

Design and Effectiveness of Public Health Subsidies in Less Developed Countries

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Introduction

- Good health is a critical economic asset, particularly in less developed countries
 - many people rely on farming or other forms of self-employment
 - when sick, cannot work and cannot generate income
- Good health is also valuable in itself
 - Life is more pleasant when one is healthier and one's kids don't die
- But good health is lacking in less developed countries

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 - vaccines, antimalarial bednet, water chlorination or water filter, etc.

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- Up to 2/3 of these deaths could be averted using existing health products
 - vaccines, antimalarial bednet, water chlorination or water filter, etc.
- How to increase adoption of these products?

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- Economic theory provides two rationales for such subsidies:
 - limiting spread of infectious diseases is a public good
 - subsidies more than pay off for themselves over time, as healthier children grow into more productive adults who will pay more taxes over their lifetime

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 - less so for inputs that require proactive behavior on part of subsidy recipient (condoms, bed nets, filters, etc.)
 - maybe if subsidize too much, many beneficiaries end up wasting inputs?

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 - 1 beneficiaries of subsidized inputs/products must put them to (appropriate) use
 - 2 Subsidies have to reach the intended beneficiaries in the first place....
 - concern: subsidized inputs left to rot in storage room by absentee health workers
 - or stolen along the way by corrupt public health officials **Corruption**

Today's talk

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- I'll present evidence from my own work on both sets of issues:
 - 1 Demand side: Designing subsidies so as to balance access and targeting to those who will **use** inputs
 - 2 Supply side: how serious a concern are governance issues in the delivery of subsidies?

Principal's problem

- A principal values the health benefit of a health product, non-health utility, alternative uses of funds
- Maximizes

$$W = \sum (b_i \cdot z_{DALY} \cdot h_i + u_i) - \lambda S + \text{continuation value}$$

- where
 - b_i = DALY value of total health benefit when i uses product appropriately
 - z_{DALY} = dollar value of DALY to principal
 - h_i = binary variable indicating whether i uses product appropriately
 - u_i = individual i 's non-health utility
 - S = total cost of the subsidy program
 - λ = marginal cost of public funds

Principal's problem

- Benefit to marginal increase in subsidy (ds) exceeds costs if:

$$use_{mar} \cdot (b_{mar} \cdot ZDALY) > (take_{mar} \cdot s + take_{inf} \cdot ds) \cdot \lambda$$

- use_{mar} = proportion induced to use by policy change
- b_{mar} = health benefit among those induced to use by policy change
- $take_{mar}$ = proportion induced to take by policy change
- s = post-policy change subsidy per taker
- $take_{inf}$ = proportion taking up product before policy change
- λ = marginal cost of public funds

Tradeoffs when increasing subsidy level?

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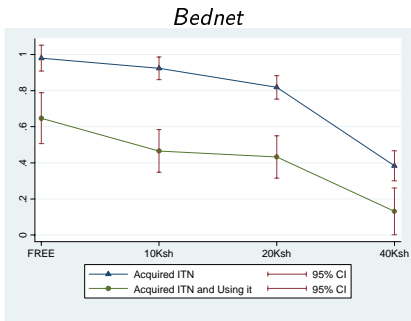
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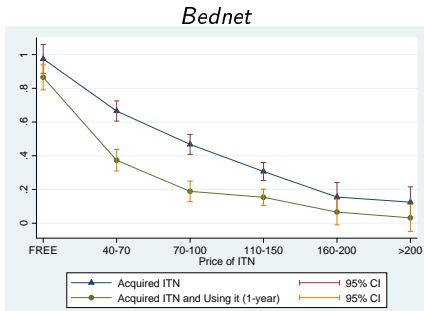
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 - Ultimately, relative importance of these problems is an empirical question (and context-specific)

Do marginal takers use subsidized inputs?

