The Demand for Health

DSE Winter School 2020, Lecture 2

Pascaline Dupas

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Introduction

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  - Reducing maternal mortality
  - Slowing the spread of HIV/AIDS, malaria and tuberculosis

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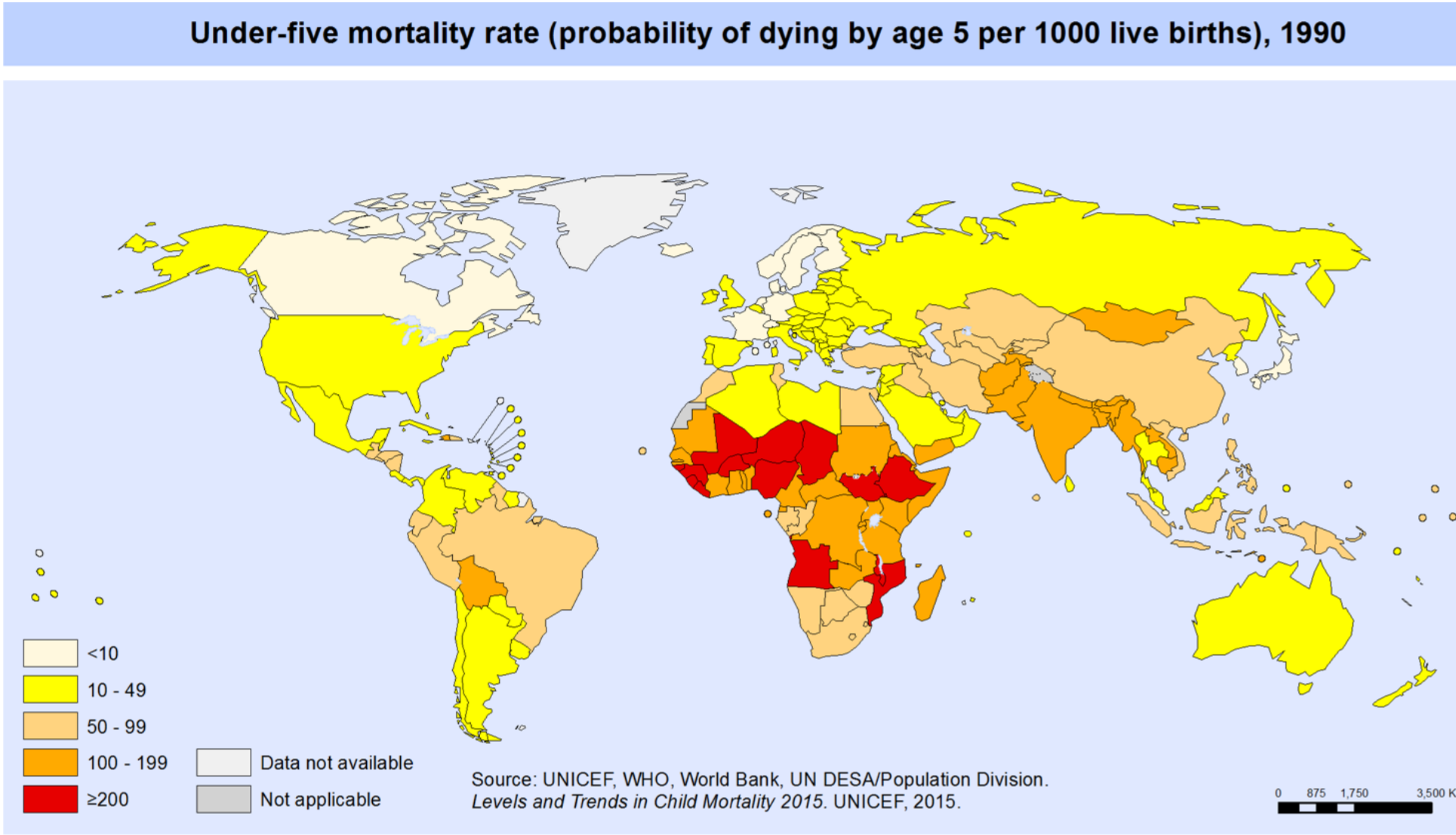
- For both these reasons, 3 of the 8 Millenium Development Goals called for specific health improvements by 2015:
  - Reducing child deaths
  - Reducing maternal mortality
  - Slowing the spread of HIV/AIDS, malaria and tuberculosis
- A good deal of progress, but didn't quite get there

