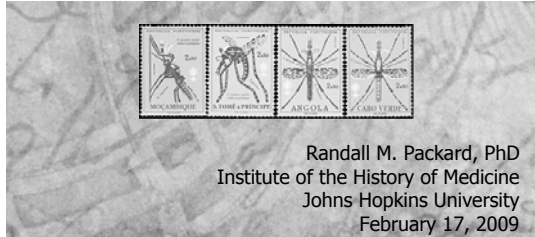


Can We Eradicate Malaria: Lessons from an Earlier Campaign



Randall M. Packard, PhD
Institute of the History of Medicine
Johns Hopkins University
February 17, 2009

Malaria Dreams



"We should declare the goal of eradicating malaria because we can eradicate malaria."

Bill Gates, Malaria Forum, October 2007

Malaria Dreams

"We are focusing our efforts to eradicate malaria on 15 countries." (December 14, 2007)



Malaria Dreams



■ Global Malaria Action Plan (2008)

- Short term: Elimination of Malaria where possible
- Scale-up control in high impact areas
- Ultimate Goal: Global Eradication

Figure II.2: Country categorization by malaria control status and burden



Source: World Malaria Report 2008. Geneva, World Health Organization, 2008; 2006 data.

Why Set Eradication as the Goal?

- New levels of cooperation and funding
 - International support for malaria control 1998=\$64 million
 - Global Fund disbursed \$864 million between 2002 and 2006.
 - Total \$1.5 Billion 2007
- Have new tools (ACTs, LLINs, vaccines)

RBM in Africa



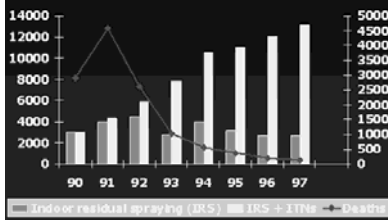
Progress

Survey to Evaluate Impact of Nationwide Distribution of LLINs and ACTs
November-December 2007

Decrease in	In-Patient Cases	Deaths in Children <5
Rwanda	64%	66%
Ethiopia	60%	51%
Zambia	29%	33%
Ghana	13%	34%

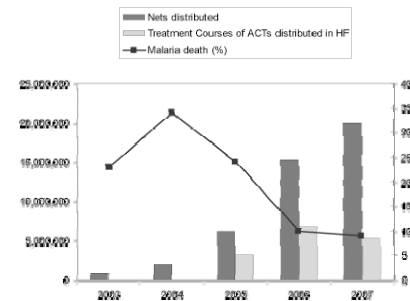
(WHO, Global Malaria Program, January 31, 2008)

Population Protected by Insecticide & Malaria Deaths from 1990 to 1997 in Vietnam



The relationship between ITNs and malaria mortality
The left axis shows population (in 000s); the right shows the number of deaths. (Conference presentation The role of ITNs in malaria control, Fred Binka, Roll Back Malaria, WHO.)

Impact of ITNs and ACTs on Malaria Deaths in Ethiopia



Why Eradicate?

- Save lives and money
- Importance of setting goal high to mobilize support
- International support cannot be sustained indefinitely
- Eradication cheaper than control

Malaria Dreams: The Original Version

"While keeping in mind the realities, one can nevertheless be confident that malaria is well on its way to oblivion."

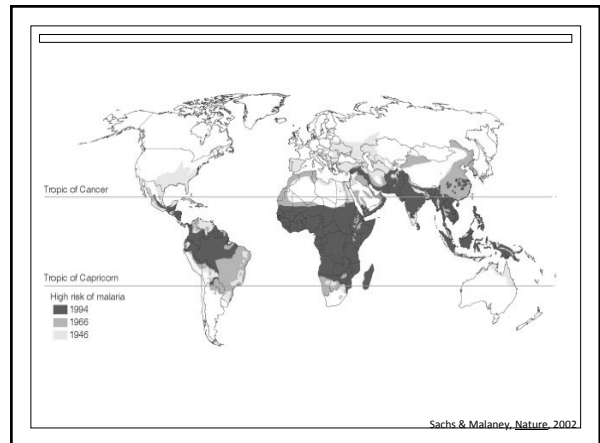
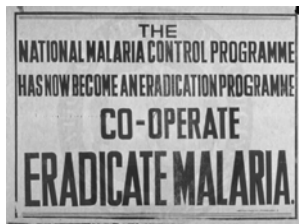
Paul F. Russell, *Man's Mastery over Malaria*, 1955

Just Spray!



