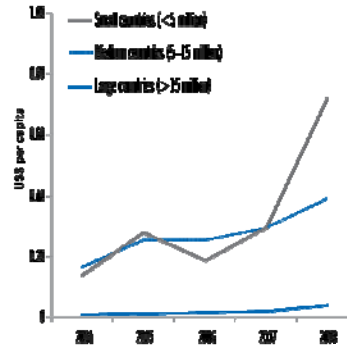
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## International funding per person at risk by size of population at risk

### WHO African Region

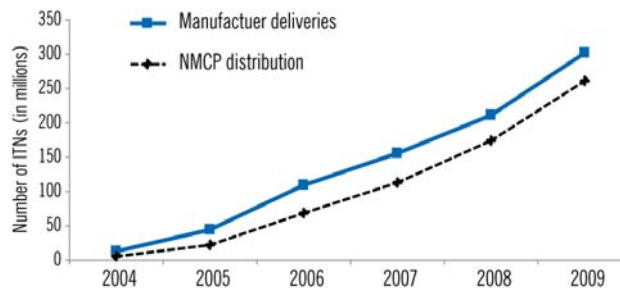


### Outside WHO African Region



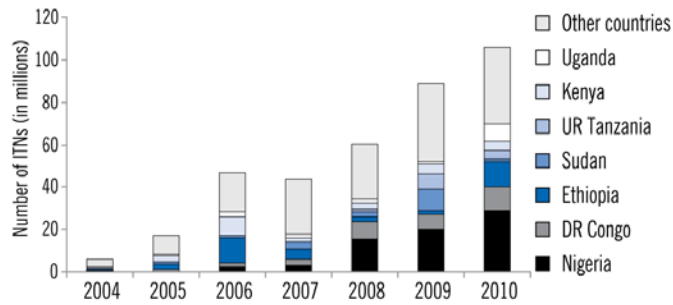
Source: IHME database with amendments to PMI and World Bank disbursements

## Cumulative number of ITNs delivered: sub-Saharan Africa



Source: AMP records of nets procured and GMP records of nets distributed

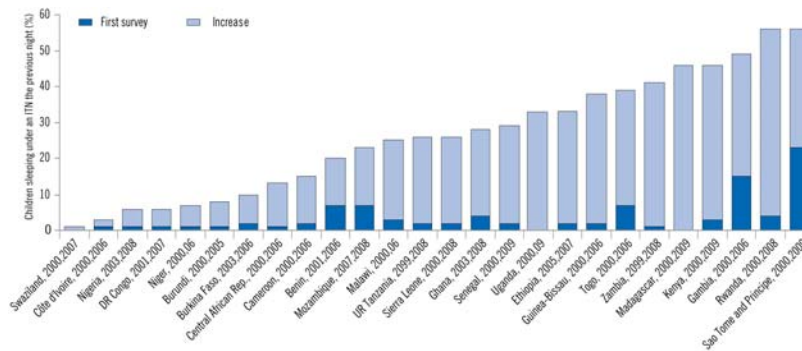
## Number of ITNs delivered by manufacturers to countries in sub-Saharan Africa



Seven countries account for >50% ITN deliveries

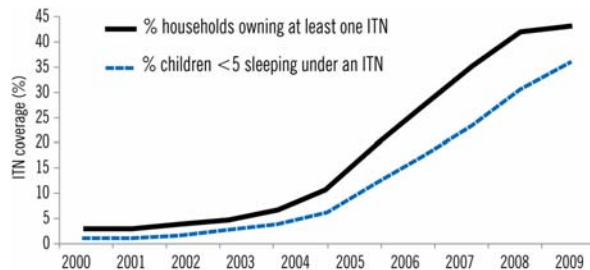
Source: AMP records of nets procured

## Trends in % of children sleeping under an ITN for countries with more than one survey, 2000–2009



Source: Household surveys (DHS, MICS, MIS)

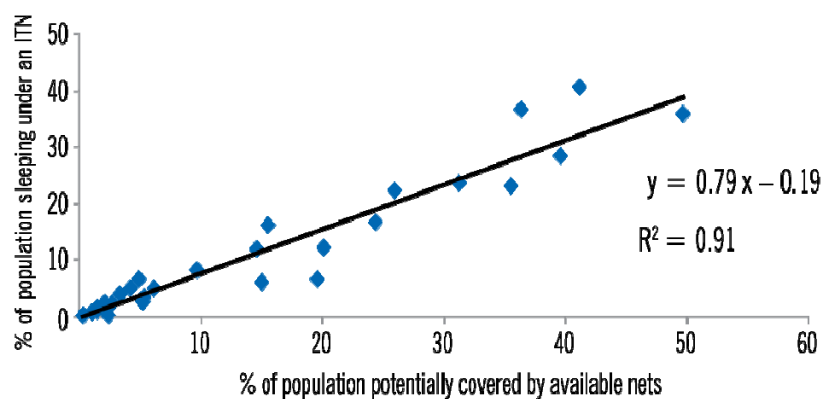
## Model based estimate of ITN coverage in sub-Saharan Africa



- 42% of households owned at least one ITN by mid 2010
- Household ITN ownership reached more than 50% in 19 African countries
- 35% of children <5 years old slept under an ITN

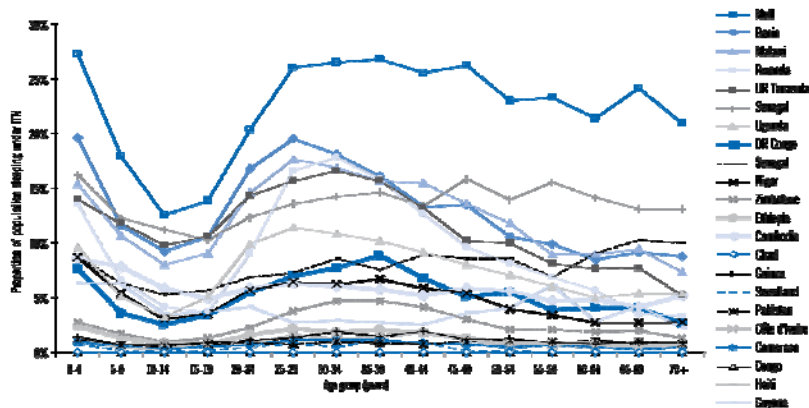
Source: Model developed by IHME using information from household surveys, nets procured from manufacturers and nets distributed by malaria programs.