Under 5 mortality, 1990



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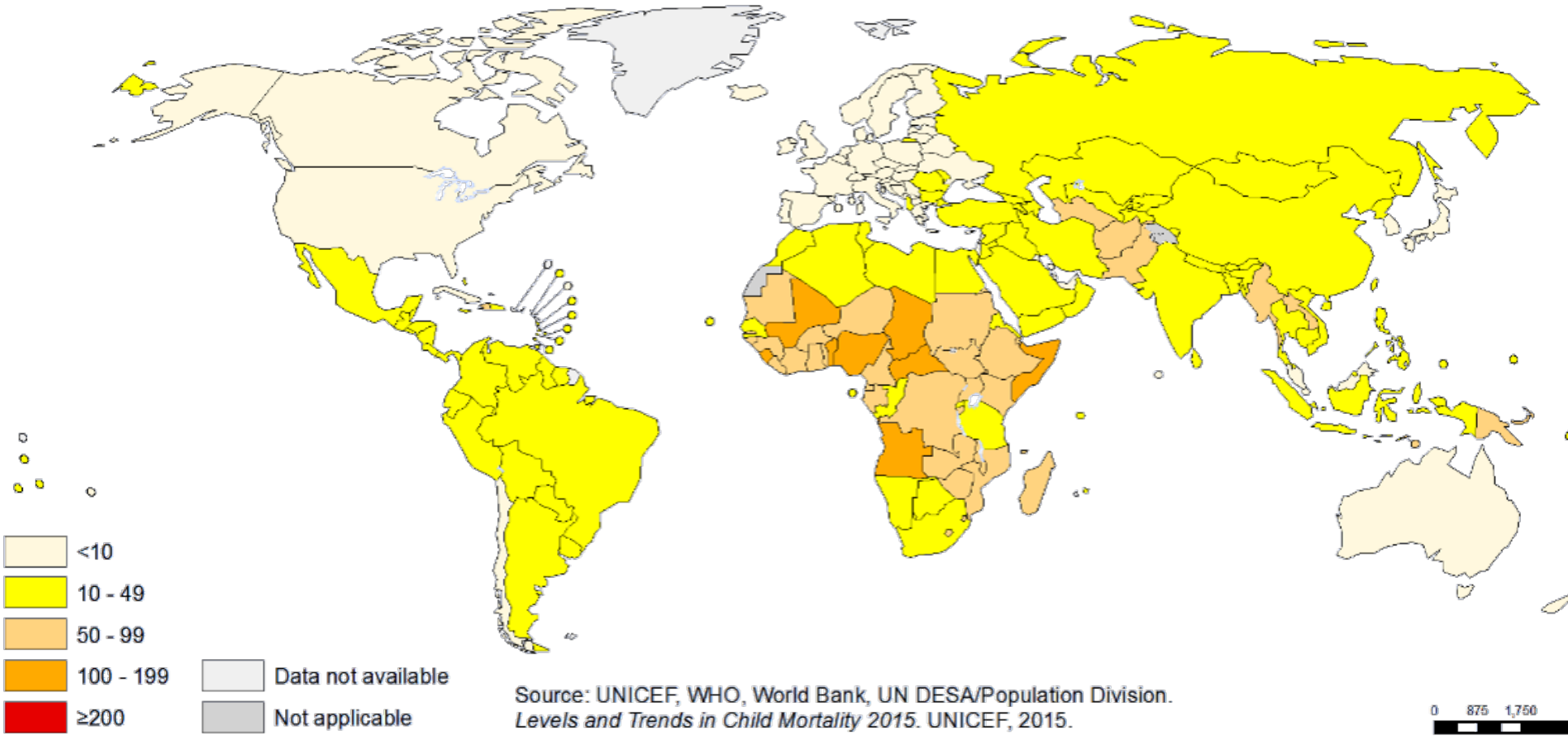