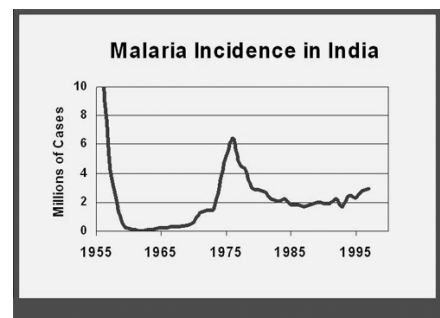
Malaria Eradication Strategy

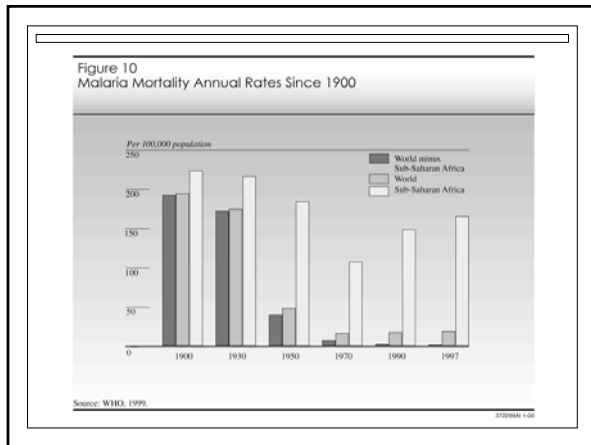
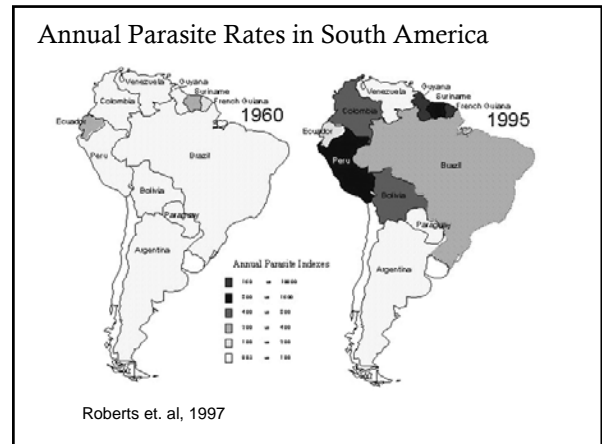
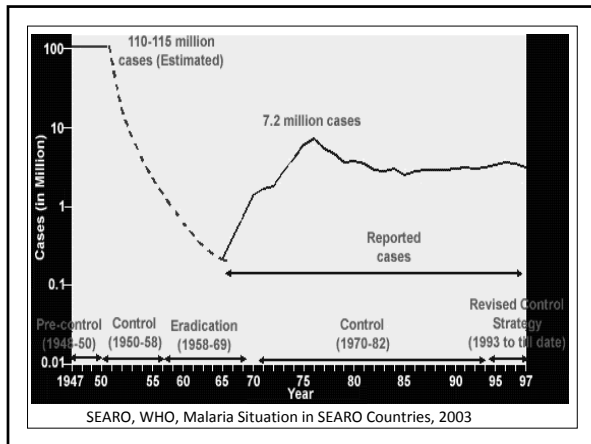
- Preparation
- Attack
- Consolidation
- Maintenance




Costs of Failure

- Multilateral funding declined from \$13.7 million in 1969 to \$7.8 million in 1974
- WHO's malaria advisory staff decreased from 444 to 155 between 1967 and 1977
- UNICEF's staff dropped from 115 to 37 between 1967 and 1977
- National programs cutback





Malaria Realities



"The fight turned out to be more difficult than expected. Mosquitoes developed resistance to DDT and the parasite developed resistance to chloroquine. Gains were made, but eradication seemed remote—and so enthusiasm faded, funding slowed—and then everything unraveled." Melinda Gates, Malaria Forum, October 2007

"Control efforts were cut back, and when the disease began spreading again, populations were especially vulnerable—because people in areas where malaria had been made scarce had lost their immunity. Meanwhile, research into malaria had stopped because the world had been so confident of eradicating it—and so there were no new medicines, insecticides or insights. Over the next ten to fifteen years, the number of malaria cases increased by a factor of six in India and by a factor of nine in China."

