Fighting Harder and Smarter Against Malaria

Dr. Bernard Nahlen
Deputy US Global Malaria Coordinator
University of Georgia, February 23, 2010
Outline

• Burden of malaria
• Global support for rolling back malaria
• President's Malaria Initiative
• Tools for malaria prevention and treatment
• Success in scaling-up interventions
• Early evidence of impact
• Challenges and opportunities
Four Human Species of Malaria

- Parasitic infection of red blood cells
  - *Plasmodium falciparum*
  - *Plasmodium vivax*
  - *Plasmodium malariae*
  - *Plasmodium ovale*
How Is Malaria Spread?

- Spread by bite of infected female *Anopheles* mosquitoes
- Night-biting mosquitoes
- Indoor-biting mosquitoes
Global Burden
(Baseline 2000 estimates)

- 107 countries and territories
- 3.5 billion people -- at risk
- Cases: 300-500 million a year
- Deaths: >1 million a year
  - Mostly *Plasmodium falciparum*
  - Mostly African children:
    - 1 dies every 30 seconds
**Africa**: almost 100% *P. falciparum*, high number of cases & deaths per population at risk; the most external support; lowest governmental spending on malaria

**Americas, Middle-East & Eurasia**: dominated by *P. vivax* species, very few cases and deaths; high degree of governmental spending

**Asia**: largest population at risk, both *P. vivax* and *P. falciparum*, moderate number of cases and deaths; two-thirds of funding comes from governments
Geographical repartition of malaria mortality, incidence and population at risk

Source: WHO World Malaria Report 2008, 2006 estimates of malaria deaths, malaria cases and total populations at risk (in high and low transmission areas)
MALARIA BURDEN GREATEST IN AFRICA, AND AMONG CHILDREN UNDER FIVE

Distribution of deaths among children under age five by cause, sub-Saharan Africa, 2000-2003
MALARIA Clinical Syndromes

**Acute Disease**
- Non-severe Acute Febrile disease
- Cerebral Malaria
- Death

**Chronic Disease**
- Chronic Asymptomatic Infection
- Anemia
- Developmental Disorders; Transfusions; Death
- Infection During Pregnancy
- Placental Malaria
- LBW
- Infant Mortality
Burden on African Health Systems

High-burden countries in sub-Saharan Africa:

- **Outpatient**
  - 30-40% visits children <5 years
  - 25-35% visits all ages

- **Inpatient**
  - 30-50% admissions children <5 years
  - 20-30% admissions all ages

- **Hospital deaths**
  - 20-40% deaths children <5 years
  - 15-40% all ages
Economic Burden of Malaria In Africa

- Estimated annual loss of growth due to malaria up to 1.3% each year
  - Compounded for 15 years, the GDP level in the 15th year reduced by nearly 1/5
- Repeated bouts of malaria hinder physical and cognitive development
  - Reduce a child's attendance and performance at school
- Impact on labor productivity
- Household income reduced
Roll Back Malaria Partnership

Launched 1998 by WHO, UNICEF, World Bank, UNDP

- Goal: To halve malaria-associated mortality by 2010 and again by 2105

  - Updated Goals (Global Malaria Action Plan, 2008):
    - To reduce global malaria cases from 2000 levels by 50% in 2010 and by 75% in 2015
    - To reduce global malaria deaths from 2000 levels by 50% in 2010 and to near zero preventable deaths in 2015
    - To eliminate malaria in 8-10 countries by 2015
    - In the long-term, eradicate malaria world-wide

  - Updated Targets: Universal coverage for all populations at risk
Goals and Targets

Abuja Summit (April 2000), by 2005

• At least 60% of malaria patients have access to effective treatment within 24 hours of onset of symptoms
• At least 60% of those at risk of malaria benefit from protective measures, such as ITNs or IPT

UN Millennium Development Goals

• Target 8: To have halted by 2015 and begun to reverse the incidence of malaria and other major diseases
  - Indicator 21: Prevalence and death rate associated with malaria
  - Indicator 22: % of population at risk in malaria-risk areas using effective malaria prevention and treatment measures
### Annual global costs (US$ millions)