## Relationship between % of population sleeping under an ITN and % with access to an ITN



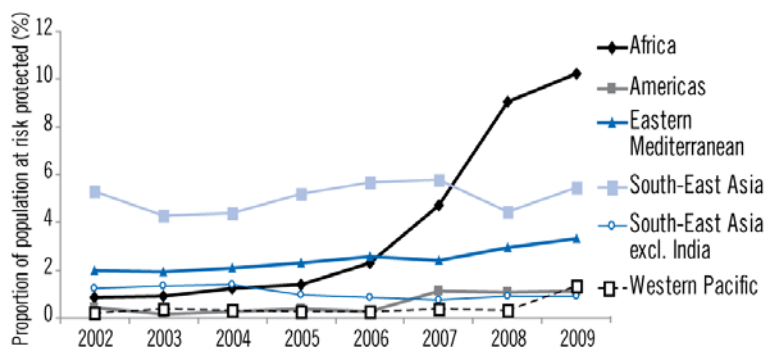
Take home message: ITNs are used to 80% of capacity

## Differences in ITN use by age group



Take home message: Persons aged 5-25 years are least likely to use an ITN

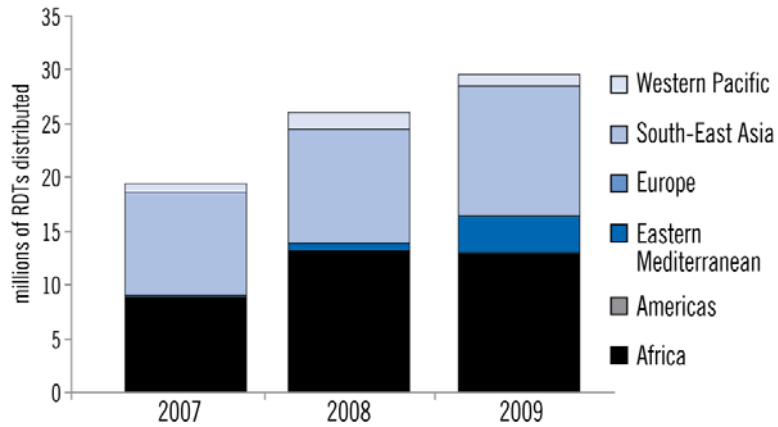
## Proportion of population at risk protected by IRS



The number of people protected by IRS increased from 13 million (2005) to 75 million (2009) in sub-Saharan Africa

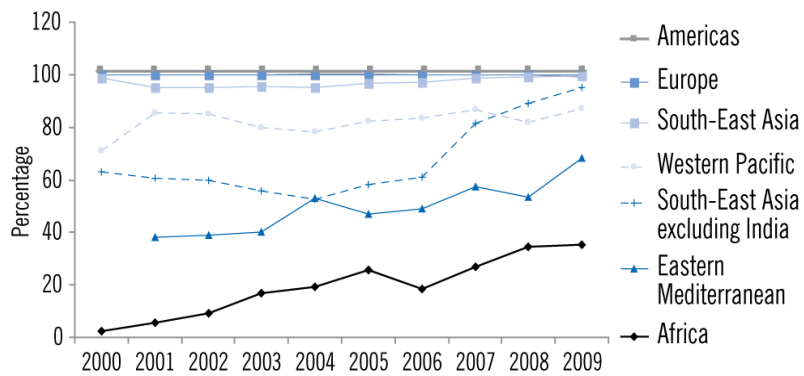
Source: malaria endemic countries

## RDTs distributed by WHO Region



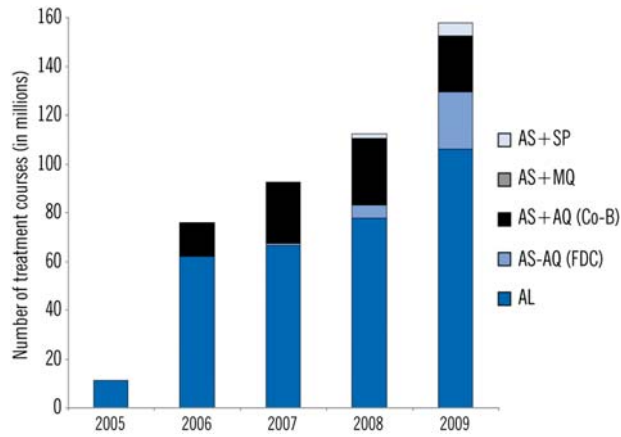
Source: malaria endemic countries

## Proportion of suspected malaria cases at public health facilities receiving a parasitological test



Based on cases reported to WHO: %'s biased upwards since countries reporting tend to undertake more case confirmation.

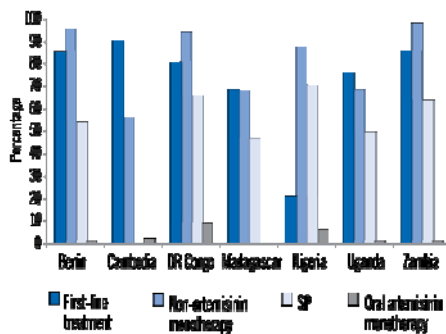
## Public sector procurement of ACTs



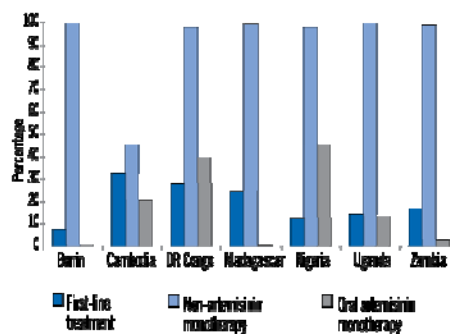
Source: Data from 7 companies eligible for procurement by WHO/UNICEF