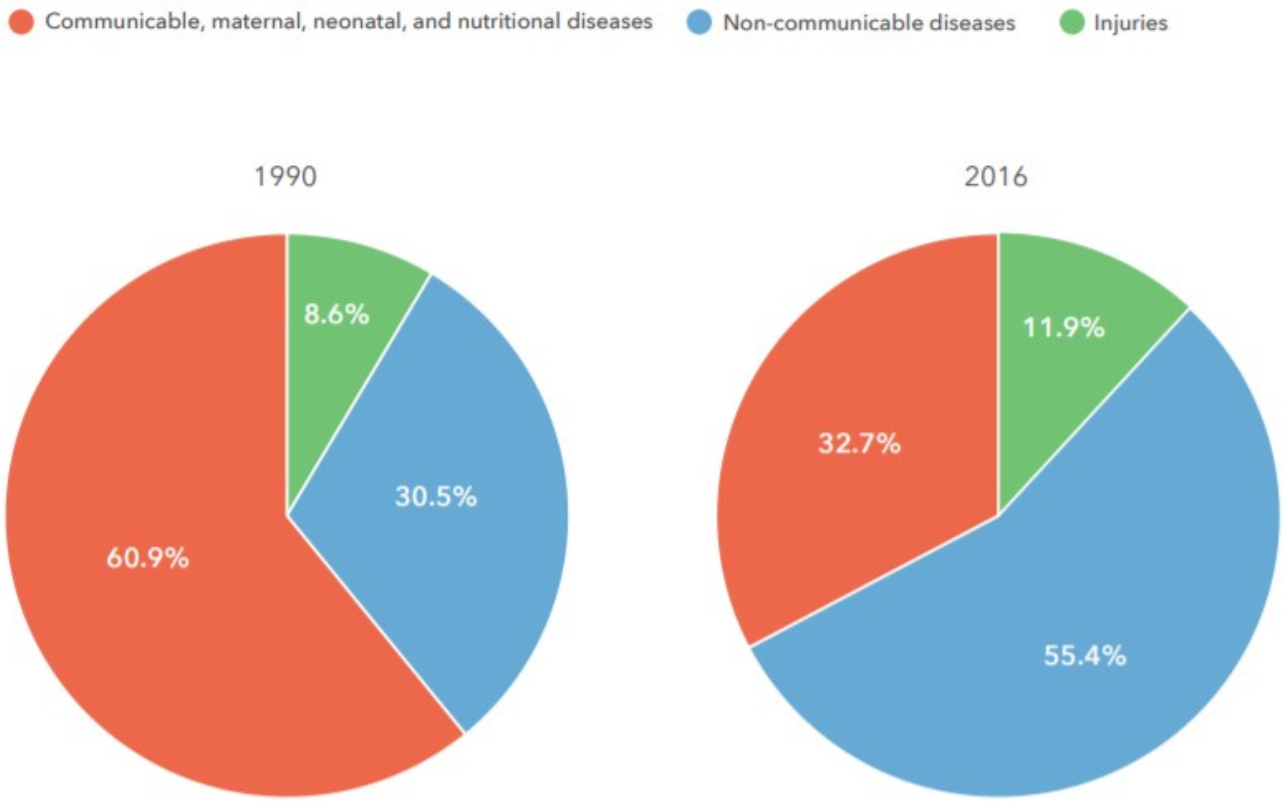
The remaining problems

2005-2007 2013-2015	India	Kenya	Malawi	Mali	India	Peru	Nicaragua	USA
Life expectancy at birth (years)	63	54	52	48	63	73	73	78
	68	62	63	58	68	74	75	78.9
Infant mortality (per 1,000 live births)	54	57	75	105	54	22	24	7
	38	36	43	74	38	13	18	5.6
Maternal mortality (per 100,000)*	280	580	620	880	280	120	110	24
	174	510	634	587	174	68	150	14
HIV prevalence (% of 15-49)	0	6	11	1	0	0	0	1
		5.9	9.1	1.3		0.3	0.3	
Prevalence of stunting (% u-5 kids)	38	26	42			18		2.1

Source: World Develpment indicators (WDI)

The burden is shifting towards NCDs

Figure 2
Contribution of major disease groups to total DALYs in India, 1990 and 2016



India had 33% of the total DALYs from CMNNDs, 55% from NCDs, and 12% from injuries in 2016. In 1990, this was 61%, 30%, and 9% of DALYs, respectively.

Source: India: Health of the Nation's States (2017)

The Culprits?

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1. Geography
   - Tropical Diseases
   - Climate (droughts, extreme temperatures)
2. Poor institutions / Poor supply of health care
   - Lack of appropriate medicines/vaccines
   - Lack of Infrastucture, Trained Professionals, Technology
   - Poor governance (absenteism, corruption)
3. Poor Private Health Behavior?
   - About 2/3 of under-5 deaths could be averted if parents used simple, relatively cheap preventative technologies (e.g., anti-malarial bednets, bleach for water purification, ORS kits to avoid dehydration during diarrhea episode) (Jones et al., *Lancet*, 2003)

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3. Poor Private Health Behavior? [today]
   - As of the beginning of the century, about 2/3 of under-5 deaths could be averted if parents used simple, relatively cheap preventative technologies (e.g., anti-malarial bednets, bleach for water purification, ORS kits to avoid dehydration during diarrhea episode) (Jones et al., *Lancet*, 2003).
     - Why don't (didn't) more people use these technologies?