- ### What went wrong?: Lessons Learned
- Parasite and mosquito resistance
 - Lack of research and development
 - Loss of economic and political support
 - Breakdown in control efforts

What Went Wrong?: *Lessons not Learned*

- Overconfidence in power of spraying
 - Inadequate attention to community "buy-in"
 - Absence of Plan "B"
 - One size fits all
 - Lack of alternatives

Importance of Broader Patterns of Development

- Absence of communications and administrative infrastructure
- Absence of health infrastructure
- Presence of development patterns that undermined control

Eradication & Development



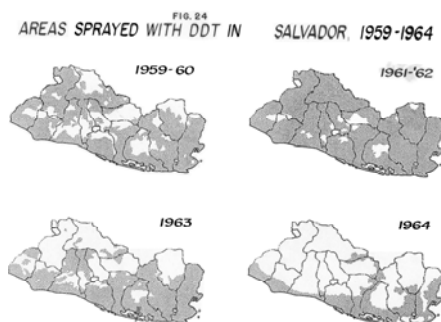
Development and Drug Resistance



Development and Drug Resistance

- Migrant workers lacked immunity
- Mining conditions encouraged breeding of *A. dirus*
- Mines treated with chloroquine MDA
- Sub-lethal doses led to resistance
- Resistant strains infected waves of new migrants
- By 1970 90% resistant/70% RIII
- Migrants spread resistance

Development and Vector Resistance



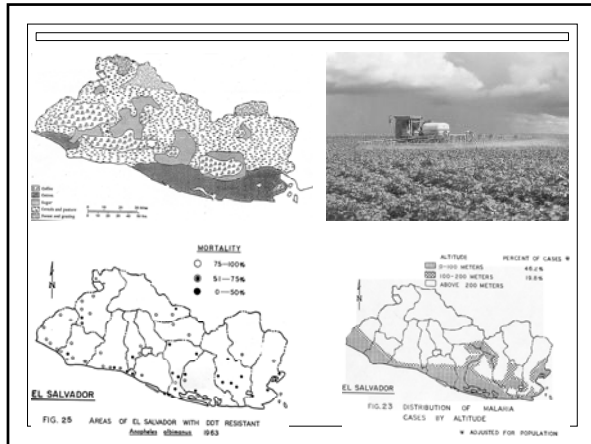


Table 1. Countries Achieving Eradication by 1970

Economically Developed	Island Nations	Socialist Countries
Italy	Grenada	Bulgaria
Netherlands	Saint Lucia	Poland
USA	Trinidad Tobago	Romania
Australia	Dominica	Yugoslavia
Brunei	Puerto Rico	Hungary
Singapore	Virgin Islands	Cuba
Portugal	Cuba	
Spain	Jamaica	
	Mauritius	
	Reunion	
	Taiwan	

Other lessons:

- Underestimated resistance
- Underestimated time needed
- Underestimated costs
 - (\$2 vs. \$011)
- Underestimated challenge of sustaining control

Cost of Malaria Elimination in Taiwan

- **Attack Phase: 1952-1957**
 - 800,000 cases to 600 cases
 - \$1.5 million
 - \$1.96 per case prevented
- **Consolidation Phase: 1958-1964**
 - 600 cases to 0 cases
 - \$1.2 million
 - \$2,169 per case prevented

Lessons for Global Malaria Action Plan?

- Have we put too much faith in the power of ACTs and LINNs to eliminate malaria?
- Have we underestimated the challenges that lie ahead?

Are we achieving buy-in?