## Availability of antimalarial medicines

### In public sector health facilities

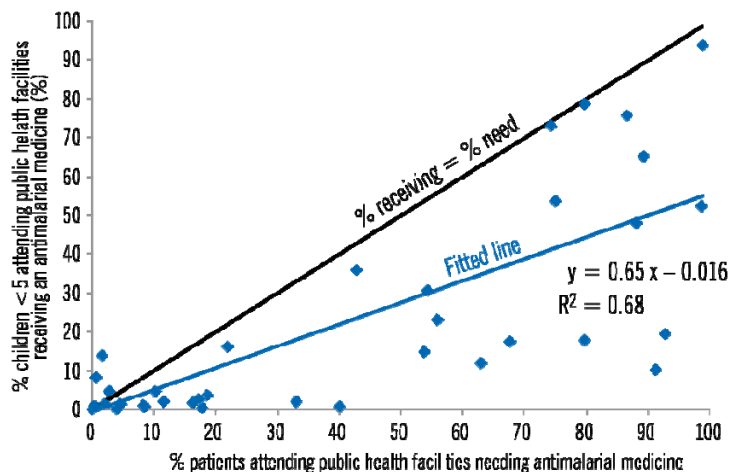


### In private sector treatment outlets

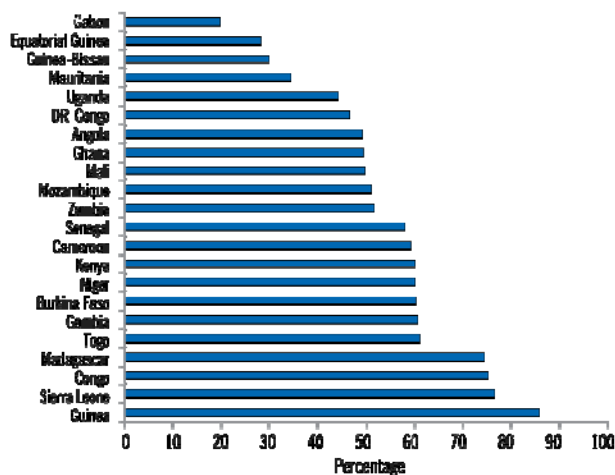


First line treatment: DR Congo, Madagascar = ASAQ; Uganda, Zambia, Benin = AL; Nigeria = AL (with ASAQ as an alternate); Cambodia = ASMO

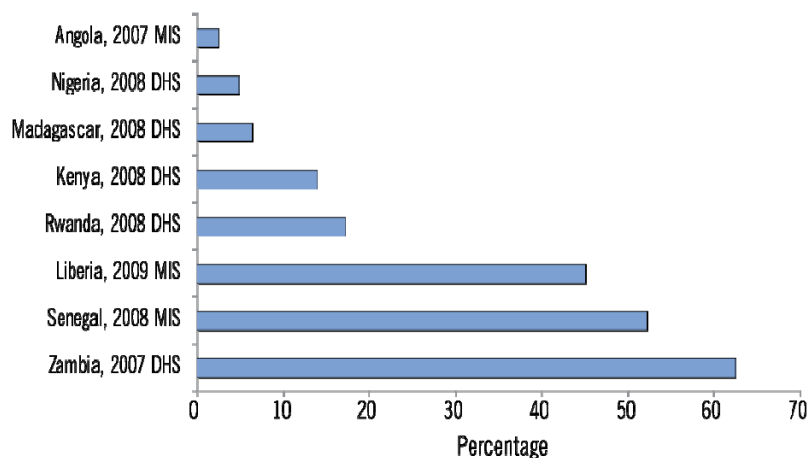
## Proportion of children receiving antimalarial medicine compared to proportion requiring antimalarial medicine



## Proportion of women attending antenatal care receiving second dose of IPT



## Proportion of all pregnant women receiving the second dose of IPT 2007- 2009



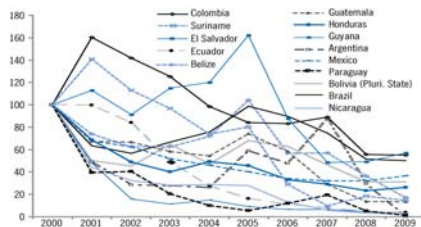
## Estimated number of malaria deaths 2000 - 2009

Deaths	2000	2005	2006	2007	2008	2009	Uncertainty bounds	
							Lower	Upper
Africa	900 000	853 000	832 000	802 000	756 000	709 000	554 000	892 000
Americas	2 400	1 600	1 600	1 400	1 100	1 300	900	1 700
Eastern Mediterranean	18 000	17 000	16 000	15 000	16 000	16 000	12 000	26 000
Europe	0	0	0	0	0	0	0	1
South-East Asia	58 000	50 000	48 000	43 000	48 000	49 000	37 000	63 000
Western Pacific	6 800	4 900	5 400	4 700	4 200	5 300	3 400	7 300
<b>World</b>	<b>985 000</b>	<b>927 000</b>	<b>904 000</b>	<b>867 000</b>	<b>826 000</b>	<b>781 000</b>		
Lower bound	797 000	744 000	725 000	694 000	662 000	628 000		
Upper bound	1 228 000	1 153 000	1 120 000	1 075 000	1 024 000	968 000		

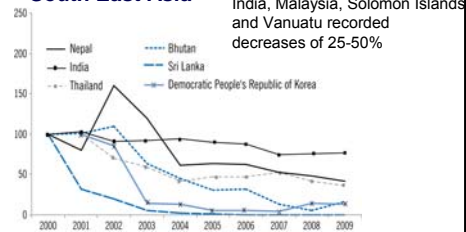
91% of deaths in Africa, 85% in children under 5  
Largest absolute decrease in numbers of deaths since 2000 in Africa