Study 1: *Bed nets*
 (Cohen & Dupas, QJE
 2010)
 Kenya, 2006
 Pregnant women
 2-mo usage



Study 2
 (Dupas, ECMA 2014)
 Kenya, 2007
 Households
 1-year usage



Study 3

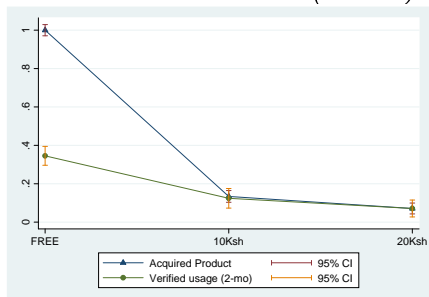
(Dupas et al., 2015)

Kenya, 2008

Mothers of young children

4-mo usage

Water Purification Product (Chlorine)



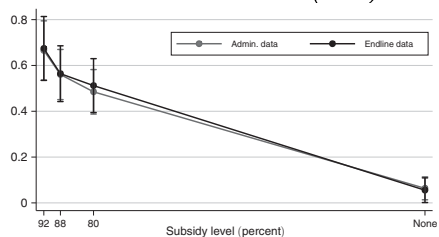
Study 4

(Cohen et al, AER 2015)

Kenya, 2010

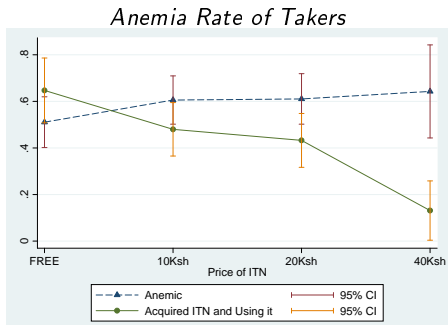
Households

Anti-malarial treatment (ACT)

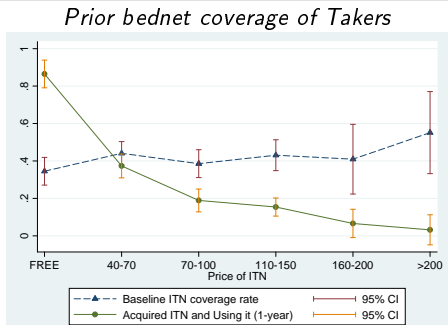


Do marginal users have lower returns?

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(Cohen & Dupas 2010)
Kenya
Pregnant women
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Study 2
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Households
1-year usage



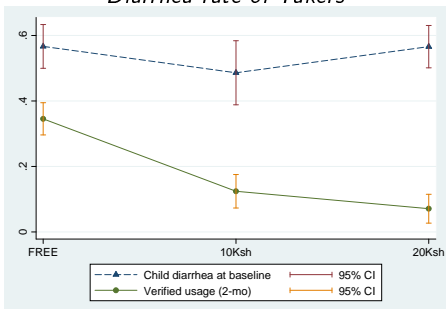
Study 3

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Kenya

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Diarrhea rate of Takers

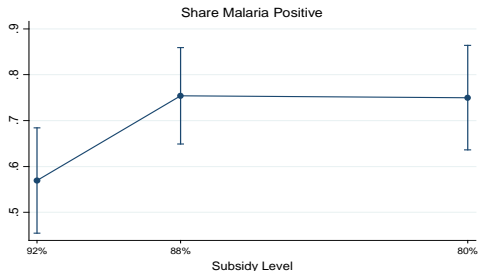
Study 4

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Households

ACT

Malaria status of Takers

Evidence from other contexts / products

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- In most other existing studies, price also appears a poor targeting tool: marginal takers do not seem to have lower usage or lower returns
 - Those more likely to buy deworming medication in Kenya don't have more worms (Kremer and Miguel, 2007)
 - Those with higher WTP for water filters in Ghana don't see greater drop in diarrhea incidence from using filter (Berry, Fischer, Guiteras, 2012)
 - Same for flip-flops in Kenya, soap and vitamins in Uganda, Guatemala and India (Meredith et al., 2014)
 - Ashraf, Berry and Shapiro (AER 2010): Zambia, water purification product (chlorine)
 - selection effect of prices, but selection on wealth, not need

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- Ordeal mechanism: Non-monetary cost to obtain a benefit
 - Can such mechanisms help screen non-users?

