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

Kara Hanson
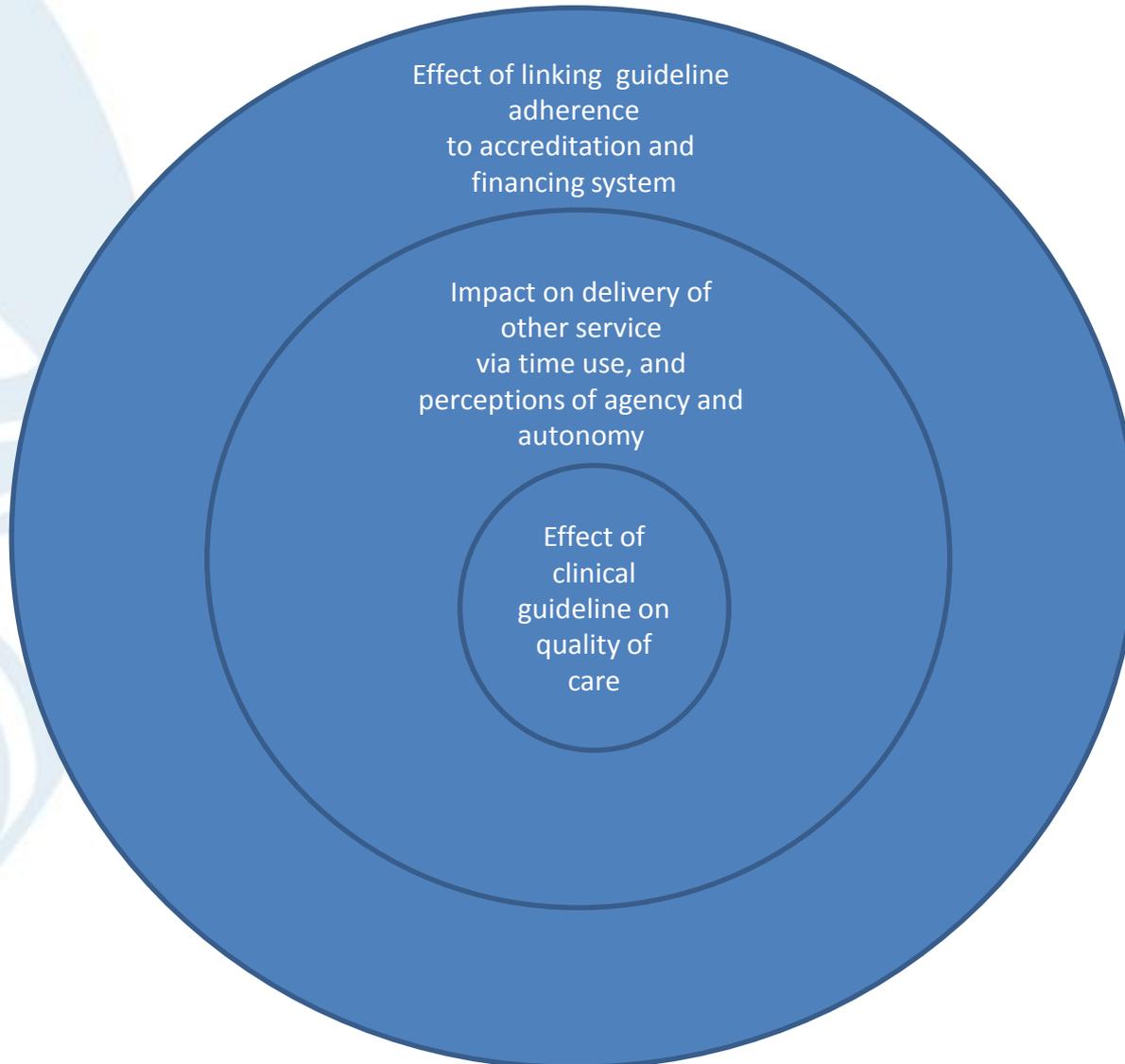
Improving health worldwide

www.lshtm.ac.uk

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

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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

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Small-n evaluation methods

International Initiative for Impact Evaluation
Working Paper 15

Addressing attribution of cause and effect in small n impact evaluations: towards an integrated framework

Howard White and Daniel Phillips
June 2012

- 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"