## Reduction of >50% in cases between 2000 and 2009: 11 African countries and 32 outside of Africa

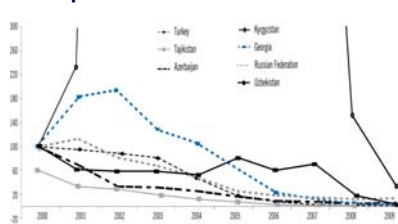
### Americas



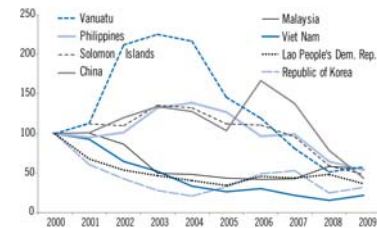
### South East Asia



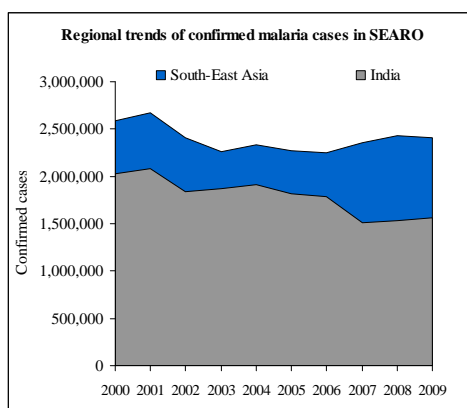
### Europe



### Western Pacific

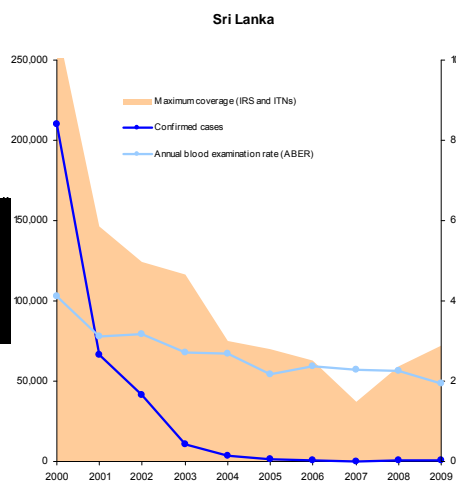


## Southeast Asia: Regional trends



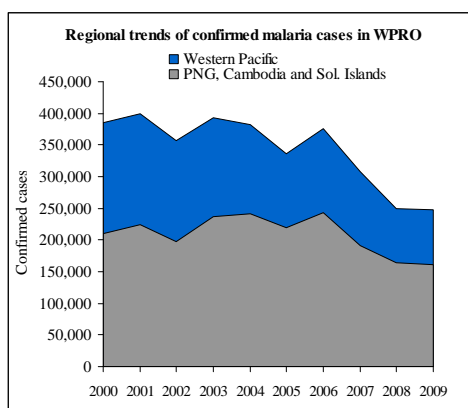
- India drives malaria burden in SEARO
- India accounted for 79% of cases in 2000 and 65% in 2009
- 5 countries with >50% decrease in confirmed cases in 2009 vs. 2000 (Bhutan, DPRK, Nepal, Sri Lanka, Thailand)
- India with 25% decrease

## Examples of success stories: Sri Lanka



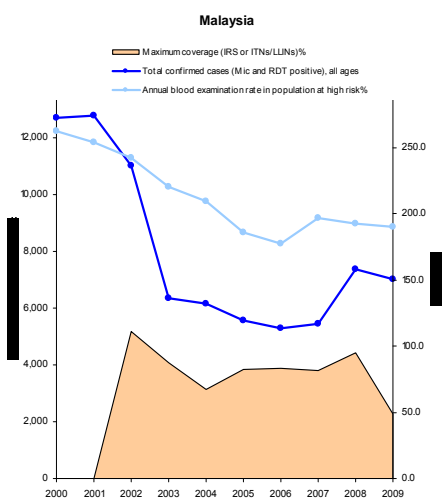
- In pre-elimination phase
- Cases decreased from 210 000 in 2000 to 558 in 2009 (mainly in the deeply forested areas)
- *P. falciparum* proportion decreased –from 28% to 5%.
- Zero deaths in 2009
- 50% of the pop at risk covered with either IRS or ITNs
- Access to diagnosis and treatment: use of Malaria Mobile Clinics (MMCs) in remote areas

## Western Pacific: Regional trends



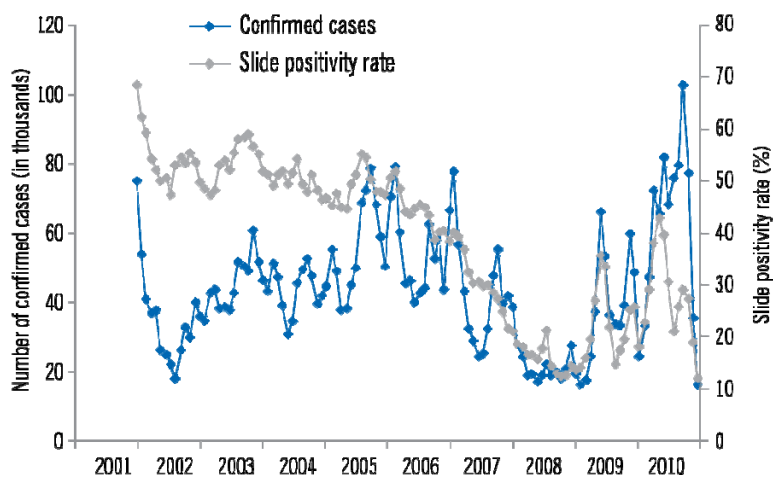
- PNG, Cambodia and Sol. Islands accounted for 70% of cases in 2009
- PNG: ~1.4 m prob. & confirmed cases / yr
- 5 countries with >50% decrease in confirmed cases in 2009 vs. 2000 (China, Laos, Rep. Korea, Sol. Islands, Vietnam)
- Malaysia, Philippines and Vanuatu had 25-50% decrease

## Examples of success stories: Malaysia



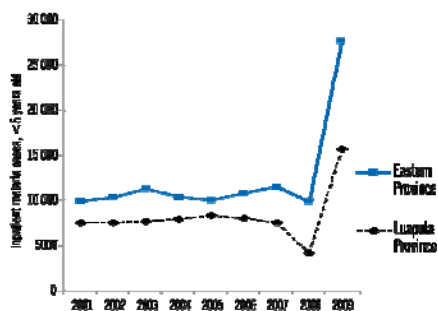
- In pre-elimination phase
- ~ 7000 cases/ year reported (mainly in the deeply forested areas); 8% imported
- Low incidence (<0.1/1000 in mainland)
- 11% of cases diagnosed in active case detection
- *P. falciparum* % declining: from 51% to 39%.
- 95% of population at risk covered with IRS or ITNs
- >100% ABER