Today's Outline

- 1 Demand side: Self-Screening tools
 - 1 Price
 - 2 Non-monetary cost (“ordeal”)
- 2 Supply side: Provider agency concerns in delivery
 - Local Capture vs. Local information

Ordeal mechanism

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- The more attractive the benefit, the greater the ordeal must typically be; may impose a significant welfare cost
- For many preventive health products (e.g. chlorine), benefit to non-health users is very small, so a small ordeal may be sufficient

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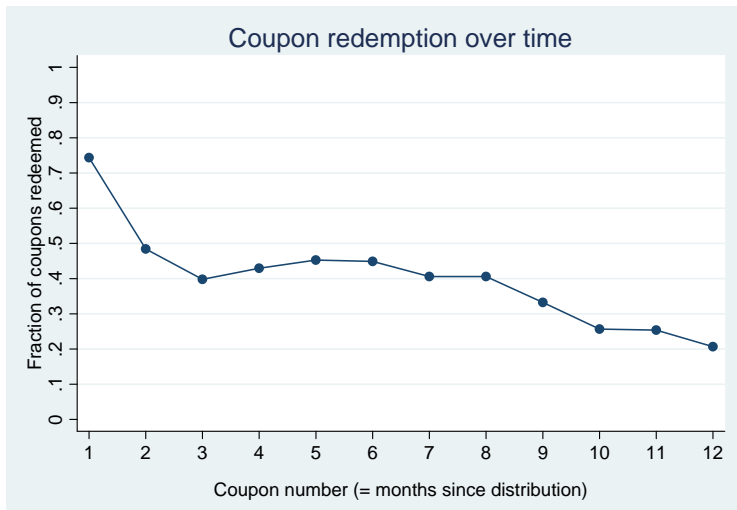
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- du_{mar} = change in non-health utility to new users
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- If there is heterogeneity in relative cost of effort and money (e.g. due to different wage levels), and heterogeneity in willingness to use
 - Joint distribution determines impact of screening through price vs. ordeal.

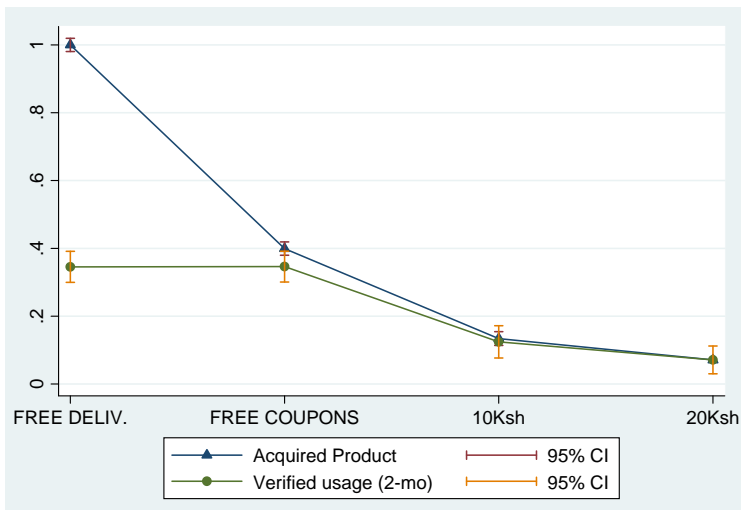
Micro-ordeal and Targeting

- Dupas, Hoffmann, Kremer and Zwane (2013), Kenya, Chlorine
- We estimate the number of inframarginal and marginal users, inframarginal and marginal takers, under three policies through a randomized evaluation:
 - 50% subsidy
 - 100% subsidy with micro-ordeal (1-year supply)
 - 100% subsidy with free delivery (1-year supply)
- Also have non-experimental estimate of take up at full price from baseline survey
- **Micro-ordeal:** 12 dated coupons for free 1-month supply each. Coupons redeemable at nearby shop.
 - Average distance to shop 3.9 km
 - For 22% of participants shop was in nearest market center
- **Free Delivery:** 1-year supply delivered in two installments (clinic visit, then home visit)