Today's Road Map

- Simple (1-slide) model of the demand for health
- Key empirical facts about the demand for health in poor countries
- Potential policy interventions to increase health outcomes

Health as human capital

Health as human capital

- People will invest in a specific health product/behavior if

  expected discounted private benefit $\geq$ *expected discounted private cost*

- Key factors:
  - cost (incl. non-pecuniary), perceptions of benefit
  - horizons over which costs and benefits accrue, discount parameter
- Treatment:
  - sick people should take a treatment if the marginal utility cost of the treatment is smaller than the marginal benefit of the treatment (=the time and non-pecuniary costs of being sick (or dead...))
- Prevention:
  - efficient to invest in prevention if the marginal consumption and non-pecuniary costs of prevention (e.g. vaccination) are less than the discounted sum of the benefits from the reduced probability of getting sick.
- Note: Perceived benefit depends on who the patient is / who the decision maker is
  - decision maker may value the health of certain members of the household more than that of others

Today's Road Map

- Simple model of the demand for health
- Key empirical facts about the demand for health in poor countries
  - Key fact 1: Discrimination within the household
- Potential policy interventions to increase health outcomes

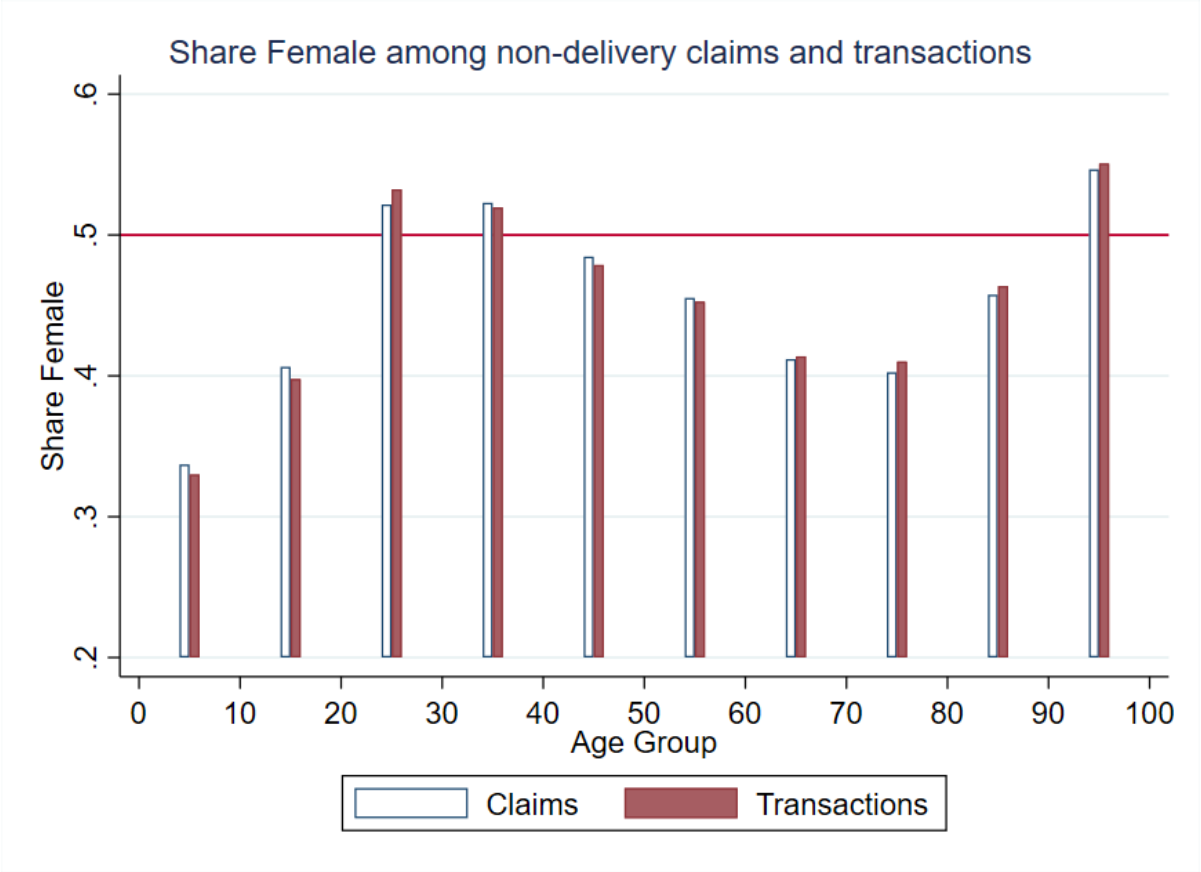
Unequal investments in life-saving procedures

- Ramakrishnan S, Khera R, Jain S, et al (2011). "Gender differences in the utilisation of surgery for congenital heart disease in India." *Heart* 97:1920-1925.
  - Girls with life-threatening heart defects are less likely than boys to get the surgery they need (44% vs. 70%)