## Recent increases in malaria cases: Rwanda

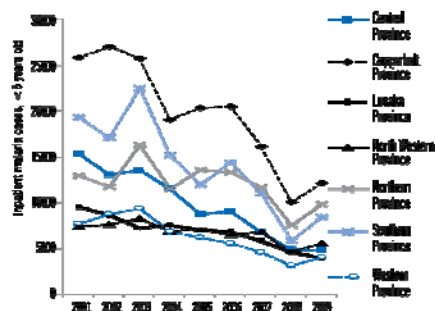


## Recent increases in malaria admissions: Zambia

In Eastern and Luapula provinces



Other provinces



## Conclusions: financing

- Funding commitments for malaria control increased consistently from 2004 to 2009 but stagnated at US\$1.8 billion in 2010
  - still short of the US\$ 6 billion required annually.
- Spending by national governments has risen in all WHO Regions between 2004 and 2009
  - large increases in donor financing do not appear to have resulted in an overall reduction in the level of domestic financing
- The highest per capita expenditure continued to be seen in countries with smaller populations at risk
- Countries in the pre-elimination and elimination phases appear to spend more per person at risk of malaria than countries in the control phase

## Conclusions: prevention

- **Nearly 280 million ITNs will have been delivered to Sub-Saharan Africa between 2008 and end of 2010**
  - sufficient to cover 76% of population at risk
- **More African households own an ITN: 42% in mid 2010 versus 11% in 2005**
  - household ITN ownership reached more than 50% in 19 African countries
- **More children under 5 years of age use an ITN: 35% in 2010**
  - the percentage of children using a net is still below the WHA target of 80%
- **The number of people protected by IRS increased from 13 million in 2005 to 75 million in 2009 in sub-Saharan Africa**
  - corresponding to protection for 10% of the population at risk in 2009
- **The percentage of pregnant women receiving the second dose of IPTp ranged from 2.4% to 62% according to 8 households surveys 2007–2009.**
  - The weighted average, representing a population of 270 million was low at 12%, due primarily to low coverage rates in Nigeria

## Conclusion: diagnosis and treatment

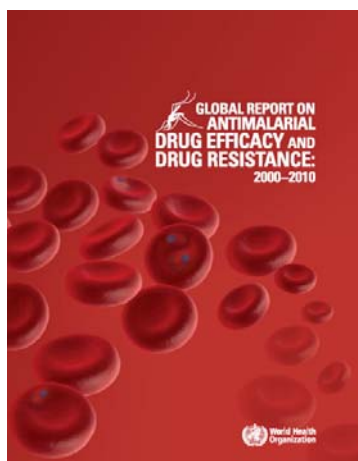
- **The percentage of reported suspected cases receiving a parasitological test increased from 67% globally in 2005 to 73% in 2009.**
  - Low rates persist in the majority of African countries: less than 20% in 21 out of 42 countries which reported
- **Small number of countries, including Lao People's Democratic Republic and Senegal, have shown that that nationwide malaria diagnostic testing can be rapidly scaled-up**
- **By end 2009, 13 African countries providing sufficient ACT courses to cover >100% of malaria cases in public sector; a further 5 African countries delivered sufficient courses to treat 50%–100% of cases**
- **Household survey data combined with health facility data suggest that, on average, 65% of treatment needs were fulfilled for patients attending public health facilities**

## Conclusion: impact

- **More than a third of 106 malarious countries (11 African countries; 32 outside of Africa) documented reductions in malaria cases of >50% in 2009 compared to 2000**
  - Number of cases fell least in countries with highest incidence rates
- **Evidence of increasing malaria cases in 3 countries previously reporting reductions (Rwanda, Sao Tome and Principe, and Zambia).**
  - Control programmes need to be maintained even when cases have been reduced substantially
- **Nine countries in pre-elimination stage in 2010; 10 countries implementing elimination programmes nationwide.**
  - Morocco and Turkmenistan certified as free of malaria by WHO Director-General in 2010
- **Number of malaria cases estimated to have decreased globally from 244 million in 2005 to 225 million in 2009**
- **Number of malaria deaths due estimated to have decreased from 989 000 in 2000 to 781 000 in 2009.**
  - Decreases in malaria burden observed in all WHO Regions, with largest % decreases in European Region, followed by the Americas. Largest absolute decrease in estimated number of deaths has occurred in Africa

## Global Report on Antimalarial Drug Efficacy and Drug Resistance, 2000-2010

<http://www.who.int/malaria/publications/atoz/9789241500470/en/index.html>



### Report describes

Mechanisms of antimalarial drug resistance emergence and spread

Scientific methods used to monitor drug efficacy and to detect / confirm resistance