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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
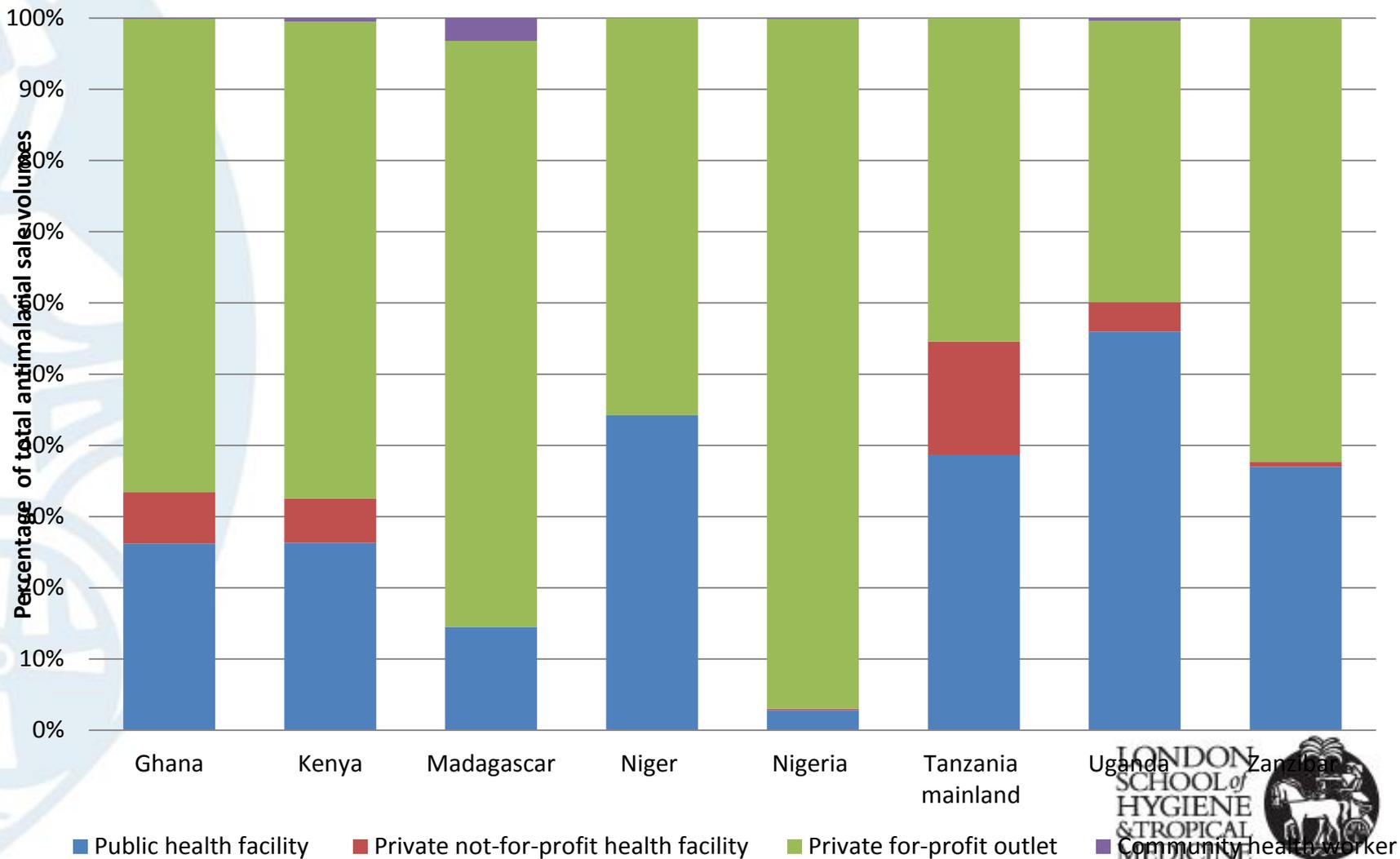
Source: World Malaria Report 2014