Back

Unequal take-up of free hospital care

- Dupas and Jain (2020). "Women Left Behind: Gender Inequity within Rajasthan's Universal Health Care Program"



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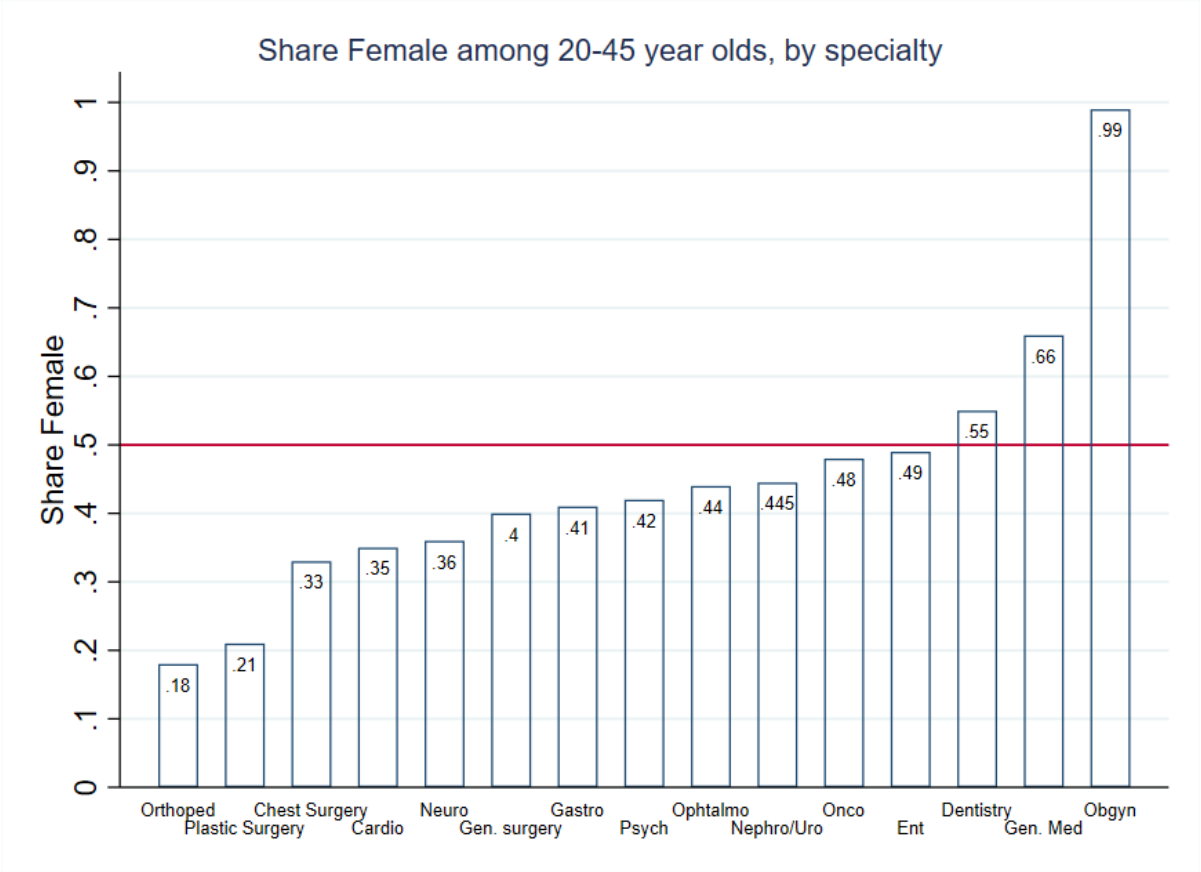
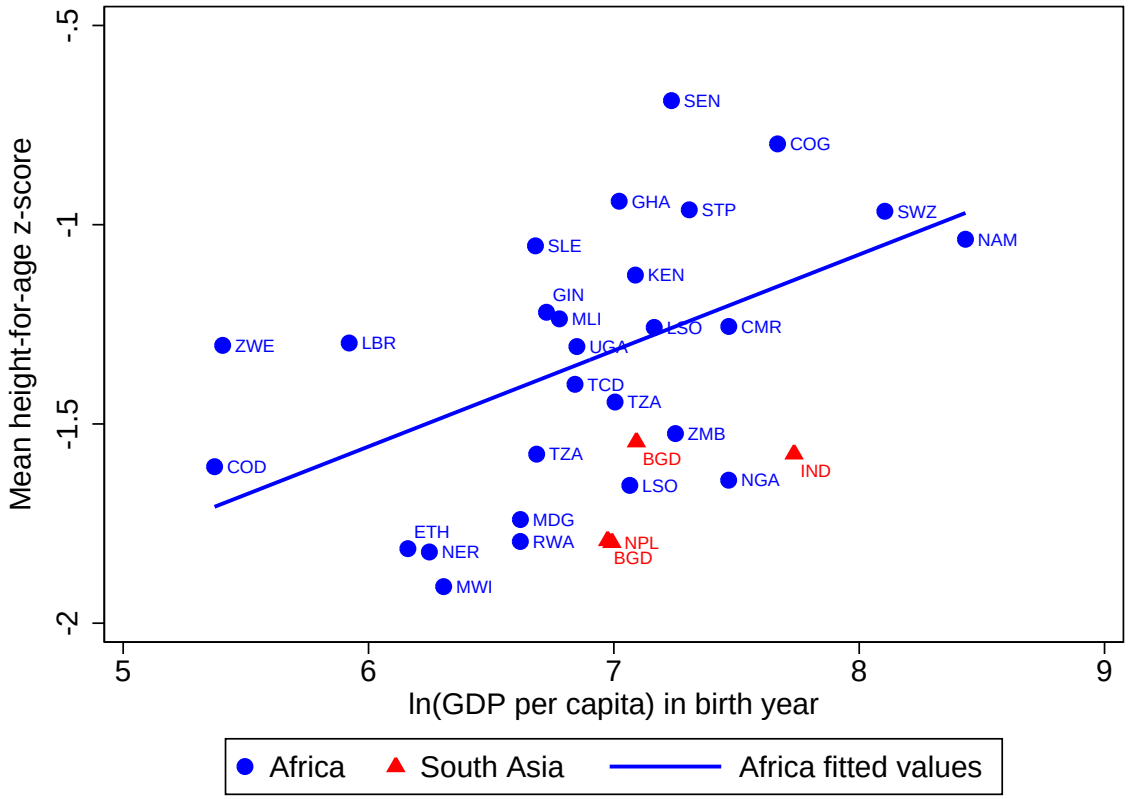
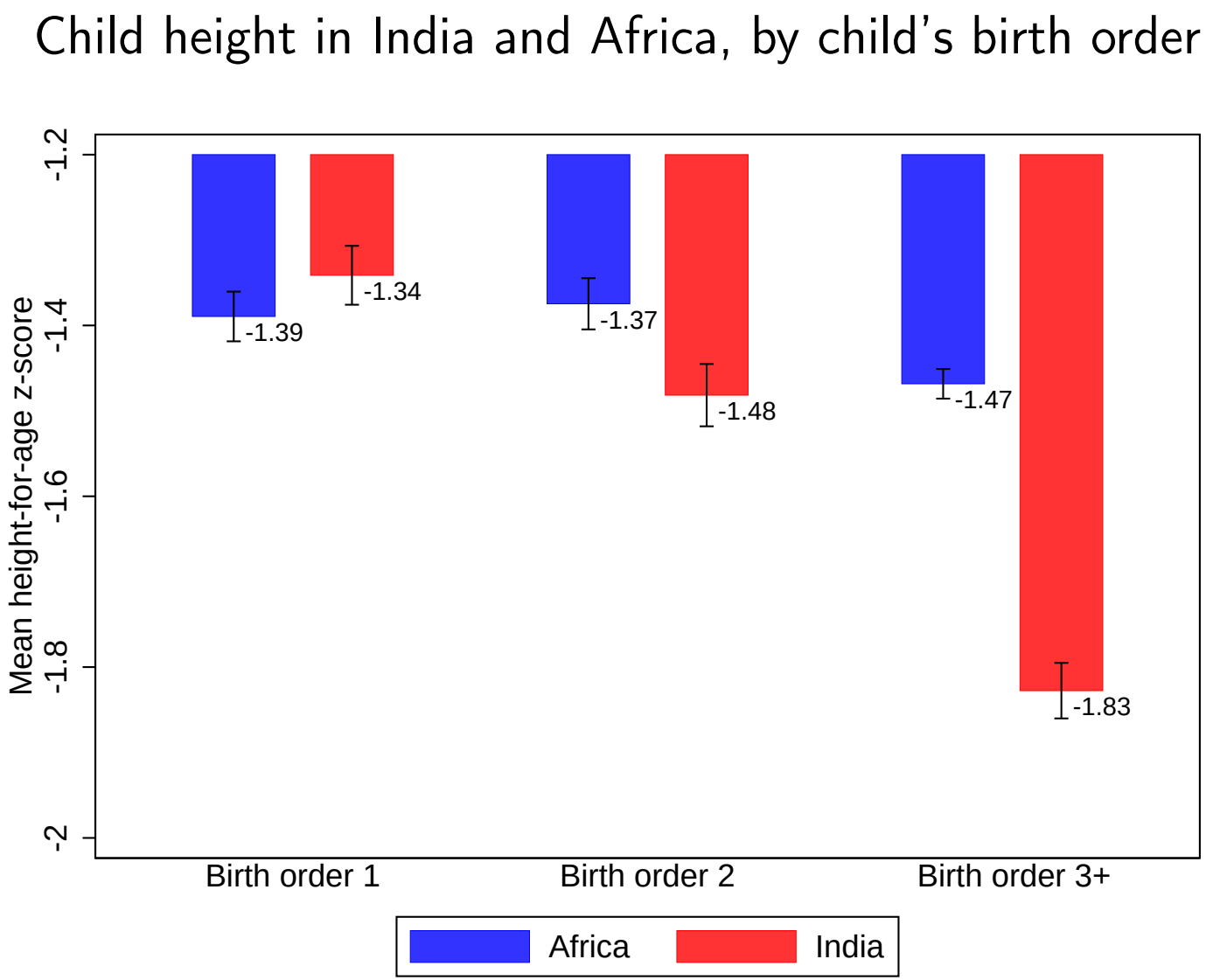