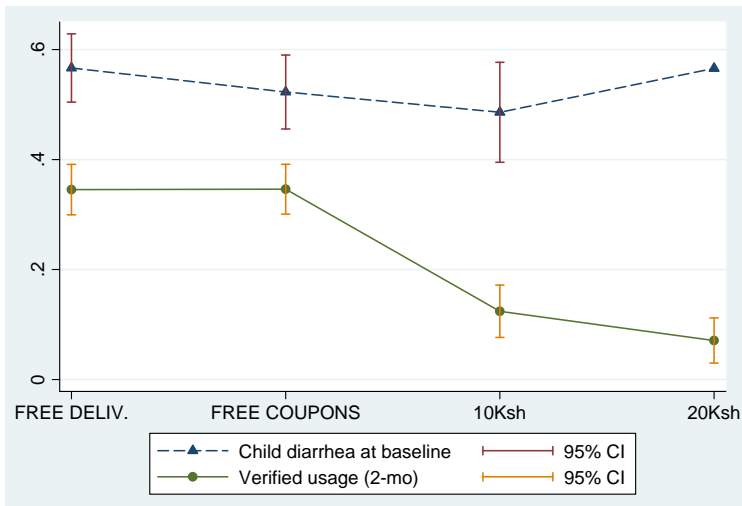
Coupon micro-ordeal



Coupon micro-ordeal reduces inclusion error without increasing exclusion error



Micro-ordeal and Targeting



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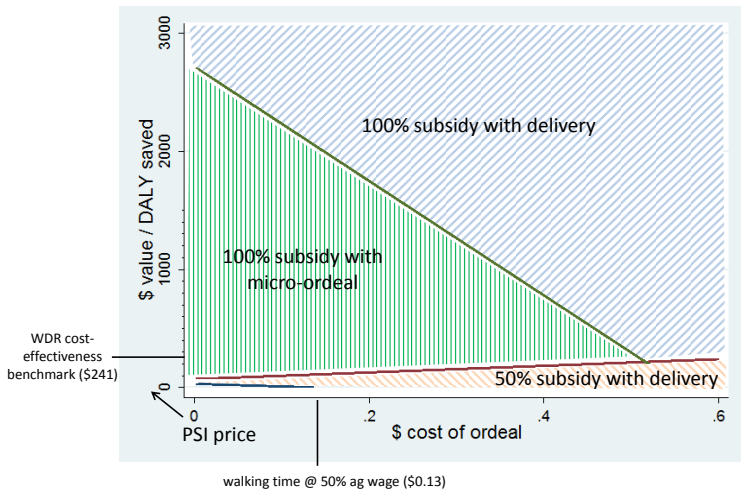
- Size of ordeal is a choice variable for the principal
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	Redeemed coupon month of survey	Positive chlorine test
Redeemable at nearest market	0.514	0.377
Not redeemable at nearest market	0.382	0.337

Preferred policy?

- Can calibrate model with assumptions on health impact of water treatment, cost of policy **Assumptions**
- Identify regions of parameter space (principal's valuation of health benefit, utility cost of ordeal) over which each policy is preferred
- For plausible range of valuations of DALY and ordeal cost, 100% subsidy with micro-ordeal is preferred to no subsidy, and to 50% and 100% subsidy with free delivery

Preferred Policy



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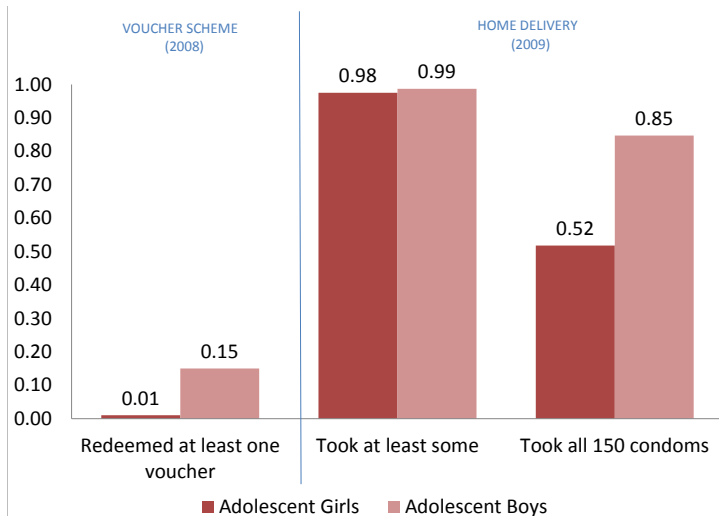
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- Sometimes the ordeal can be too costly (because of the nature of the product, e.g. family planning product that people may be embarrassed to obtain from a local store) and it reduces take-up considerably even among high-return folks

Macro-ordeal...