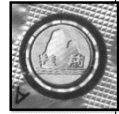
- Most interventions require behavioral change
- Insufficient investment in developing and assessing communication and behavioral change strategies
- No structure within the RBM Partnership that coordinates partners' country level communication support.
- Application of broad, generic strategies, including messages and specified behavioral outcomes, without understanding the unique dimensions of specific communities (GMAP, 212)

Despite the gains in production and distribution, end-user compliance is still a major challenge. A 2004 survey showed that of nets owned, only 56% had been slept under the night prior in Nigeria, 62% in Zambia, and 61% in Ethiopia.” (GMAP, 32)



Is There a Plan B?

- Have we prepared for resistance to ACTs and LLINs
 - Palin revisited
 - Challenge of monotherapies and counterfeit drugs
- One size fits all?
- Do we have alternatives?



Have we Recognized the Importance of broader patterns of development?

“...weaknesses in socioeconomic development, such as poverty, poor quality of housing and limited access to health care limit the feasibility and effectiveness of malaria control strategies. At the national level, there are often only limited financial resources for malaria-control intervention which, compounded with the human resource crisis in the public health sector, have led to fragmented implementation of control strategies that were limited in scale and in the populations targeted.” (GMAP, 121)

Armed Conflicts

- Since 1980 violent clashes in 21 African countries, affecting 165 million people.
- Dafur, Congo, Zimbabwe



War and Malaria



(Project Ploughshares, Conflict Report 2003)

- Weakens health systems
- Disrupts malaria control
- Damages agriculture
- Transforms environment
- Displaces people

Malaria and Civil War in the DCR

- Health centers destroyed (70% reduction)
- Malaria control programs disrupted
 - 2003/4 24,000 of 500,000 ITNs
- Forest cover destroyed
- Malaria causes 45% of all childhood death (WHO)



Refugees and Malaria

- Displaced populations more difficult to protect
- Displaced populations exposed to malaria (e.g. Southern Sudan)
- Refugee camps encourage transmission (Goma, 1994, Angola 2002)
- Refugee camps transform local environments
- Refugees may introduce malaria into low risk areas (e.g. Burundi, 1990s)

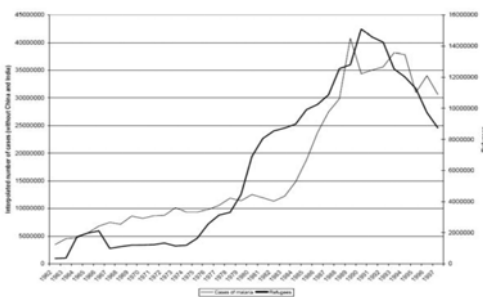
Refugees and Malaria

- 2000-2700 cases/1000 refugees (Monalvo, et al 2007)
- 13% of cases reported by WHO caused by forced migration/civil war



Malaria and Refugees

Figure 2. Refugees and cases of malaria.
Sources: UNHCR and Weekly Epidemiological Record (1999).



Malaria and Poverty

GNP
per capita
(1995)



Malaria
Index



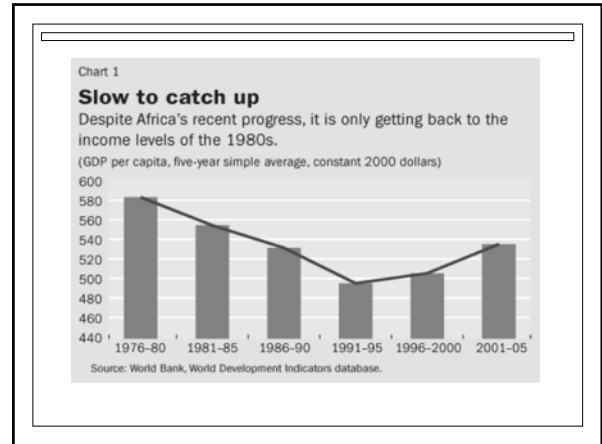
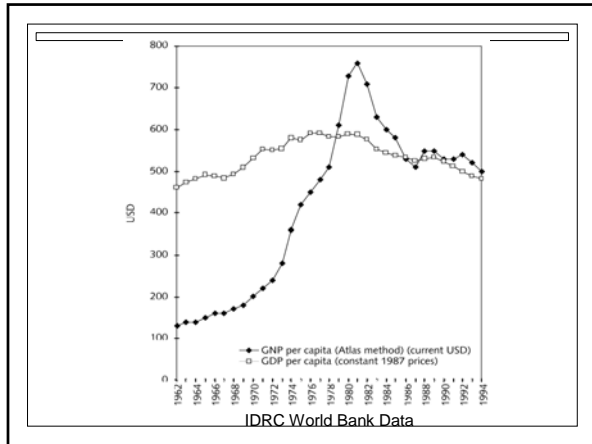
Sachs and Gallup, 2001

