Establishing the impact of system-level interventions: Plausibility designs and other approaches from the “small-n evaluation” toolkit

Kara Hanson
What is a system-level intervention? System research?

- Effect of linking guideline adherence to accreditation and financing system
- Impact on delivery of other service via time use, and perceptions of agency and autonomy
- Effect of clinical guideline on quality of care

System-level intervention and research

System-sensitive research

Service-level intervention and research
System level change often poses small-n study design problem

- Small N
- Heterogeneity affecting treatment population, wider context, treatment itself
- Treatment is national in scope
- Budget constraints prevent large-n methods

- White and Phillips
Small-n evaluation methods

- Mechanism-based vs. experimental approaches to causal inference
- “Find rigorous empirical evidence that supports the assumptions of one explanation, but also to plausibly demonstrate that it is absent for alternative counterfactual hypotheses”
Malaria as a public health problem

- 3.2 billion people at risk
- 198 million cases globally in 2013
- 584,000 deaths
- Heaviest burden in Africa (90% of all malaria deaths), and in children < 5 years (78% of all deaths)
- Effective prevention and treatment interventions exist

Source: World Malaria Report 2014
Treatment of Fever in Children under Five, 2008-9

Source: ACTwatch Household Surveys
www.actwatch.info
Antimalarial market share by sector, 2010

Percentage of total antimalarial sale volumes

- Ghana
- Kenya
- Madagascar
- Niger
- Nigeria
- Tanzania mainland
- Uganda
- Zanzibar

Public health facility
Private not-for-profit health facility
Private for-profit outlet
Community health worker

Source: Independent Evaluation of AMFm, 2012
The idea of a “global ACT subsidy”...

• 2004: “Saving Lives, Buying Time” report by Institute of Medicine Committee led by Kenneth Arrow argued for a price subsidy to improve the affordability and availability of ACT
• Roll Back Malaria Partnership led a process to transform the concept into initiative supported by major institutions involved in malaria control
• Hosted by Global Fund to Fight AIDS, Tuberculosis and Malaria
AMFm comprised three elements

1. Price negotiations with ACT manufacturers
2. Buyer subsidy (co-payments) at top of global supply chain
3. Supporting interventions to ensure effective ACT scale-up
The AMFm model

Multiple eligible ACT manufacturers

First line buyers
Private Buyers (e.g. National Wholesalers)

Wholesalers

Retailers, private clinics and public providers

Distributors

NGO Buyers (e.g. PSI, MSF)

Co-payment

Public Buyers (e.g. Ministry of Health)

Central medical stores

Medicines

Money

Patients
AMFm implemented in 8 national scale pilots, 2010-2013
“Plausibility” evaluation design

Pre-and Post-test

Baseline Assessment (2010)

- Outlet surveys on ACT availability, price & market share
- Secondary household survey data on ACT use
- Documentation of key contextual factors

Intervention
( Financing platform in place and functional)

Endpoint Assessment (2011)

- Outlet surveys on ACT availability, price & market share
- Secondary household survey data on ACT use
- Documentation of AMFm implementation process & key contextual factors

- Remote area study (Ghana, Kenya)
- AMFm logo study (Ghana, Kenya, Madagascar, Nigeria)
<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Ghana</th>
<th>Kenya</th>
<th>Madagascar</th>
<th>Niger</th>
<th>Nigeria</th>
<th>Tanzania mainland</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. 20 percentage point increase in QAACT availability</td>
<td>52 (p&lt;0.01)</td>
<td>35 (p&lt;0.01)</td>
<td>4.6 (p=0.99)</td>
<td>10 (p=0.99)</td>
<td>26 (p=0.14)</td>
<td>44 (p&lt;0.01)</td>
<td>46 (p&lt;0.01)</td>
<td>39</td>
</tr>
<tr>
<td>2. Median price of QAACTs with AMFm logo is &lt; 3 times the median price of the most popular antimalarial in tablet form that is not a QAACT (ratio)</td>
<td>3.0 (p=0.81)</td>
<td>1.0 (p&lt;0.01)</td>
<td>1.6 (p&lt;0.01)</td>
<td>2.5 (p&lt;0.01)</td>
<td>3.1 (p=0.99)</td>
<td>1.0 (p&lt;0.01)</td>
<td>3.3 (p=0.99)</td>
<td>1.5</td>
</tr>
<tr>
<td>3. Median price of QAACTs with AMFm logo is less than the median price of AMT tablets (difference, QAACT – AMT)</td>
<td>-0.94 (p&lt;0.01)</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>-6.3</td>
</tr>
<tr>
<td>5. 10 percentage point increase in market share of QAACTs</td>
<td>40 (p&lt;0.01)</td>
<td>31 (p=0.01)</td>
<td>8.6 (p=0.61)</td>
<td>-8.8 (p=0.99)</td>
<td>18 (p&lt;0.01)</td>
<td>16 (p=0.23)</td>
<td>17 (p=0.08)</td>
<td>48</td>
</tr>
<tr>
<td>6. Decrease in market share of oral AMTs (percentage point change)</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>-3.9 (p=0.03)</td>
<td>na</td>
<td>-12</td>
</tr>
<tr>
<td>4. 5 percentage point increase in percentage of children with fever who received ACT treatment</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
</tbody>
</table>
**Plausibility strengthened**

where:

- Congruency of expected trend (quick impact in intervention area; no change in control area)
- Lack of measurable confounding (confounding on observables)
- Congruency of dose-response
- Congruency of mediating variables
- Congruency of lack of impact in absence of intervention
- Congruency of magnitude of effect on mediating variables