Preference for first-born son, not any son

- Jayachandran and Pande (AER, 2016): "Why are Indian children shorter than African children?"
- Stylized fact: South Asian children seem shorter than they should be
  - **Child height versus national GDP:**



Preference for first born son seems to explain this



Preferences for first born son

TABLE 5—CHILD GENDER AND THE BIRTH ORDER GRADIENT IN HEIGHT

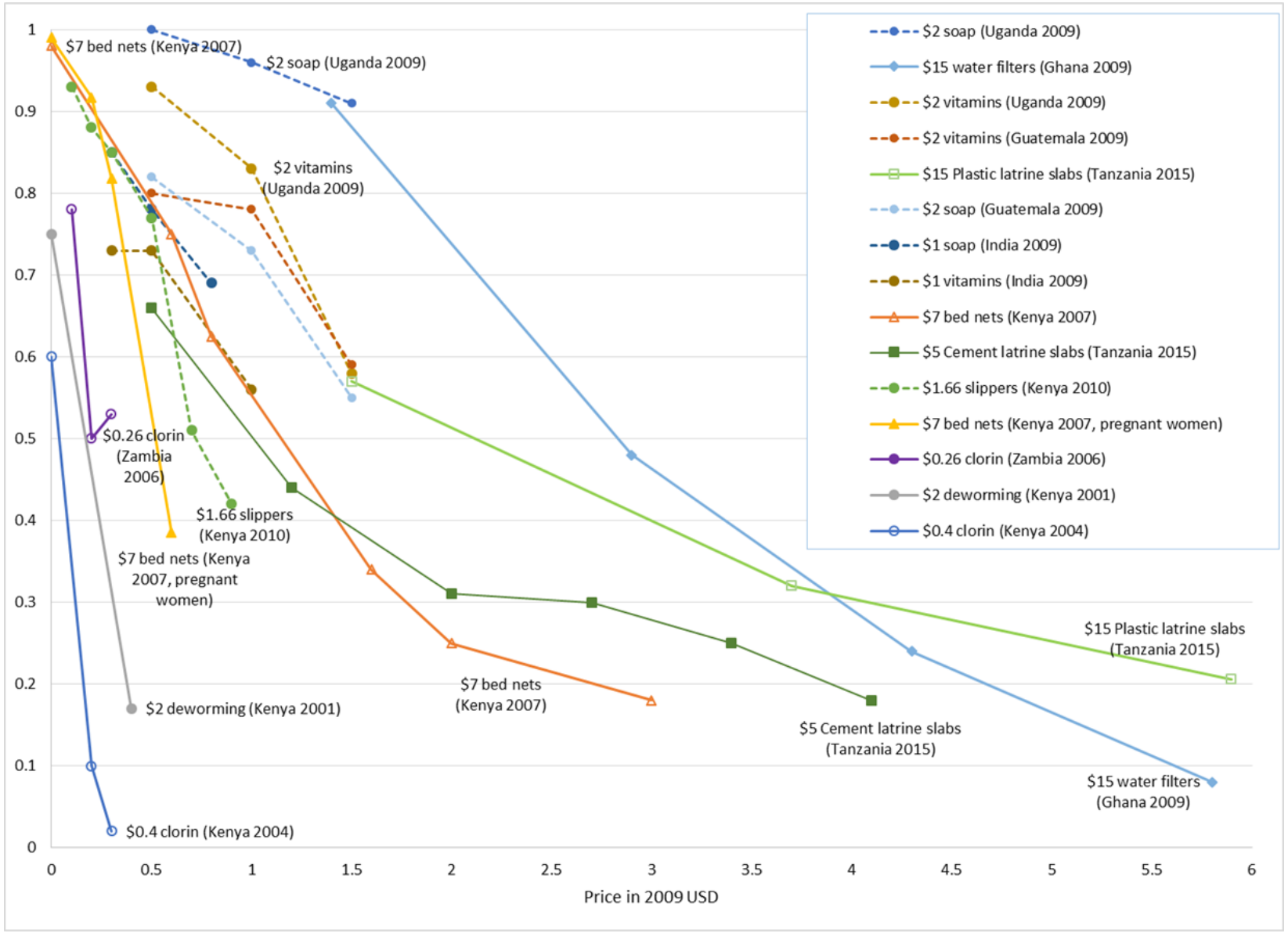
	HFA z-score			WFA z-score	HFA z-score			WFA z-score
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
India	0.148				−0.011			
	[0.026]				[0.014]			
India × Girl	−0.111				−0.143	−0.147	−0.098	−0.116
	[0.036]				[0.020]	[0.019]	[0.032]	[0.014]
India × 2nd child	−0.107	−0.152	−0.228	−0.122				
	[0.036]	[0.040]	[0.069]	[0.030]				
India × 3rd+ child	−0.352	−0.221	−0.414	−0.175				
	[0.033]	[0.047]	[0.097]	[0.035]				
India × 2nd child × Girl	−0.076	−0.045	−0.024	−0.047				
	[0.053]	[0.057]	[0.101]	[0.043]				
India × 3rd+ child × Girl	−0.051	−0.048	−0.030	−0.064				
	[0.047]	[0.067]	[0.092]	[0.049]				
Africa mean of outcome	−1.575	−1.575	−1.575	−1.575	−1.351	−1.351	−1.351	−1.351
Age and other controls	No	Yes	No	Yes	No	Yes	No	Yes
Mother fixed effects	No	No	Yes	No	No	No	Yes	No
Observations	168,108	165,596	83,228	165,596	168,108	167,737	83,228	167,737