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Treatment of Fever in Children under Five, 2008-9
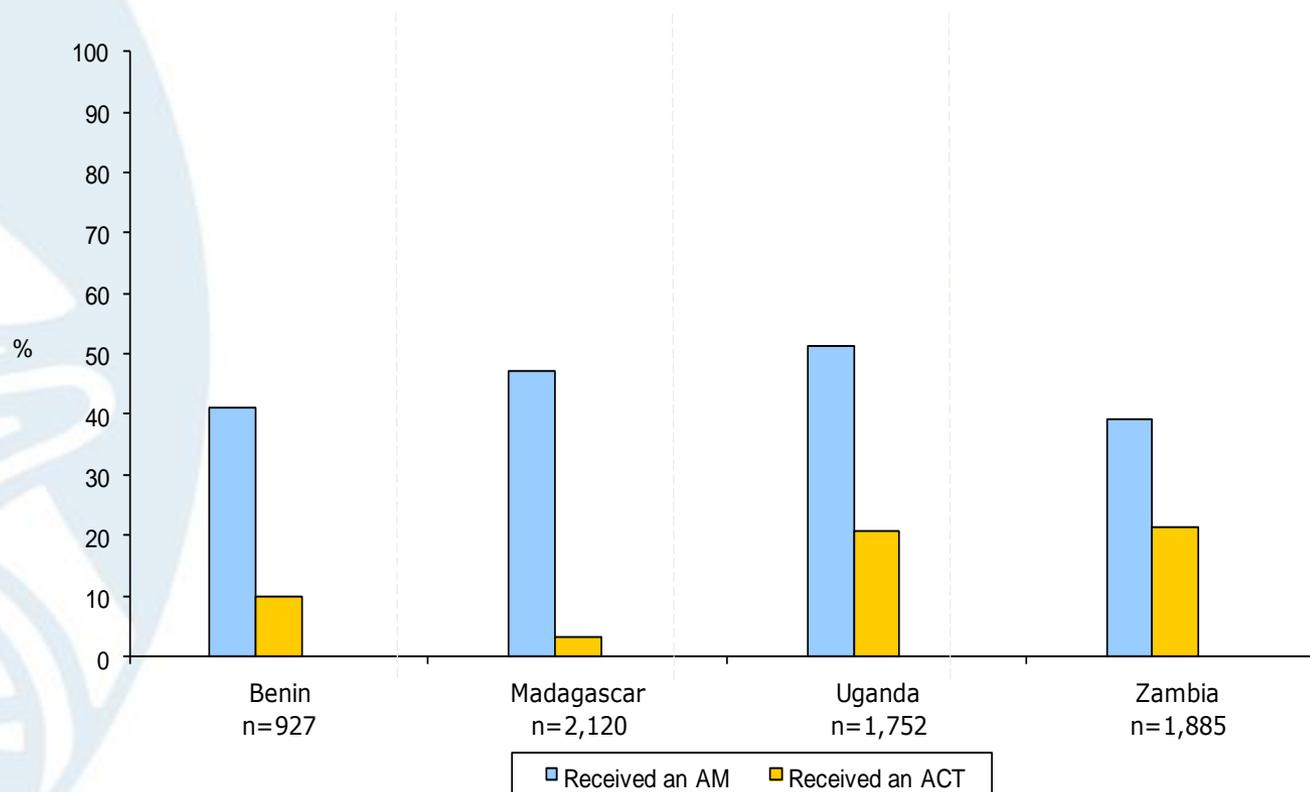
Source: ACTwatch Household Surveys
www.actwatch.info