Results of therapeutic efficacy studies for all antimalarial treatments

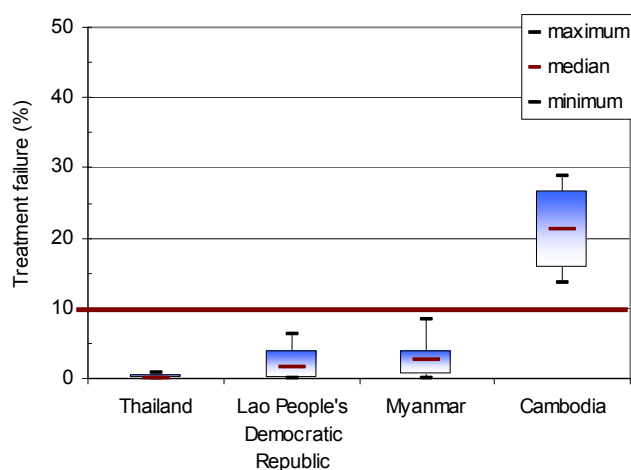
- Over time and by geography

Emergence of AR on the Thai–Cambodia border and containment response

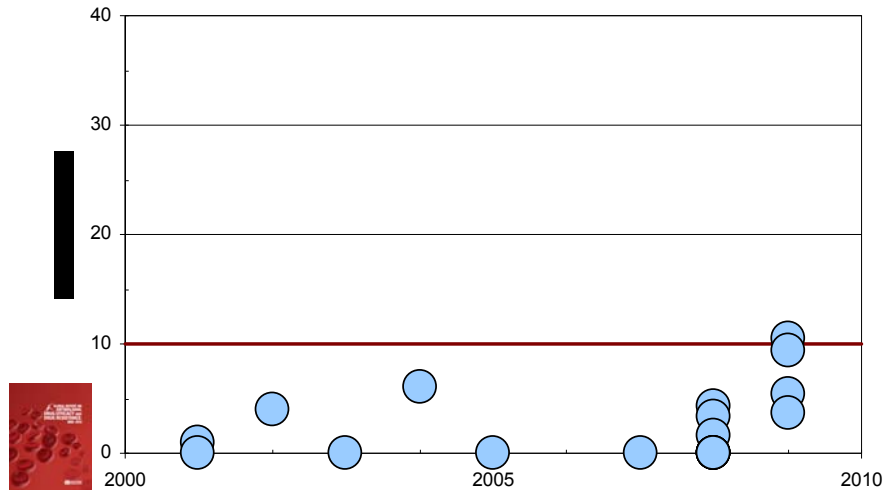
## WHO database on antimalarial drug efficacy

- **Data come from three main sources:**
  - published data, obtained by searching journal articles
  - unpublished data from reports by ministries of health, national malaria control programmes, nongovernmental organizations, research institutes and partners involved in the development of new antimalarial medicines; and
  - raw data from regular surveillance studies conducted
- **Contains 3932 studies representing 267,841 patients**
- **For this report, 1120 studies representing 81,848 patients were included**

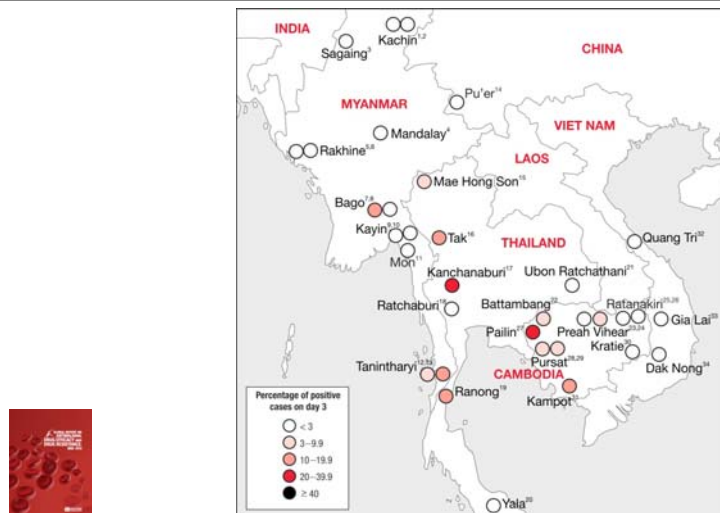
## Artemether-lumefantrine (AL): treatment failure rates in SEA Region



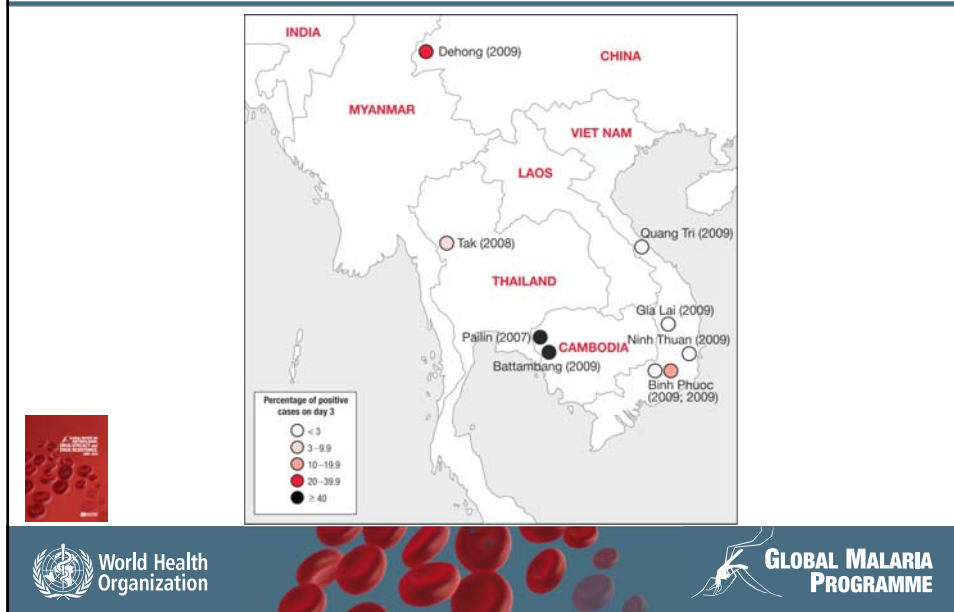
## Artesunate-mefloquine: treatment failure rates in Thailand



## Percentage of patients with Pf parasitemia on day 3 after treatment with an ACT



## Percentage of patients with Pf parasitemia on day 3 after treatment with oral artesunate monotherapy



## GPARC launch – January 2011

GLOBAL PLAN FOR ARTEMISININ RESISTANCE CONTAINMENT

World Health Organization

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2011

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## Global Plan for Artemisinin Resistance Containment (GPARC)

Goal: Protect ACTs as an effective treatment for *Pf* malaria

- Define priorities to contain and prevent artemisinin resistance (AR)
- Motivate actions and provide clear accountabilities for key stakeholders
- Mobilize resources to fund AR containment and prevention
- Increase collaboration and coordination on AR containment activities
- Define governance mechanisms and indicators to assess progress

Developed with input from ~100 partners across RBM partnership  
Supported by the Bill & Melinda Gates Foundation