Malaria and Poverty

It is certainly true that poverty itself can be held accountable for some of the intense malaria transmission recorded in the poorest countries. Personal expenditures on prevention methods such as bednets or insecticides, increased funding for government control programmes and general development such as increased urbanization can reduce malaria transmission. (Sachs and Malaney, 2002)

Africa is Getting Poorer

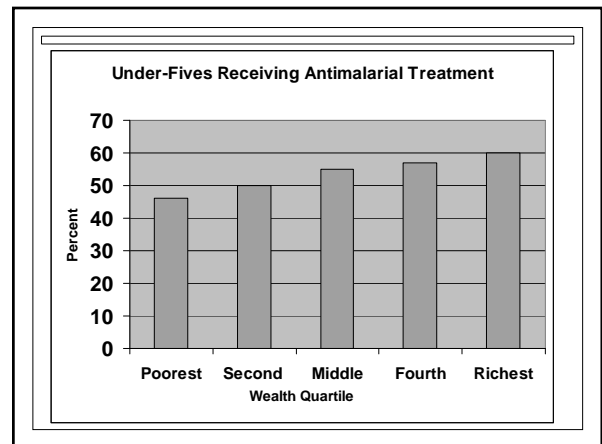
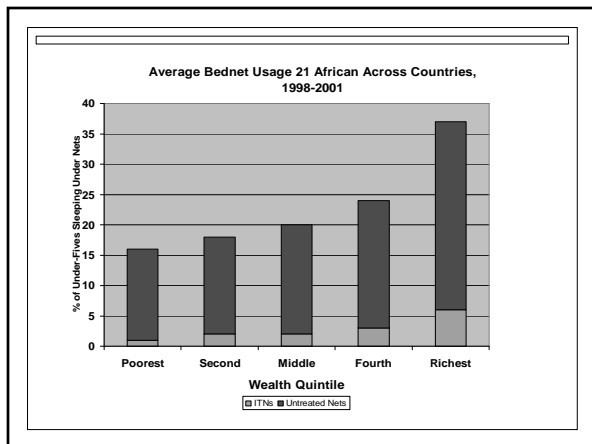
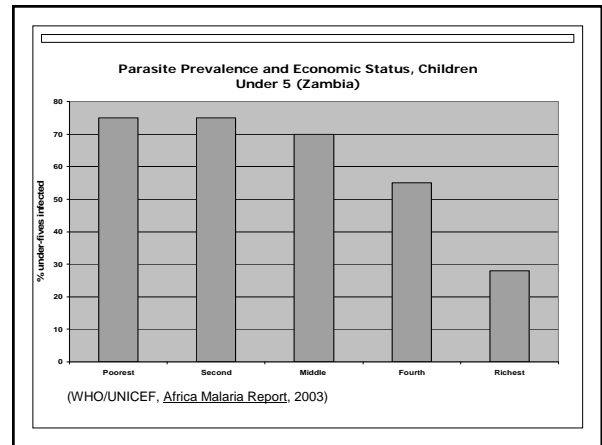
- Sub-Saharan Africa's share of world exports declined from 2.5% in 1980 to 1% in 1990
- Per capita GNP fell 44.3% between 1960-1999
- Total debt as percentage of export goods and services rose from 10.9% in 1980 to 20.5% in 1990 and averaged 27% in 90s.