- Product considered: Male Condoms



Today's Outline

- 1 Take-up: Self-Screening tools
 - 1 Price
 - 2 Non-monetary cost (“ordeal”)
- 2 Delivery: Provider agency
 - Local Capture vs. Local information

Agency in delivery

- Potential concerns:
 - Leakage:
 - Olken (2006): at least 18% of the rice provided in an Indonesian relief program disappeared between the government warehouse and holds
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 - Extortion:
 - anecdotal evidence from many countries of side payment requests for free drugs/services
 - Shirking by government providers/agents:
 - Das's work in India, Leonard's work in Tanzania
 - Chaudhury et al. (2006): absenteeism of health providers common in many developing countries
 - Banerjee et al. (2011), Udaipur: lack of reliability of health staff causes full immunization rates among children to drop from 23% to 10%

Dizon-Ross, Dupas, Robinson (2015)

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- Focus on WHO-recommended program of distributing free antimalarial bed nets (LLINs) to pregnant women through antenatal clinics (ANCs)
- Audited such a program in three countries:
 - Ghana, 72 health centers (TI rank: 64/178)
 - Kenya, 48 health centers (TI rank: 139/178)
 - Uganda, 48 health centers (TI rank: 130/178)

Measurement: Outcomes of interest

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 - sent ineligibles to health centers and recorded if they could obtain LLIN and if so at what price (“mystery clients”) [▶ Examples](#)

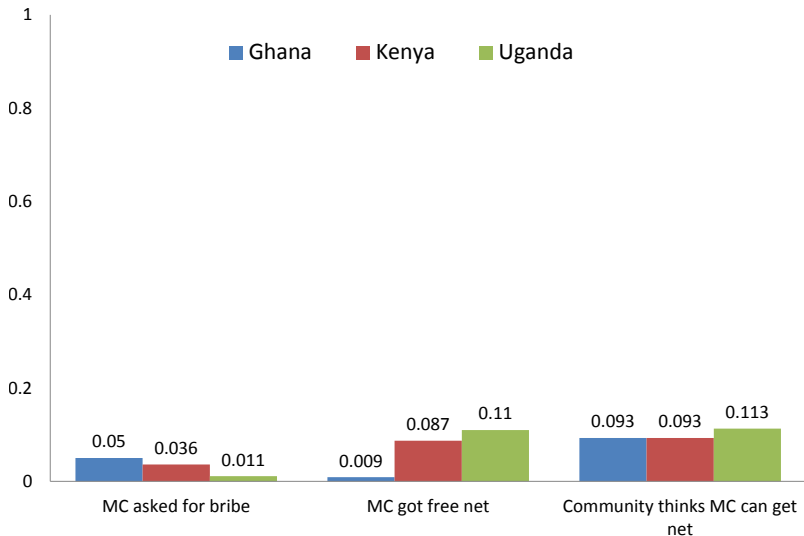
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- **Coverage, Extortion** among eligibles:
 - randomly surveyed ANC clients and asked them whether they received LLIN at health center, whether had to pay for it

Result 1: Very modest leakage to ineligible



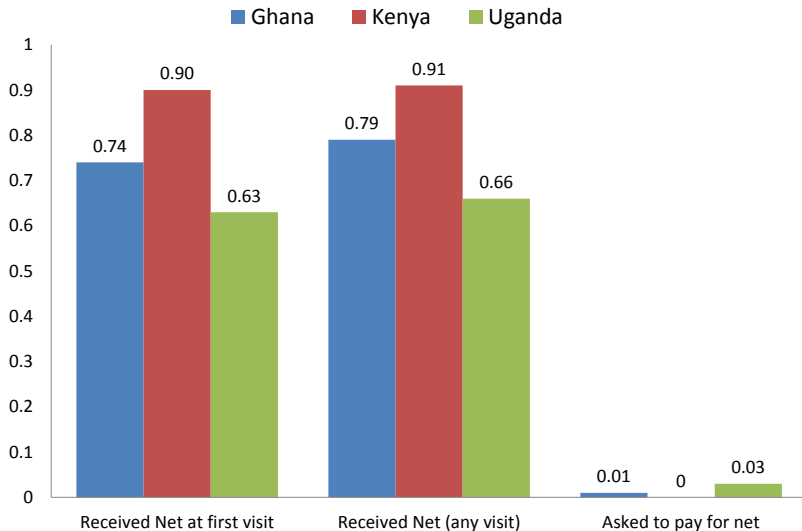
Leakage or Efficient Targeting?