Antimalarial market share by sector, 2010

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

SAVING LIVES, BUYING TIME

Economics of Malaria Drugs in an Age of Resistance

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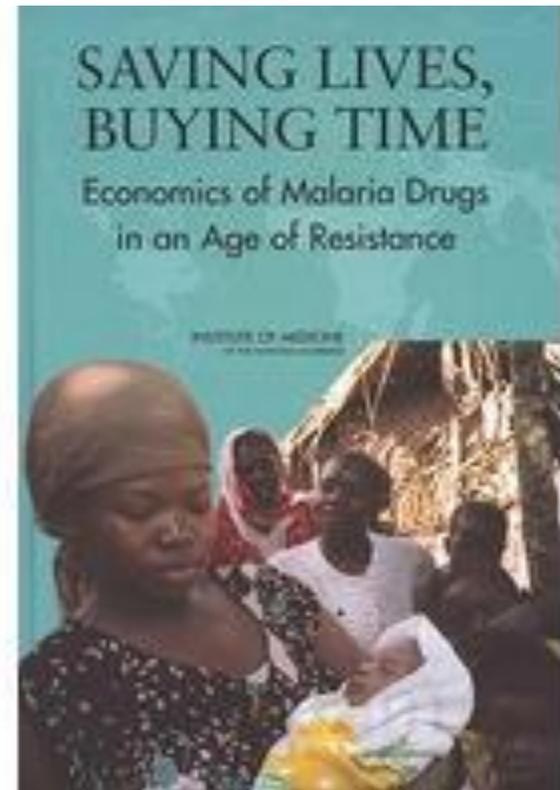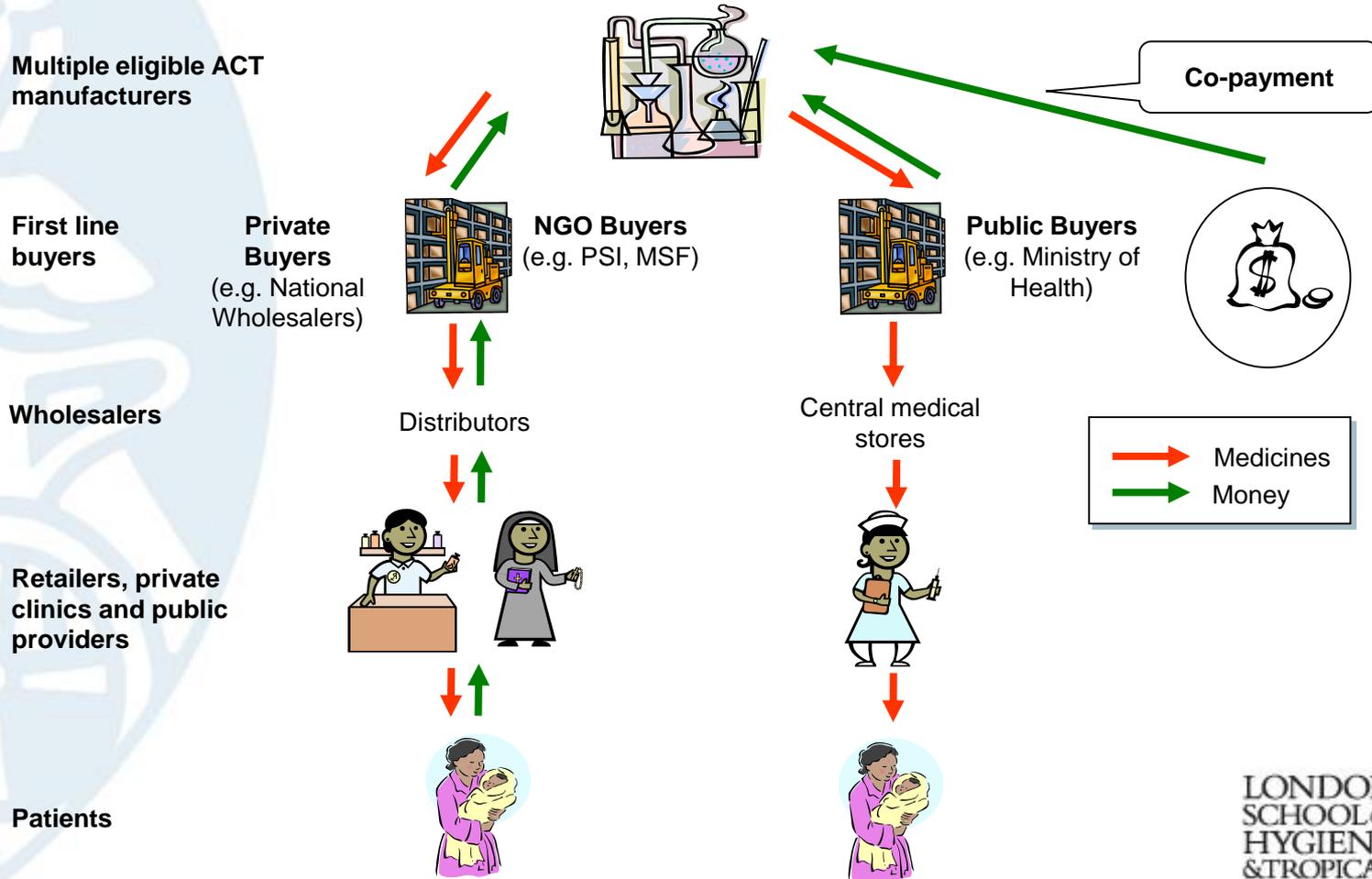
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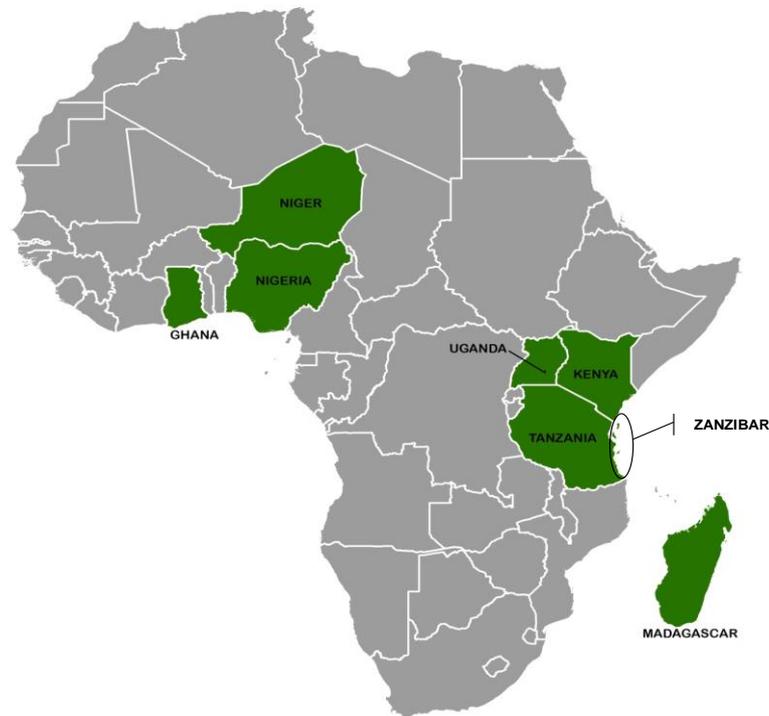
AMFm comprised three elements