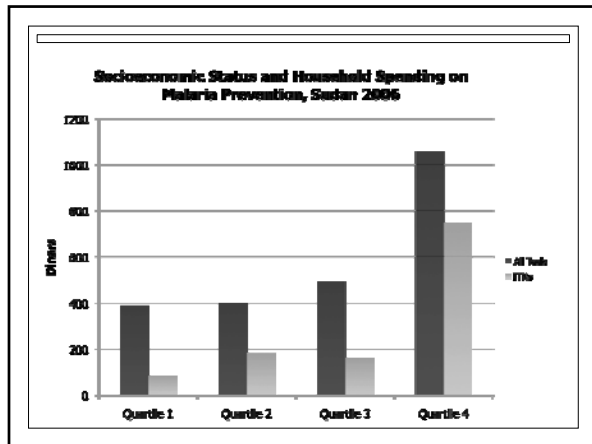


Malaria and Poverty

- Individual poverty
 - Limits ability to take preventive measures
 - Limits ability to provide treatment for sick
 - Contributes to resistance


Photograph by John Stanmeyer





Poverty and Risk

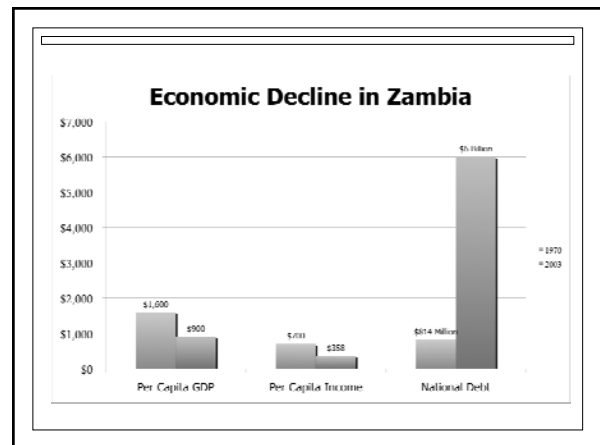
- "Makorokoza" in Zimbabwe
- 1990s economic downturn
- 100,000-500,000
- Malaria
 - 25/1000 in 1992
 - 150/1000 in 2002



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Malaria and Poverty

- National Poverty
 - Undermines preventative services
 - Undermines ability to provide health care



Impact on Health System: Zambia

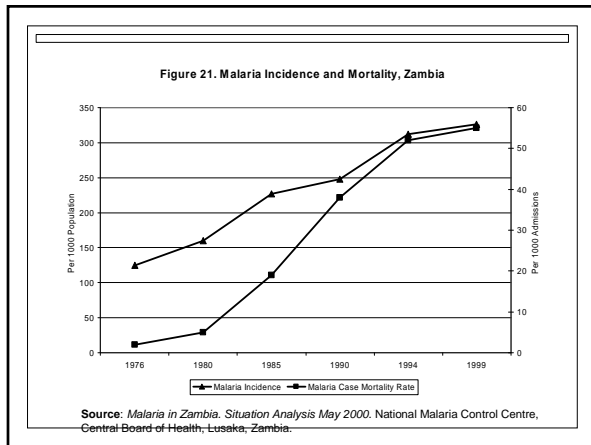
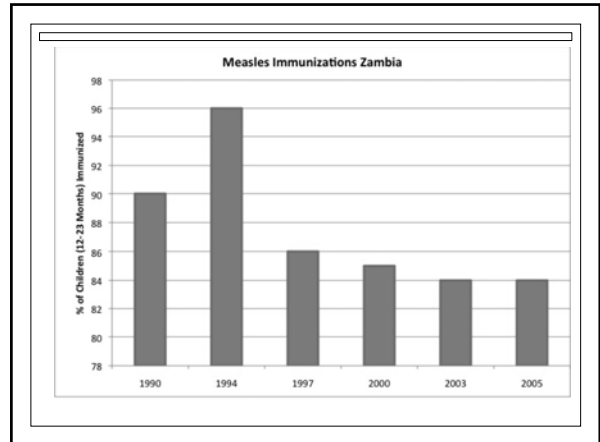
- Per capita health expenditure
 - 1970 = US\$ 23
 - 2005 = US\$11
- 152 of 186 countries