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- Dep. Var: Ineligible “Mystery Client” was able to get a free net

Requested for pregnant woman	0.012 [0.023]
Requested for child	0.18*** [0.045]
If asked, said that had child	0.11** [0.047]
MC signaled that educated	0.0077 [0.016]
Healthworker female	-0.012 [0.022]
Health facility Fixed effects	X
Observations	683
R-Squared	0.402
Mean of the Dependent Variable	0.0378

Result 2: Fairly High Coverage among Eligibles, no extortion



Errors of exclusion or Efficient Targeting?

- Dep. Var: Pregnant woman received free net at first prenatal visit, as per program rule:

Years of education	-0.0068** [0.0030]
Health facility Fixed effects	X
Observations	2,028
R-Squared	0.357
Dep. Var. Mean	0.762

Summary of Results

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- Very little leakage
- No extortion, high coverage among eligibles
- Suggests that for very simple, easy to verify targeting rule, and obvious health benefits for beneficiaries, health workers can be relied upon
 - aware of health benefits to targeted beneficiaries and intrinsically motivated to deliver those

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- Rationale for these subsidies is that they could have large effects on health, nutrition, etc.
- But for the hoped-for impacts to be maximized, need a number of things to hold:
 - 1 subsidies must be targeted/assigned to those for whom the returns are highest
 - 2 leakage has to be limited
 - 3 beneficiaries of subsidized inputs/products must put them to (appropriate) use

Conclusion

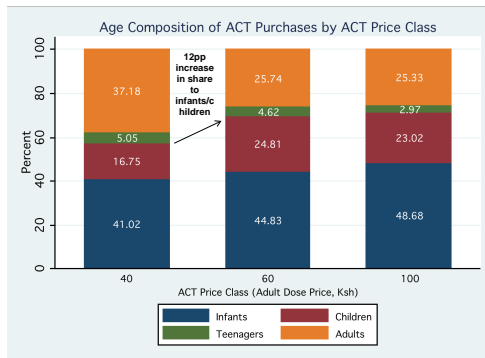
- Price is often too blunt a tool for targeting in areas where people are poor and credit constrained
 - Too many exclusion errors when subsidy level is low
 - Identifying the subsidy level that optimally balances risk of exclusion and risk of inclusion errors requires local experimentation as it is context specific
- In some contexts / for some products (water purification), “ordeal mechanism” alongside full subsidy can reduce wastage of subsidized inputs on people with low returns
- Agency problems on the delivery size are not first order for products that are high impact and easy to target
- Indeed, massive increase in free distribution of bed nets throughout sub-Saharan Africa over past 10 years (Roll Back Malaria) has led to important decrease in under-5 mortality (Cogneau and Rossi, 2016)

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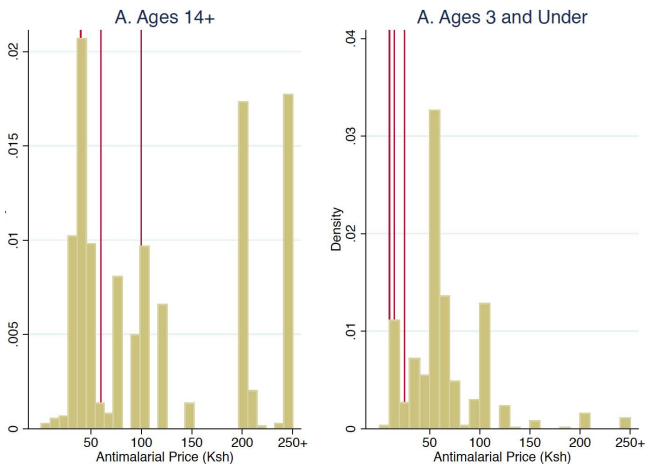
Appendix Slides