1. Price negotiations with ACT manufacturers

2. Buyer subsidy (co-payments) at top of global supply chain

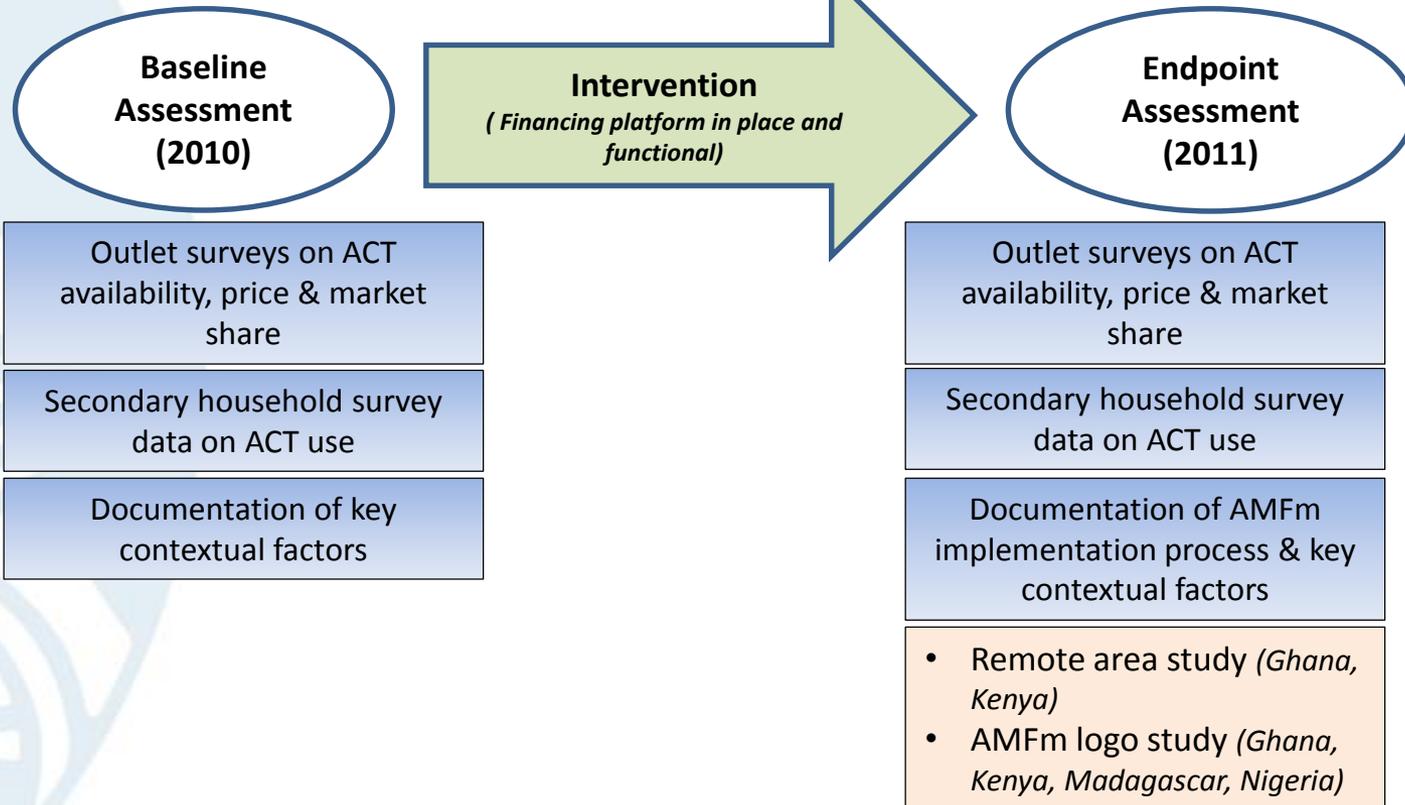3. Supporting interventions to ensure effective ACT scale-up