<table>
<thead>
<tr>
<th>Cost</th>
<th>2009</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevention</td>
<td>3,728</td>
<td>3,982</td>
<td>3,724</td>
<td>3,864</td>
<td>2,576</td>
</tr>
<tr>
<td>Case management</td>
<td>968</td>
<td>1,359</td>
<td>550</td>
<td>226</td>
<td>87</td>
</tr>
<tr>
<td>Program</td>
<td>638</td>
<td>839</td>
<td>764</td>
<td>787</td>
<td>714</td>
</tr>
<tr>
<td><strong>Global control and elimination</strong></td>
<td>5,335</td>
<td>6,180</td>
<td>5,037</td>
<td>4,877</td>
<td>3,378</td>
</tr>
<tr>
<td>Research and Development</td>
<td>759</td>
<td>759</td>
<td>800</td>
<td>681</td>
<td>460</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,094</strong></td>
<td><strong>6,939</strong></td>
<td><strong>5,837</strong></td>
<td><strong>5,559</strong></td>
<td><strong>3,838</strong></td>
</tr>
</tbody>
</table>
## Current funding required by region (US$ millions)

<table>
<thead>
<tr>
<th>Region</th>
<th>2007</th>
<th>GAP</th>
<th>2009</th>
<th>2010</th>
<th>2011-20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Africa</strong></td>
<td>622</td>
<td>1,577</td>
<td>2,199</td>
<td>2,686</td>
<td>2,291</td>
</tr>
<tr>
<td><strong>The Americas</strong></td>
<td>178</td>
<td>49</td>
<td>227</td>
<td>261</td>
<td>224</td>
</tr>
<tr>
<td><strong>Asia-Pacific</strong></td>
<td>217</td>
<td>2,504</td>
<td>2,721</td>
<td>3,008</td>
<td>2,467</td>
</tr>
<tr>
<td><strong>Middle East and Eurasia</strong></td>
<td>92</td>
<td>96</td>
<td>188</td>
<td>226</td>
<td>147</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,109</td>
<td>4,226</td>
<td>5,335</td>
<td>6,180</td>
<td>5,129</td>
</tr>
</tbody>
</table>
Who supports the effort to fight malaria?
Global Malaria Funding Initiatives

Global Fund to Fight AIDS, TB and Malaria
- Established July 2001 by G8 countries
- To date, US$ 4.6 billion committed to support countries to fight malaria

US President’s Malaria Initiative, by 2010
- Launched June 2005
- Phase 1: $1.26 billion over 5 years to fight malaria in 15 focus countries in Africa
- Phase 2: $5 billion over 5 years (2009-2013)

World Bank Malaria Booster Program
- Launched September 2005
- Phase 1: $500 million to fight malaria in Africa
- Phase 2: $1 billion

Gates Foundation Malaria Forum (October 2007)
- Goal: Elimination → Eradication
US President’s Malaria Initiative

Goal:
To contribute to reduction of malaria-associated mortality by 50%

Targets:
To expand coverage of malaria prevention and treatment measures to 85% of the most vulnerable populations – children <5 years of age and pregnant women

- Interagency initiative led by USAID, and implemented together with CDC
- Interagency Steering Group
  - USAID
  - Dept of Health and Human Services
  - Department of State
  - Department of Defense
  - National Security Council
  - Office of Management and Budget
PMI Focus Countries

- Beginning in **FY06**: Angola, Tanzania, Uganda
- Beginning in **FY07**: Rwanda, Senegal, Mozambique, and Malawi
- Beginning in **FY08**: Benin, Ghana, Mali, Kenya, Liberia, Madagascar, Zambia, Ethiopia (Oromiya Region)
- Beginning in **FY 2011**: DR Congo and Nigeria
## PMI Funding Levels

<table>
<thead>
<tr>
<th>Year</th>
<th>Funding Level</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>$30 million</td>
<td>3 countries</td>
</tr>
<tr>
<td>2007</td>
<td>$154 million</td>
<td>7 countries</td>
</tr>
<tr>
<td>2008</td>
<td>$300 million</td>
<td>15 countries</td>
</tr>
<tr>
<td>2009</td>
<td>$300 million</td>
<td>15 countries</td>
</tr>
<tr>
<td>2010</td>
<td>$500 million</td>
<td>15 countries</td>
</tr>
<tr>
<td>Hyde/Lantos</td>
<td>$5 billion (FY09-FY13)</td>
<td>17+ countries</td>
</tr>
</tbody>
</table>
Transparency & Accountability