Increasing the price changes how households allocate subsidy across members

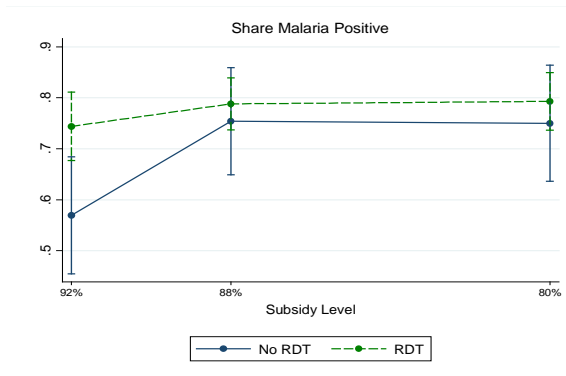


(Source: drug shop redemption data) [◀ Back](#)

Price of non-ACT antimalarials, by age group



(Source: drug shop transaction records data)



(Source: surprise RDT tests at drug shops)

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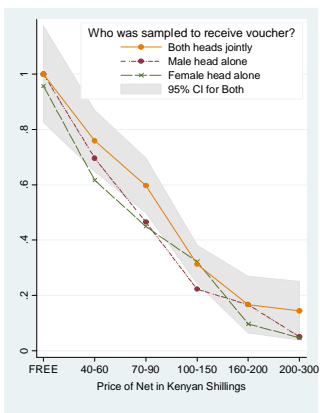
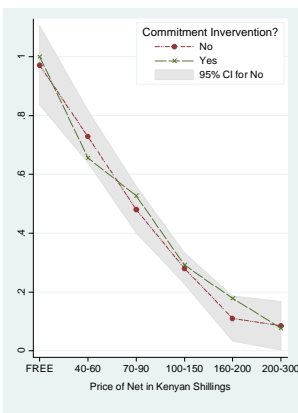
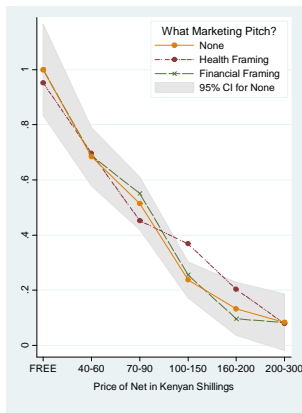
Calibration

- Estimated health benefit:
 - Focus on child deaths averted; excludes adult health benefit, diarrhea impact on child development
 - Child mortality 8.25% in Kenya, 20% of which due to diarrhea
 - Point of use water treatment reduces diarrhea episodes by 39% (Arnold and Colford systematic review, adjusted for compliance)
 - One child death = 30.28 DALYs
 - 1.7 children under 5 per household in the sample
 - Annual health benefit of water treatment per household = $8.25\% \text{ U5MR} \times 20\% \times 39\% \times 30.28 \text{ DALYs} \times 1.7 \text{ children}/5 \text{ years} = 0.068 \text{ DALYs}$
- Cost of program: Assume cost of each policy is the cost of water treatment solution only
 - In reality, direct delivery more costly than coupon system

Calibration

- Valuation of DALY
 - WHO considers interventions costing less than GDP per capita / DALY "highly cost effective"
 - Kenyan GDP = \$768
 - 1993 WDR implicitly recommended \$150 US/DALY as threshold of cost effectiveness (= \$241 in 2013 dollars)
- Value of time to walk to shop to redeem coupon
 - Average distance to shop to redeem coupon was 3.9 km
 - At walking pace of 5 km/hour, round trip takes 1.56 hours
 - Given agricultural wage of \$0.16/hour, standard assumption of travel cost as 50% of wage rate, time cost is \$0.13
 - Likely upper bound, since may be going to the market anyway, principal may put low value on time cost

In the case of ITNs in Kenya, demand curve remains stubbornly steep...



Source: Dupas AER P&P (2009)

Mystery Client Narratives

- “MC: good afternoon madam
- HW: afternoon my brother
- HW: please can i help you?
- MC: yes, please madam. I need a mosquito net
- HW: we don't have bednets in this facility. It was last month that, a certain NGO brought some and they said we should be giving it to only pregnant women for free and that one also got finished for about three weeks ago
- MC: please madam check inside and see, may be you will get one for me
- HW: no, but i told you that, it has finished, even yesterday some pregnant women came here but they didn't get some. And you are not even qualified for the nets because it is restricted to only pregnant women.
- MC: so madam when will you get some?
- HW: i dont know
- MC: then let me give you my phone number, so that when you get some you can call me to come
- HW: no, because when we get some, i can't call you to come, because you are not eligible
- MC: ok. thank you madam. “

Mystery Client Narratives

“The facility looked very quiet. After several knocks, a sleepy voice answered. After some time, a young lady came out with a sleepy face.