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The AMFm model

Multiple eligible ACT manufacturers

First line buyers

Private Buyers (e.g. National Wholesalers)

NGO Buyers (e.g. PSI, MSF)

Public Buyers (e.g. Ministry of Health)

Co-payment

Wholesalers

Distributors

Central medical stores

Retailers, private clinics and public providers

Patients

Medicines
Money

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AMFm implemented in 8 national scale pilots, 2010-2013

NIGER

NIGERIA

GHANA

UGANDA

KENYA

TANZANIA

ZANZIBAR

MADAGASCAR

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"Plausibility" evaluation design

Pre-and Post-test

Baseline Assessment (2010)

Intervention
(Financing platform in place and functional)

Endpoint Assessment (2011)

Baseline	Endpoint
Outlet surveys on ACT availability, price & market share	Outlet surveys on ACT availability, price & market share
Secondary household survey data on ACT use	Secondary household survey data on ACT use
Documentation of key contextual factors	Documentation of AMFm implementation process & key contextual factors
	• Remote area study *(Ghana, Kenya)* • AMFm logo study *(Ghana, Kenya, Madagascar, Nigeria)*

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Success metrics

Benchmark	Ghana	Kenya	Madagascar	Niger	Nigeria	Tanzania mainland	Uganda	Zanzibar
1. 20 percentage point increase in QAACT availability	52 (p<0.01)	35 (p<0.01)	4.6 (p=0.99)	10 (p=0.99)	26 (p=0.14)	44 (p<0.01)	46 (p<0.01)	39
2. Median price of QAACTs with AMFm logo is < 3 times the median price of the most popular antimalarial in tablet form that is not a QAACT (ratio)	3.0 (p=0.81)	1.0 (p<0.01)	1.6 (p<0.01)	2.5 (p<0.01)	3.1 (p=0.99)	1.0 (p<0.01)	3.3 (p=0.99)	1.5
3. Median price of QAACTs with AMFm logo is less than the median price of AMT tablets (difference, QAACT – AMT)	-0.94 (p<0.01)				-1.17 (p<0.01)			-6.3
5. 10 percentage point increase in market share of QAACTs	40 (p<0.01)	31 (p=0.01)	8.6 (p=0.61)	-8.8 (p=0.99)	18 (p<0.01)	16 (p=0.23)	17 (p=0.08)	48
6. Decrease in market share of oral AMTs (percentage point change)					-3.9 (p=0.03)			-12
4. 5 percentage point increase in percentage of children with fever who received ACT treatment	na	na	na	na	na	na	na	na

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

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

Distributed via public
and private
distribution chains

Relative prices of
QAACTs ↔ QAACT availability ← Demand for QAACTS
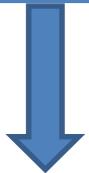
Antimalarial market
size

QAACT market share

QAACT/ACT use

Appropriate treatment

↓

Malaria burden and
artemisinin resistance

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Manufacturer price negotiations
AMFm subsidy

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

Distributed via
public and private
distribution chains

AMFm
communications
including logo

Relative prices
of QAACTs

QAACT availability

Demand for
QAACTS

Training

Recommended
retail price

Antimalarial market
size

QAACT market
share

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

QAACT/ACT use

Appropriate treatment

↓

Malaria burden and
artemisinin resistance

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Manufacturer price negotiations
AMFm subsidy

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

Demand levers (from July 2011)

