Impact Evaluation Workshop for Health Sector Reform
Cape Town, South Africa, December 7-11, 2009

Impact Evaluation of Malaria Prevention and Treatment

Jed Friedman (World Bank)
Evaluating Health Programs is Different

- Evaluation methods often used in medicine to determine efficacy of treatment.
- What we know less about:
  - How to get people to utilize prevention / treatment services?
  - What is the most cost effective mode of prevention / treatment given behavioral response?
  - What are the socioeconomic effects of health interventions?
Some Differences

- HIV/AIDS: Largely behaviorally driven
- Malaria: Vector-born disease

...But the behavioral aspects are important

**Treat Infected**
- Early Diagnosis & Drug Type (AMT, ACT)

**Problems**
- Access
- Compliance
- Cost-Effectiveness
- Long-Term Effect

**Vector Control**
- Prevent Breeding (DDT)
- Prevent Entry (Proofing)
- Prevent Bite (ITN, Spray)

**Problems**
- Resistance to Insecticides
- Compliance

**Protect Everyone**
- ITN, LLIN
- Mosquito Proofing

**Problems**
- Valuation/Usage
- Compliance
Malaria Control Is Not Principally a Question of Technical Innovation

“Widespread use of ITNs and state-of-the-art drugs succeeded in cutting malaria deaths half in 2 countries most heavily affected by the disease, Rwanda and Kenya.”

*Washington Post* (01/31/08)

“This is a genuinely historic achievement. This is not theoretical. We do not have to wait for a vaccine or new drugs. If we implement today’s technologies aggressively on a national scale we will have a big impact.”

*Richard Feachem, former Director of the Global Fund*

“With the resources available, we should be able to eradicate malaria before I hang up my lab coat.”

*Peter Agre, Malaria Research Institute, JHU*
Impact of Policy Change on Malaria Prevalence: **South Africa**

### Policy Regime Switches

1. **Pesticide Resistance**
   - DDT Stops: 1996
   - Spraying Resumes: 2000

2. **Drug Resistance**
   - Multidrug Therapy: 2000

### Aggravating Exogenous Factors

- Refugee Flow
- Heavy Rains
- Worsening Resistance

In Kwazulu-Natal the combined effect of switching from SP to the fixed combination of AL and IRS with DDT was associated with a decrease in cases of 78% and an increase in cure rate of 87% (Barnes K, unpublished data; in Yeung et al. 2004).
Case 1: DDT - India
Quasi Experiment (Cutler et al. 2007)

- Long-term Effects of Malaria Eradication
- Outcome Measure: Educational Gains
  1. Literacy Rate (LR); 2. School Completion Rate (SCR)
- Method: Quasi Experiment using Diff-in-Diff

1947 Pre-Eradication
- Population: 334 million
- Cases: 75 million (annual)
- Prevalence: 22% (annual)
- Mortality: 800,000 (annual)
- Mortality: 10% of total deaths

1953 Intervention
1\textsuperscript{st}: 1953 NMCP Launched
  - DDT Spraying
    - 2 Rounds per Year
    - 125 Malaria Control Units
2\textsuperscript{nd}: 1958 NMEP Launched

Gains
12\% ↑ in LR, SCR
- Malaria explains half of these gains
- Income ↓ through malaria 7-10% 

Sample: 300,000 Households, 1 million Individual Observations (NSS)
- Control: Pre-Eradication Cohorts (C\(_0\)): 1912-1952
- Treatment: Post-Eradication Cohorts (C\(_1\)): 1962-1972
- Omitted: Eradication Cohorts: 1953-1961
Case 2: ITN – Kenya
Field Experiment (Cohen and Dupas 2008)

• Explore tradeoffs between cost-sharing (CS) & free distribution for ITNs
• Randomize price of ITNs ($0 \leq p < p_{\text{Prevailing CS}}$) in prenatal clinics in Kenya
• Evaluate impact on pregnant women

1. Demand / Uptake
   - Cost-sharing (C/S) does considerably dampen demand.
   - Uptake Drops: i) by 75% from 0 price to prevailing CS price; ii) by 20% for ↑10Ksh.

2. Usage
   - No evidence that C/S reduces wastage on those who do not use the net.
   - Free ITN owner is not less likely to use net than those who paid higher prices.
   - Coverage (Uptake + Usage): 63% (Free Net) v. 14% (40Ksh)

3. Need (Health)
   - No evidence that C/S induces selection of those who need net more.
   - Those paying higher prices appear no sicker (anemia) than control group.

4. Compare Cost Effectiveness (Externality Assumptions)
   - Number of child lives saved highest under free distribution.
   - Free distribution is more CE when externality threshold is medium level.

Source: Cohen and Dupas 2008
1) Demand for ITNs: Monthly Net Sales by ITN Price

![Graph showing the relationship between ITN price (in Ksh) and the average number of ITNs sold/distributed per month. The x-axis represents ITN price (in Ksh) and the y-axis represents the average number of ITNs sold/distributed per month.]

Source: Cohen and Dupas 2008
2) ITN Usage Rates by Price: Share of “Takers” who Report Using ITN at Home

Source: Cohen and Dupas 2008
Case 3: ITN – Uganda
Experimental Evidence on ITNs from Rubagano and Kimuli Villages (Hoffman¹)

Do free goods stick to poor households?