- MC: Good morning Madam. Please can I get a net here?
- HW: No! We don't have nets here!
- MC: Ah! But someone told me he got his nets here. Or is there another facility around?
- HW: *(She was getting irritated)*. I say we don't have nets. Let that person you believe get the net for you.

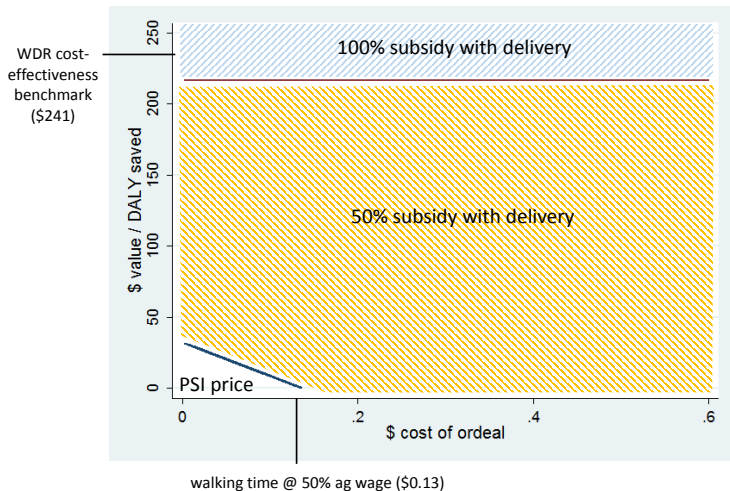
She left me and entered the room she had come from.”

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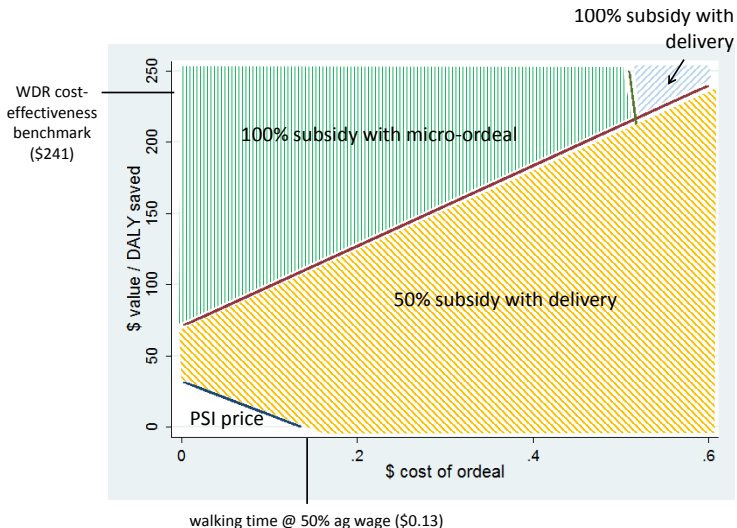
Mystery Client Narratives

- MC: good afternoon madam. can i get a bednet here
- HW: do you have money?
- MC: how much?
- HW: the round one is GHC 15 and the square one is GHC 20
- MC: wow! that is very expensive
- HW: that is how it is sold
- MC: is that the same type you give to pregnant women?
- HW: are you pregnant?
- MC: i learnt it is the best quality
- HW: the one i have is among the best.
- MC: can i see it.
- HW: if you can't pay, then there is no need to bring it.
- MC: oh! how can i buy what i haven't seen.
- HW: ok! then when you bring the money, i will go and bring. if you don't like it, i will take it and give you your money back.
- MC: please i will give you. GHC 8.
- HW: then go and come another day when the one in-charge is around. for now, my duty is to sell it at the price i have just told you
- MC: when?
- HW: tomorrow i will help talk on your behalf for her to reduce the price

Preferred Policy without micro-ordeal option



Preferred Policy with micro-ordeal option



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