Other public sector QAACT purchases, eg. PMI

Taxes, market share and markups

Health financing system

Macroeconomic and political climate; exchange rate

Distributed via public and private distribution chains

AMFm communications including logo

Relative prices of QAACTs

QAACT availability

Demand for QAACTS

Training

Recommended retail price

Other IEC/BCC on case management or negative media

Antimalarial market size

Availability of diagnostics

QAACT market share

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

QAACT/ACT use

Interventions to increase adherence, eg, packaging

Appropriate treatment

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

Malaria burden and artemisinin resistance

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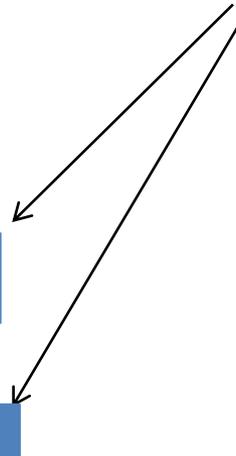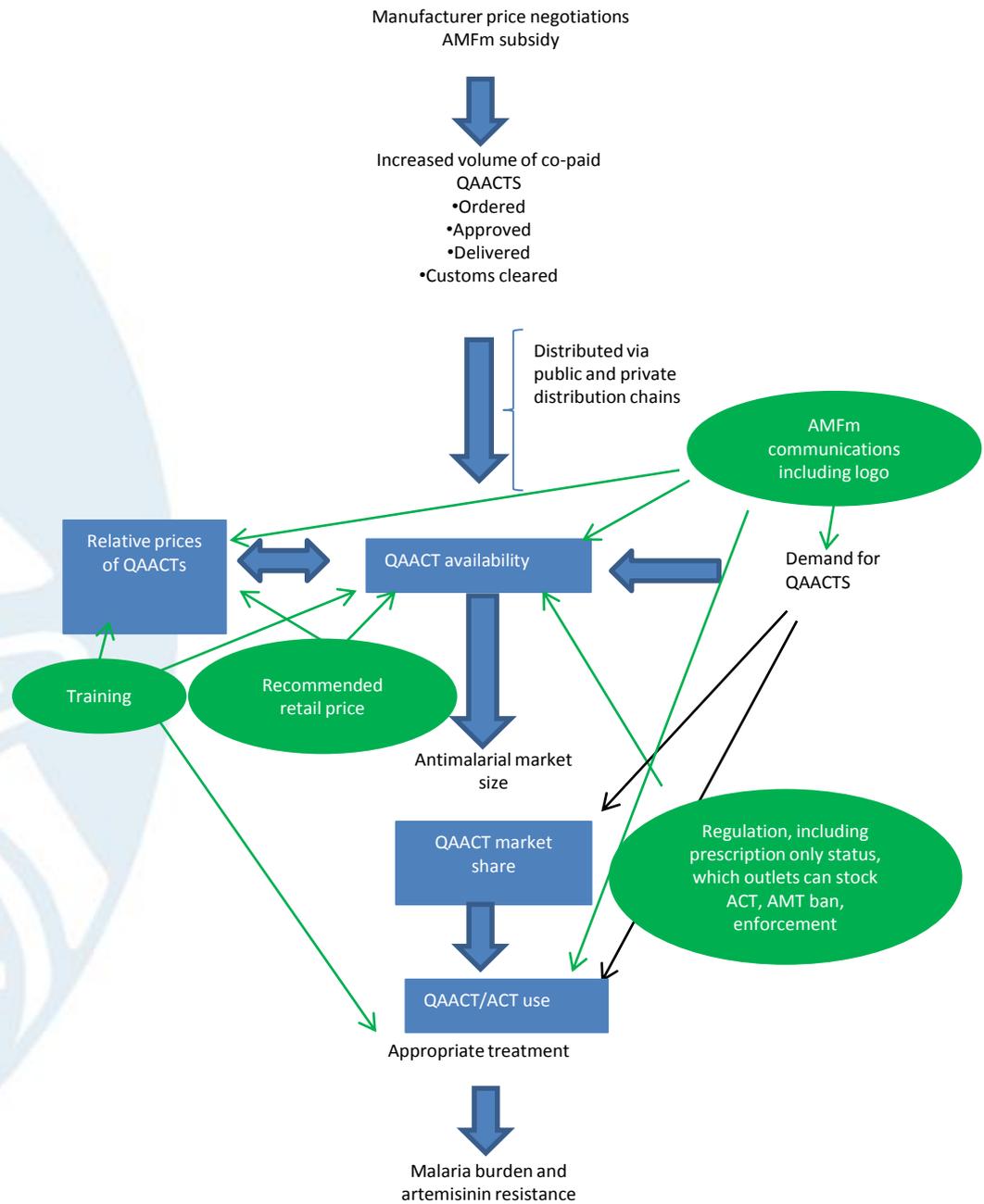
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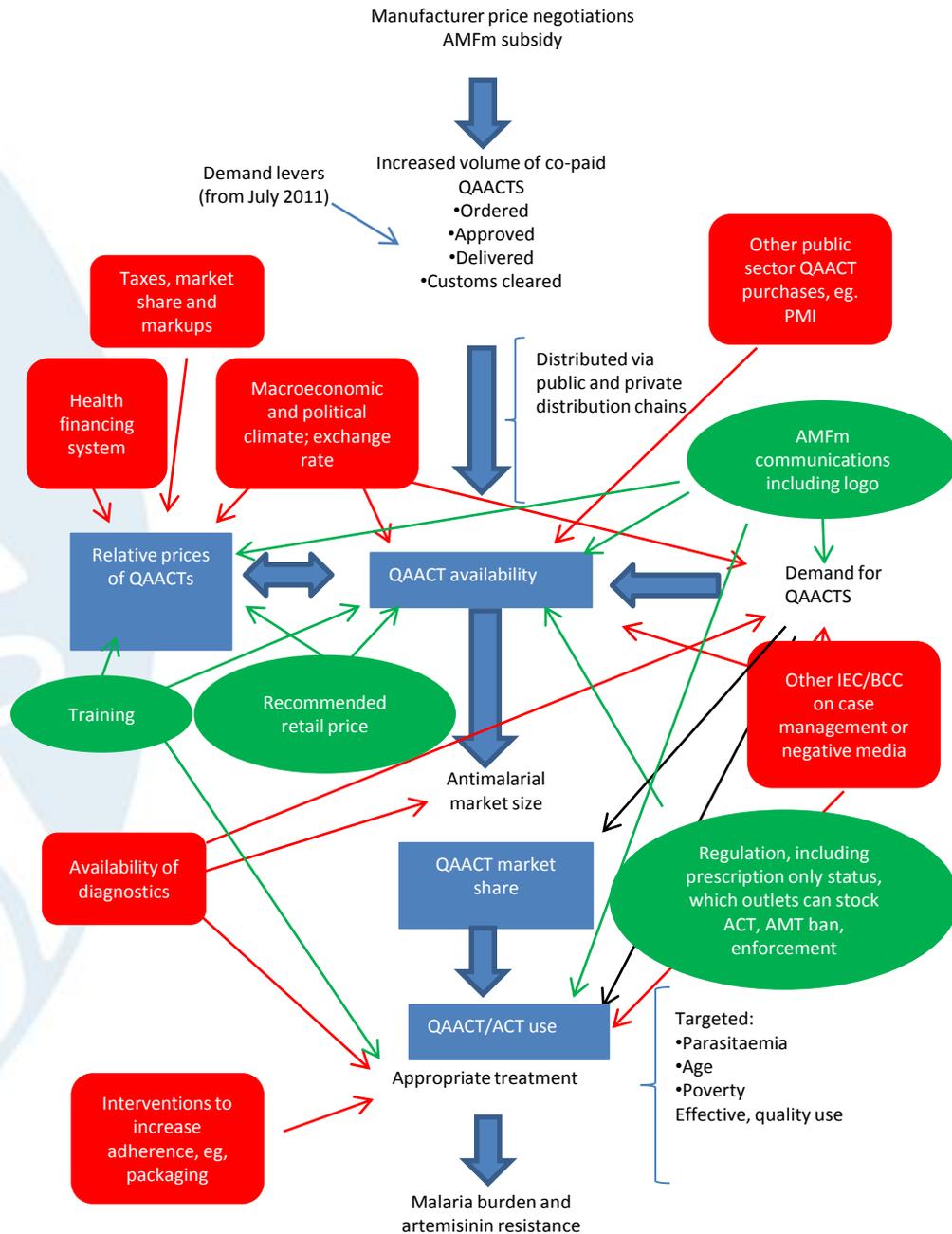
Implementation strength