## Artemisinin Resistance: Working definition for purposes of GPARC

Artemisinin Resistance: working definition used to refer to

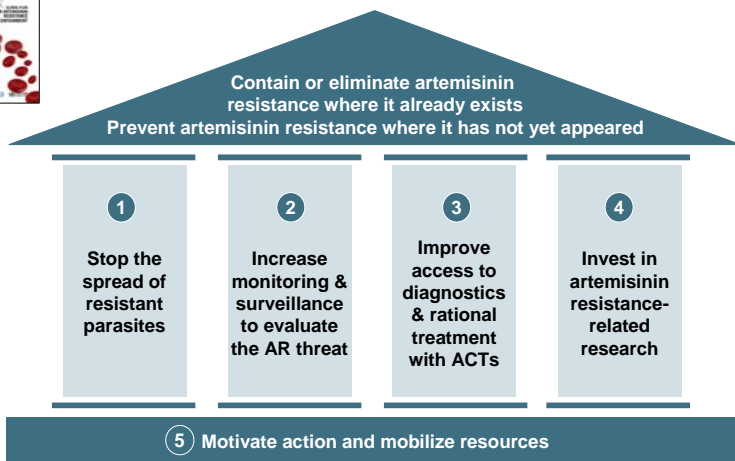
- An increase in parasite clearance time, as evidenced by > 10% of cases with parasites detectable on day 3 after treatment with an ACT (suspected resistance);

– OR –

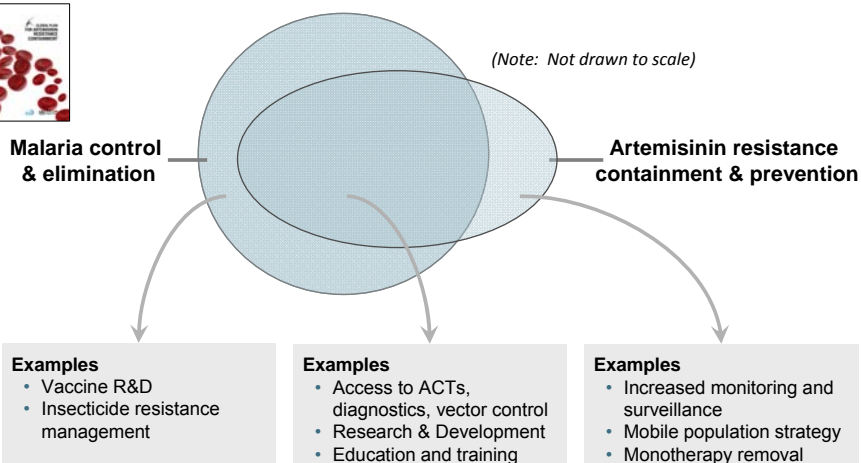
- Treatment failure after treatment with an oral artemisinin-based monotherapy with adequate antimalarial blood concentration, as evidenced by the persistence of parasites for 7 days, or the presence of parasites at day 3 and recrudescence within 28/42 days (confirmed resistance)



## GPARC action pillars



## GPARC builds on existing control and elimination efforts, with focus on interventions unique to AR



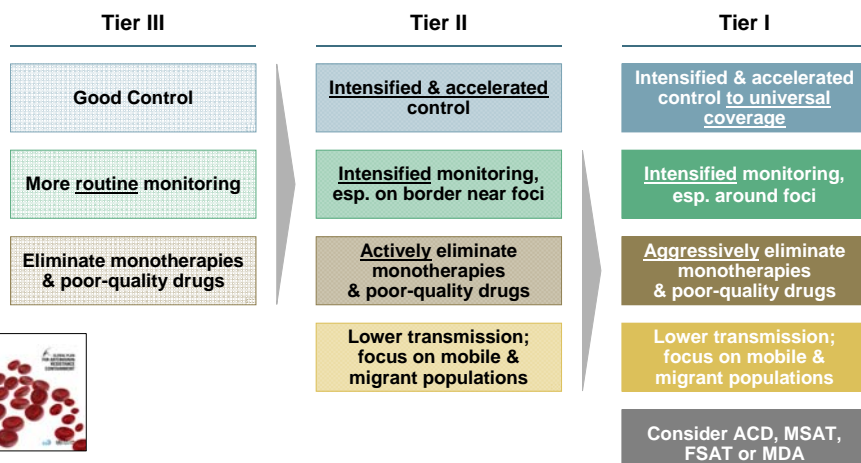
## GPARC recommendations customized locally (by Tier) based on degree of AR threat

Endemic country to evaluate its level of AR risk and apply recommendations to design a containment or prevention plan

- Tier 1** Areas with credible evidence of artemisinin resistance
- Tier II** Areas with significant inflows of people from Tier I areas, including those immediately bordering Tier I
- Tier III** Areas with no evidence of artemisinin resistance and limited contact with Tier I areas



## GPARC: summary of recommendations by Tier



## Example of GPARC Implementation in Tier 1: ARCE project on Thai-Cambodia border

- Ambitious cross-border strategy to eliminate artemisinin resistant parasites
- Coordinated by WHO working closely with Cambodian and Thailand Ministries of Health; largely funded by BMGF, GFATM, and USAID

Target areas	Program combines proven malaria prevention & treatment strategies
<p><b>Zone 1: areas where artemisinin tolerance detected</b></p> <ul style="list-style-type: none"> <li>• Cambodia: ~ 270K people in 4 provinces</li> <li>• Thailand: ~110K people</li> </ul> <p><b>Zone 2: areas without evidence of tolerance, but high risk (close to zone 1)</b></p> <ul style="list-style-type: none"> <li>• Cambodia: 9 provinces / ~4M people</li> <li>• Thailand: 7 provinces / ~7M people</li> </ul>	<p><b>Activities designed for specific cultural, social, scientific context</b></p> <ul style="list-style-type: none"> <li>• Large-scale distribution of LLINs</li> <li>• Free early diagnosis and treatment of malaria at the village level</li> <li>• 24-hour health facilities to diagnose and treat malaria</li> <li>• Intensive surveillance of positive cases</li> <li>• Education programs</li> <li>• Innovative approaches to reach mobile populations</li> <li>• Efforts to stop the sale of fake and substandard drugs</li> <li>• Stringent measures to stop the sale and use of monotherapies</li> <li>• Pilot intensive screening in most malaria-affected border villages</li> <li>• Basic and operational research</li> </ul>



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## If AR spreads more quickly than anticipated, escalated response will be required