PMI Web Site (www.fightingmalaria.gov)
  - Operational plans
  - PMI strategy and program/technical guidance
  - All contracts and agreements
  - Activity reports from Implementing Partners
What tools do we have to fight malaria?
Life-Saving Interventions

1. **Long-lasting Insecticide-treated mosquito nets (LLINs)**
   - Prevent malaria transmission
   - Provide a physical and chemical barrier against mosquito bites
   - To be effective, must be used

2. **Indoor residual spraying (IRS)**
   - Prevents malaria transmission for all members of a household
   - 12 insecticides approved by WHO for IRS
     - Pyrethroids and DDT most common
Life-Saving Interventions

3. **Intermittent preventive treatment in pregnancy (IPTp)**
   - Prevents adverse effects of malaria in pregnancy:
     - anemia in mother
     - low birth weight for infant, major risk for newborn death

4. **Case management**
   - Dx malaria using microscopy or RDTs when available
   - Rx uncomplicated malaria with artemisinin-based combination therapy (ACTs)
Intermittent preventive treatment (IPT) involves the administration of full, curative treatment doses of an effective antimalarial drug at predefined intervals during pregnancy.
Intermittent Preventive Therapy

Benefit:
- Mothers: less malaria, less anaemia
- Infants: fewer of LBW

Weeks of pregnancy:
- Conception
- Quickening
- Birth

Rx, Rx
Low birth weight
Insecticide-Treated Materials

- Physical barrier
- Long-acting insecticide
- Repellent activity
ITN Efficacy Trials in Africa
Entomologic Inoculation Rates and Protective Efficacy

- **Gambia** (EIR=1-30)
  - 23%

- **Ghana** (EIR=100-300 {sea})
  - 18%

- **Burkina Faso** (EIR=300-500 {sea})
  - 14%

- **Coastal Kenya** (EIR=10-30)
  - 29%

- **Western Kenya** (EIR=300+ {per})
  - 16%

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Household Ownership of Insecticide Treated Mosquito Nets (ITNs) in malaria-endemic African Countries

September 2008, data from DHS, MICS, MIS and other national surveys
ITNs protect pregnant women against malaria
Trends in inpatient and outpatient malaria cases, 2001-2006/7

- **Eritrea**
- **Rwanda**
- **Sao Tome and Principe**
- **Zanzibar**

Integrated interventions include Long-Lasting Insecticidal Nets (LLIN), Artemisinin-based Combination Therapy (ACT), and Indoor Residual Spraying (IRS).
Early Evidence of Impact of Nationwide Distribution of LLINs and ACTs

<table>
<thead>
<tr>
<th>Decrease in:</th>
<th>In-Patient Cases</th>
<th>Child Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rwanda</td>
<td>64%</td>
<td>66%</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>60%</td>
<td>51%</td>
</tr>
<tr>
<td>Zambia</td>
<td>29%</td>
<td>33%</td>
</tr>
<tr>
<td>Ghana</td>
<td>13%</td>
<td>34%</td>
</tr>
</tbody>
</table>

(WHO, Global Malaria Programme, January 2008)
Emerging Threats

Artemisinin resistance: Thai-Cambodia border
Insecticide resistance
Research to bring forward new tools

• Today’s tools today, tomorrow’s tools tomorrow
• Need to continually develop improved tools and techniques and to use them wisely and widely
  - Resistance by the malaria parasite to today’s drugs will continue to develop; new generations of drugs will be required
  - Same is true for mosquitoes and the insecticides that we use against them
• Vaccines against malaria are under development
  - over the next decades, we will see the mobilization of several generations of vaccines of different kinds
Challenges/Opportunities

• **Global**
  - Sustaining political and financial support
    - Demonstrable impact within short period of time when interventions scaled up
    - Call for eradication/elimination
      - new drugs, new insecticides, vaccines, new approaches to vector control

• **National**
  - Weak health systems
    - NMCP partnership with EPI and Reproductive Health (ANC)
      - Controlling malaria unburdens the health system
  - Implementation extends beyond MOH
    - NGO partners

• **Community**
  - Sustaining compliance when malarial illness becomes less common
Are we being overly optimistic?

- Consensus on package of tools
- Consensus on global plan
- Mechanism for partner coordination
- New program partnerships (ANC, EPI, intersectoral collaboration)
- Greater community involvement
- Highest level political commitment
- New tools being developed
Thank You!