**Analytical support in AMFm evaluation**:

- Before / after design
- Theory of Change
- Measurement of implementation strength
- Changes in for-profit sector
- Comparison with non-AMFm countries
Manufacturer price negotiations
AMFm subsidy

Increased volume of co-paid QAACTS
• Ordered
• Approved
• Delivered
• Customs cleared

Distributed via public and private distribution chains

Relative prices of QAACTS

QAACT availability

Antimalarial market size

QAACT market share

QAACT/ACT use

Appropriate treatment

Demand for QAACTS

Malaria burden and artemisinin resistance

Key:
Blue rectangle = AMFm IE indicators
Green circle = SIs
Red oblong = Contextual factors
Manufacturer price negotiations

AMFm subsidy

Increased volume of co-paid

AMFm price negotiations

Malaria burden and artemisinin resistance

Appropriate treatment

QAACT/ACT use

Regulation including prescription only status, ACT, AMT ban, enforcement

Demand for QAACTS

AMFm communications including logo

Distributed via public and private distribution chains

• Ordered
• Approved
• Delivered
• Customs cleared

QAACT availability

QAACTs

• Antimalarial market size
• Relative prices of QAACTs

Antimalarial market

Recommended retail price

Training

Relative prices of QAACTs

QAACTs

Key:
Blue rectangle = AMFm IE indicators
Green circle = SIs
Red oblong = Contextual factors

AMFm

London School of Tropical Medicine
Manufacturer price negotiations
AMFm subsidy

Increased volume of co-paid QAACTS
• Ordered
• Approved
• Delivered
• Customs cleared

Demand levers (from July 2011)

Taxes, market share and markups

Health financing system

Macroeconomic and political climate; exchange rate

Relative prices of QAACTs

Recommended retail price

Antimalarial market size

Distributed via public and private distribution chains

AMFm communications including logo

Other IEC/BCC on case management or negative media

Regulation, including prescription only status, which outlets can stock ACT, AMT ban, enforcement

Targeted:
• Parasitaemia
• Age
• Poverty
Effective, quality use

Other public sector QAACT purchases, eg. PMI

Availability of diagnostics

Interventions to increase adherence, eg. packaging

Training

Appropriate treatment

Malaria burden and artemisinin resistance

QAACt availability

QAACt/ACT use

QAACt market share

QAACt market size

Demand for QAACTs

Key:
Blue rectangle = AMFm IE indicators
Green circle = SIs
Red oblong = Contextual factors
Implementation strength

‘the pooled effect of dose, duration, specificity, and intensity of intervention - in order to determine how much implementation efforts are needed to achieve a meaningful level of change in coverage and health outcomes’

<table>
<thead>
<tr>
<th></th>
<th>Ghana</th>
<th>Kenya</th>
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<th>Niger</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Doses of AMFm ACTs delivered per person at risk (2010-2011)</strong></td>
<td>1.01</td>
<td>0.90</td>
<td>0.31</td>
<td>0.19</td>
<td>0.42</td>
<td>0.84</td>
<td>0.08</td>
<td>0.14</td>
</tr>
<tr>
<td><strong>% delivered to private for-profit sector buyers</strong></td>
<td>94.3%</td>
<td>49.6%</td>
<td>62.3%</td>
<td>62.2%</td>
<td>76.9%</td>
<td>24.5%</td>
<td>71.0%</td>
<td>19.8%</td>
</tr>
<tr>
<td><strong>Months from arrival of AMFm ACTs to mid-point of endline survey</strong></td>
<td>15-1/2</td>
<td>15</td>
<td>13-1/2</td>
<td>6-1/2</td>
<td>9-1/2</td>
<td>7</td>
<td>14</td>
<td>9-1/2</td>
</tr>
<tr>
<td><strong>Months from IEC/BCC implementation at scale to mid-point of endline survey</strong></td>
<td>9</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Demand levers (2nd half of 2011)</strong></td>
<td>Yes. 27% of PFP orders approved</td>
<td>Yes. 56% of PFP orders approved</td>
<td>Yes. 90% of PFP orders approved</td>
<td>No</td>
<td>Yes. 24% of PFP orders approved</td>
<td>Yes. 57% of PFP orders approved</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Mediating factors: public vs. private–for-profit

Change in QAECT availability (percentage points)
Comparison with non-AMFm countries
Evaluation conclusion

In summary, our evaluation has shown that subsidies applied to manufacturer price, when partnered with supporting interventions such as communications campaigns, can be an effective mechanism to rapidly improve the availability, price, and market share of QAACTs, particularly in the private for-profit sector. Although care should be taken in extrapolating these results to countries with very different antimalarial markets, positive results were achieved across a range of malaria transmission, economic, and cultural contexts.

Tougher et al. 2012. Lancet
Implications for evaluating system level policies in RISE

- System-level change will often pose “small-n” problems for evaluation
- Mechanism-based approaches to inference can be used to understand and attribute impact
- These need to be conducted with rigour – RISE presents an opportunity to explore and strengthen such methods
- Are we carried away with confounding on unobservables? When is plausibility sufficient?
Acknowledgements

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The Independent Evaluation was funded by the Global Fund to Fight AIDS, Tuberculosis and Malaria. Additional funding for outlet surveys in three countries was provided by the Bill and Melinda Gates Foundation through its support of the ACTwatch project.

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- Clinton Health Access Initiative – for invaluable information about country implementation processes
- Global Fund Secretariat
- Research staff at ICF International and LSHTM
- Research staff in all 8 pilots
- Respondents in AMFm pilot countries

Full report and supplement on ACT use available at:
http://www.theglobalfund.org/en/amfm/independentevaluation/
Main evaluation results published in Tougher et al, Lancet 2012