### Situation today

Artemisinin resistance contained in Greater Mekong Subregion

### Scenario A

Artemisinin resistance spreads beyond Greater Mekong Subregion

### Scenario B

Artemisinin resistance emerges in or spreads to high transmission Tier III area

Potential severity of impact on malaria-related deaths

**GPARC recommendations to implement in endemic countries**

**Heightened urgency: 3 actions to launch immediately**

- Global advocacy to escalate AR to the top of global health and development agendas
- Intensive, coordinated containment efforts
- Significant increase in funding and potential reallocation of current funding



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## V. Motivate action and mobilize resources

### Proposed areas of involvement by constituency

	Global policy & norms	Surveillance & reporting	Contain. & implement.	Resource mobilization	Advocacy & political engagement	Research	Local policy & regulation	Emergency response
<b>Endemic countries Tier I, II &amp; III</b>	✓	✓	✓	✓	✓	✓	✓	✓
<b>Multilaterals</b> WHO - GMP	✓	✓	✓	✓	✓	✓ <sup>1</sup>	✓	✓
<b>Multilaterals</b> WHO Regional & Country offices		✓	✓	✓	✓		✓	✓
<b>Multilaterals</b> all other			✓	✓	✓			✓
<b>Research &amp; academia</b>		✓		✓	✓	✓		
<b>NGOs</b> International & local NGOs, CBOs			✓	✓	✓			✓
<b>Private sector</b>		✓	✓	✓	✓	✓		✓
<b>Funding agencies and bi-laterals</b>		✓	✓	✓	✓	✓	✓	✓

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1. Research conducted by WHO-TDR

## Cost to implement the GPARC estimated at ~\$175 M USD per year

	Annual costs (USD)
<b>Implementation costs</b>	<b>~\$110 M USD</b>
• Tier I costs (all recommendations)	~\$10-20 / PAR*
• Tier II costs (Tier I costs exc. transmission reduction tools)	~\$8-10 / PAR*
• Tier III costs	
– Monitoring of ACT efficacy	~\$50-100K / country
– Additional costs to enforce drug regulations	~\$260-714K / country
• Global costs (implementation, monitoring and surveillance)	~\$8-14M
<b>Research costs</b>	<b>~\$65M USD</b>
• Additional non-artemisinin drug development costs	~\$50M
• Acceleration of laboratory research	~\$10-15M
<b>Total GPARC costs</b>	<b>~\$175 M USD</b>

**Implementation costs will vary significantly by area depending on intensity of threat and starting infrastructure**

\* PAR : Person-At-Risk

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## Global Malaria Programme – 2011 products

- Global Plan for Artemisinin Resistance Containment, January 2011
- Good Procurement Practices for malaria Rapid Diagnostic Tests, March 2011
- Inter-agency operational manual for universal access to malaria diagnostics, Q2, 2011
- Implementation manual for intermittent preventive treatment in infants (IPTi), Q2, 2011
- WHO Product Testing of Malaria Rapid Diagnostic Tests, 3<sup>rd</sup> round (with FIND, TDR, & CDC), June 2011
- Progress and impact report on malaria elimination 2000-2010 (with RBM and PATH), Date TBD
- Progress and impact report on malaria control outside of Africa (with RBM and PATH), Date TBD
- Global malaria surveillance guidelines, Date TBD
- Severe malaria practical handbook, 2<sup>nd</sup> edition, Date TBD
- Elimination Scenario Planning Tool, Date TBD
- Policy guidance on intermittent preventive treatment in children (IPTc), Date TBD
- World Malaria Report 2010, December 2011



## Malaria control and elimination: 2011 – 2015

**The era of one-size-fits-all approach for malaria control is coming to an end as malaria transmission drops and new interventions are introduced**

**Sustaining high intervention coverage may prove more difficult than initially achieving it**

**Resistance to antimalarials and insecticides are major threats to continued success**

**Malaria control paradigm is shifting, as countries move from lowering morbidity & mortality to reducing transmission**

**Fundamental changes are happening (e.g. universal diagnostic testing) and are on the horizon (e.g. vaccines)**

**Routine surveillance is critical to sustained control and eventual elimination**

***P. vivax* will become increasingly important as *P. falciparum* burden drops, and is a more formidable elimination challenge**

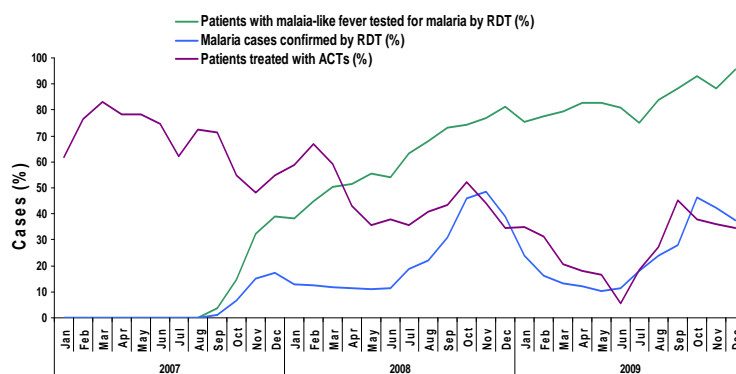


## Universal diagnostic testing

- WHO recommends confirmation of malaria through parasite-based diagnosis in all patients prior to instituting treatment (Malaria Treatment Guidelines 2010)
- Rationale:
  - Malaria prevalence amongst fever cases decreasing in many areas
  - Quality-assured RDTs are now available
  - Parasitologic confirmation in persons with suspected malaria will:
    - Improve differential diagnosis and fever management
    - Diminish unnecessary use of ACTs
    - Provide accurate surveillance data to manage programmes



## Senegal: Rapid Diagnostic Tests (RDTs) are scaled up, and the need for antimalarial treatment drops



Source: Sénégal Programme National de Lutte contre le Paludisme and Université Cheikh Anta Diop de Dakar

**“Knowledge is power.  
Information is liberating.”**

**Kofi Annan, 7<sup>th</sup> Secretary General  
of the UN**

## **The power of communities**

If communities can know the true burden of malaria, and can see the fruits of prevention and control efforts, then the will to eliminate and ultimately eradicate malaria will never fade

# Thank you

Keep our eye on the prize:  
a world free of malaria