'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'

Avan, BI; Schellenberg, JA (2012) Measuring Implementation Strength Literature Review: Possibilities for maternal and newborn health programmes. In: London School of Hygiene Tropical Medicine Staff Symposium 2012, 5 November 2012, London, UK. Downloaded from: http://researchonline.lshtm.ac.uk/1126669/

	Ghana	Kenya	Tanzania mainland	Zanzibar	Nigeria	Uganda	Madagascar	Niger
Doses of AMFm ACTs delivered per person at risk (2010-2011)	1.01	0.90	0.31	0.19	0.42	0.84	0.08	0.14
% delivered to private for-profit sector buyers	94.3%	49.6%	62.3%	62.2%	76.9%	24.5%	71.0%	19.8%
Months from arrival of AMFm ACTs to mid-point of endline survey	15-1/2	15	13-1/2	6-1/2	9-1/2	7	14	9-1/2
Months from IEC/BCC implementation at scale to mid-point of endline survey	9	9	7	5	3	0	*	*
Demand levers (2nd half of 2011)	Yes. 27% of PFP orders approved	Yes. 56% of PFP orders approved	Yes. 90% of PFP orders approved	No	Yes. 24% of PFP orders approved	Yes. 57% of PFP orders approved	No	No

Mediating factors: public vs. private–for-profit

Change in QAACT availability (percentage points)

Legend: ■ Private for-profit ■ Public

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

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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?

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Acknowledgements

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