**Design**

$N_{HH} = 193$  $T_1$: Free Net: 71,  $T_2$: Cash Transfer: 72,  $C$: Uncompensated: 50

**Findings**

- Wealth and endowment effects result in very few HHs selling free net (FN).
- Only 6% of FN would be sold in frictionless market. Accounting for transaction cost would further reduce this number.
- No significant gender gradient in average compensated valuation of ITNs.
- Man have higher income elasticity of supply for ITNs. Men have higher ATP.

**Implications**

- Distributing FN to women ➤ less leakage.
- Marketing among men ➤ more effective.

Source: Hoffmann, Barrett, and Just (2007)
Case 3: ITN – Uganda
Experimental Evidence on ITNs from Rubagano and Kimuli Villages (Hoffman2)

Psychology, gender, intra-HH allocation of ITNs

Design:
\[ N_{HH} = 143 \]
\[ T_1: \text{Free Net: 71, } T_2: \text{Cash Transfer: 72} \]

Findings
- Free nets lead to greater number of children covered, even for HHs with ATP.
- Net retention is higher for free nets (Endowment Effect): \( N_{FN} > N_{CT} \)
- Women tend to cover larger proportion of HH with nets.
- Intra-HH allocation of purchased nets (CT) depends on cost-benefit calculations, with income-earners, net purchasers, and people often suffering from malaria receiving it.
- Accompanied with a message, in-kind nets (FN) induce allocation to children.

Implications
Beyond price, mode of allocation and communication are important.

Source: Hoffmann (2007)
Overview of the World Bank’s Malaria Impact Evaluation Program (MIEP)

- Program launched to conduct malaria policy relevant operational impact evaluation under the Booster Program for Malaria Control

**Goals:**

- to generate evidence on effective approaches to increase utilization of malaria prevention and treatment services
- to increase familiarity with IE approaches and build evaluative capacity in national malaria control programs
- currently conducting evaluation studies in 6 countries assessing effectiveness of a variety of control strategies

**Access to effective treatment**

**Nigeria** MIEP is assessing the involvement of trained community- and private sector-based agents (CDDs and PMVs) in malaria prevention, and case management to increase access to prompt diagnosis with RDTs and treatment with ACTs.

**Zambia** estimating the gains in access through the introduction of RDTs and ACTs through village Community Health Workers (CHW)
Access to effective treatment (cont)

**Nigeria** assessing the introduction of RDTs and ACTs to the workforce of a large sugar cane plantation in order to estimate productivity costs of adult malaria infection

**India** estimating the gains in quality of care through the involvement of local organizations in supportive supervision and training of CHWs

**Integrated vector control**

**Eritrea** determining the cost-effectiveness of continued Indoor Residual Spraying (IRS) in a low-endemic setting

**School based programs**

**Kenya and Senegal** asking whether the introduction of preventive therapy through schools results in higher attendance and learning as well as better student health

Overview of the World Bank’s Malaria Impact Evaluation Program (MIEP) (cont.)
<table>
<thead>
<tr>
<th>Country</th>
<th>Project</th>
<th>PIs</th>
<th>Impact Evaluation</th>
<th>Project Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eritrea</td>
<td>IDF Grant – Capacity building for evidence-based policy making in the health sector</td>
<td>P. Carneiro, J. Keating</td>
<td>Experimental Design (RCT) of impact of indoor residual spraying, and incentives for improving larval habitat management</td>
<td>$485,000</td>
</tr>
<tr>
<td>India</td>
<td>Leveraging local capacity to assist malaria control efforts</td>
<td>J. Friedman</td>
<td>Experimental design of CBO assistance to government malaria prevention and fever case management initiatives</td>
<td>$200 million</td>
</tr>
<tr>
<td>Kenya</td>
<td>School-based Malaria Prevention</td>
<td>S. Brooker, M. Jukes</td>
<td>Experimental Design (RCT) of teacher training and school-based intermittent preventive treatment</td>
<td>$4 million approved + $10.4 million Pipeline</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Malaria Control Booster Program</td>
<td>P. Carneiro, E. Velenyi</td>
<td>Experimental Design (RCT) of Community- and Private Sector-based Malaria Control</td>
<td>$180 million + $100 million Additional Financing</td>
</tr>
<tr>
<td>Senegal</td>
<td>School-based Malaria Prevention</td>
<td>S. Brooker, M. Jukes</td>
<td>Experimental Design (RCT) of teacher training and school-based intermittent preventive treatment</td>
<td>$5 million</td>
</tr>
<tr>
<td>Zambia</td>
<td>Zambia Access to ACTs Initiative</td>
<td>J. Friedman, E. Velenyi</td>
<td>Quasi Experimental Design (Matching and RCT) of Public Sector Supply Chain Management and Community- and Private Sector-based Malaria Control</td>
<td>$26.85 million</td>
</tr>
</tbody>
</table>
Conclusions

• Impact evaluation studies have already contributed much information for understanding the efficacy and cost-effectiveness of various malaria prevention options.

• Recent impact evaluation studies will help policy makers work through certain malaria control decisions such as free ITN distribution vs. cost-recovery.

• However many critical questions remain. For example, how do we affect people's behavior to ensure adoption and proper usage of nets? How do we increase the proportion of fever cases seeking treatment at facilities with adequate diagnostic and curative care?

• *Impact Evaluation of Malaria Programs (See Handout)*
  – Friedman, Legovini, and Velenyi; Development Dialogue Notes Vol. 1 (2009)

• **This week we will discuss methods through which we can answer these questions.**
1. Malaria Control [http://www.malariasite.com/malaria/ControlOfMalaria.htm](http://www.malariasite.com/malaria/ControlOfMalaria.htm)