SAP and Health Sector Reform 1990s

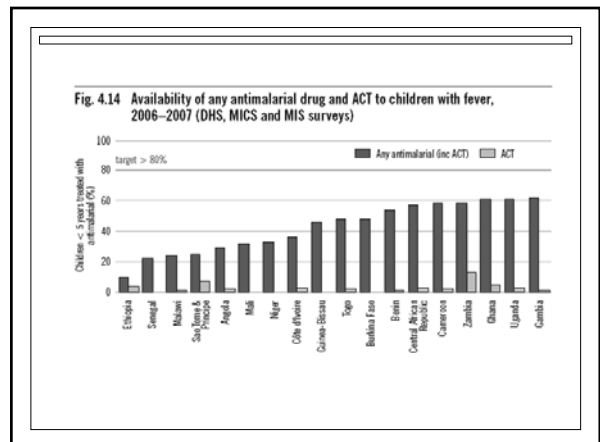
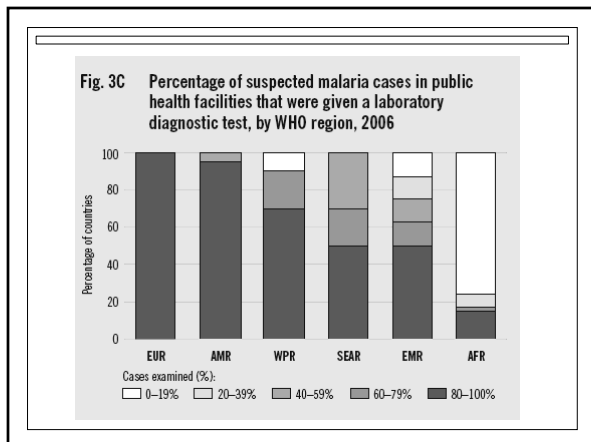
- Forced reduction in wages
- 1993: 1/3 nurses applied to work abroad
- 50% of health facilities closed by 2005
- User Fees = 60% drop in health attendance, 20% in deliveries in Lusaka

Takatoshi Kato, Deputy Managing Director, International Monetary Fund August 2005 *"The health system faces severe constraints that prevent many public health needs from being adequately addressed. Staffing levels are insufficient—a problem exacerbated by the massive emigration of health workers to wealthier countries. Donors' response to the capacity problem in health care has been, in part, to set up parallel delivery systems that attract workers from the public sector, thereby bypassing the urgent need for capacity building in that sector. However, to raise staffing levels and equip health centers, the government and its development partners must make major investments."*



Are Health Systems Up to Task?

- Africa carried more than 24% of the world's disease burden in 2006 but has only 3% of the world's health workers
- "Africa's health systems are too weak and services are too under-resourced to support a targeted reduction in the disease burden." (Dr. Margaret Chan, September 2008)



Questions?

- How does one insure prompt and effective treatment?
- How does one provide intermittent preventive therapy to pregnant women?
- How does one identify cases and avoid outbreaks?

Are our Projections Accurate?

- Do we know how long it will take to eliminate malaria?
- Do we know how long countries will need to sustain control?
- Do we know how much it will cost to sustain control or achieve elimination?

How Much Will it Cost?

Table 1: Summary of annual global costs

Cost (US\$ millions)	2009	2010	2015	2020	2025
Prevention cost	3,728	3,982	3,724	3,864	2,576
Case management cost	968	1,359	550	226	87
Program cost	638	839	764	787	714
Global control and elimination costs	5,335	6,180	5,037	4,877	3,378
Research & Development cost	759	759	800	681	460
Total Cost	6,094	6,939	5,837	5,559	3,838

GMAP, 2008, 16

Unanswered Questions

- Can we promise that international donors will support control efforts indefinitely?
- Do we have a plan for helping countries to help themselves?
- Is there a plan for reducing violence?
- Do we have a plan for re-building health systems?

Unanswered Questions

- Should we set out to eradicate malaria if we cannot answer these questions?

Melinda Gates, Malaria Forum, October 2020?

“The fight turned out to be more difficult than expected. Mosquitoes developed resistance to LLINs and the parasite developed resistance to artemisinin. Gains were made, but eradication seemed remote—and so enthusiasm faded, funding slowed—and then everything unraveled.”