Notes: Standard errors are clustered by mother and appear in brackets. Child age dummies are included in all regressions. Columns 2, 4, 6, and 8 additionally include mother's literacy, maternal age, and PSU fixed effects. In

Today's Road Map

- Simple model of the demand for health
- Key empirical facts about the demand for health in poor countries
  - Not everyone's health is valued as highly
  - Low levels of investments in preventives
- Potential policy interventions to increase health outcomes

Low levels of investments in preventive health



Source: Dupas and Miguel 2016 (forthcoming *Handbook of Field Experiments*)

Why the low investment in these high-return technologies?

1. People don't care about health?

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Do people care about health?

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- Exhibit 1: they spend a lot of money (relative to their income) on treating illnesses
  - Kenya, 70% of households have at least one presumed malaria episode per month; spend $1.70 on medicines on average (more than a day's wage) (Cohen, Dupas, Schaner 2013)
  - Often households go into serious debt to deal with health emergencies (Ananth et al., 2009)
  - Or they sell assets, work more (Kochar, REStat 1999), take on risky jobs (Robinson and Yeh, JHR 2011), etc.

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  - Or they sell assets, work more (Kochar, REStat 1999), take on risky jobs (Robinson and Yeh, JHR 2011), etc.
- Exhibit 2: they report being stressed about health issues
  - Own health or health of relatives is the primary source of stress or anxiety among the poor (Banerjee and Duflo, PE 2011)

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Why low investments in these high-return technologies?

1. People don't care about health?
   - Actually, they very much do, though not always equally for everyone in the household
2. They don't know the returns to these technologies?

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  - India: people told that their water source was contaminated with *E Coli* $\Rightarrow$ started using bleach to purify
  - Nigeria: people told that bednets are more effective against malaria when treated with insecticide $\Rightarrow$ more likley to treat their bednet
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- They lack information about their own health status
  - For example, they lack access to proper diagnosis and as a result often treat themselves for the wrong illness ▸ malaria status

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2. But why can't they slowly save for these technologies?
   - Lack of access to savings tools?
   - Also heath emergencies can easily wipe out savings: vicious cycle of poor health

Why low investments in these high-return technologies?

1. People don't care about health?
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2. They don't know the returns to these technologies?
   - Indeed, they often don't
3. They don't have the money to invest in preventative technologies?
   - Indeed they often lack access to credit

What can be done?

What can be done?

- Make sure people have information
- Incentivize parents to invest in girls?
- Subsidize preventative technologies in the short-run, to put people over the hump?
- Provide credit?

What can be done?

- Make sure people have information
  - Yes, but all of it – don't leave out crucial info
- Incentivize parents to invest in girls?
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Providing the right amount information

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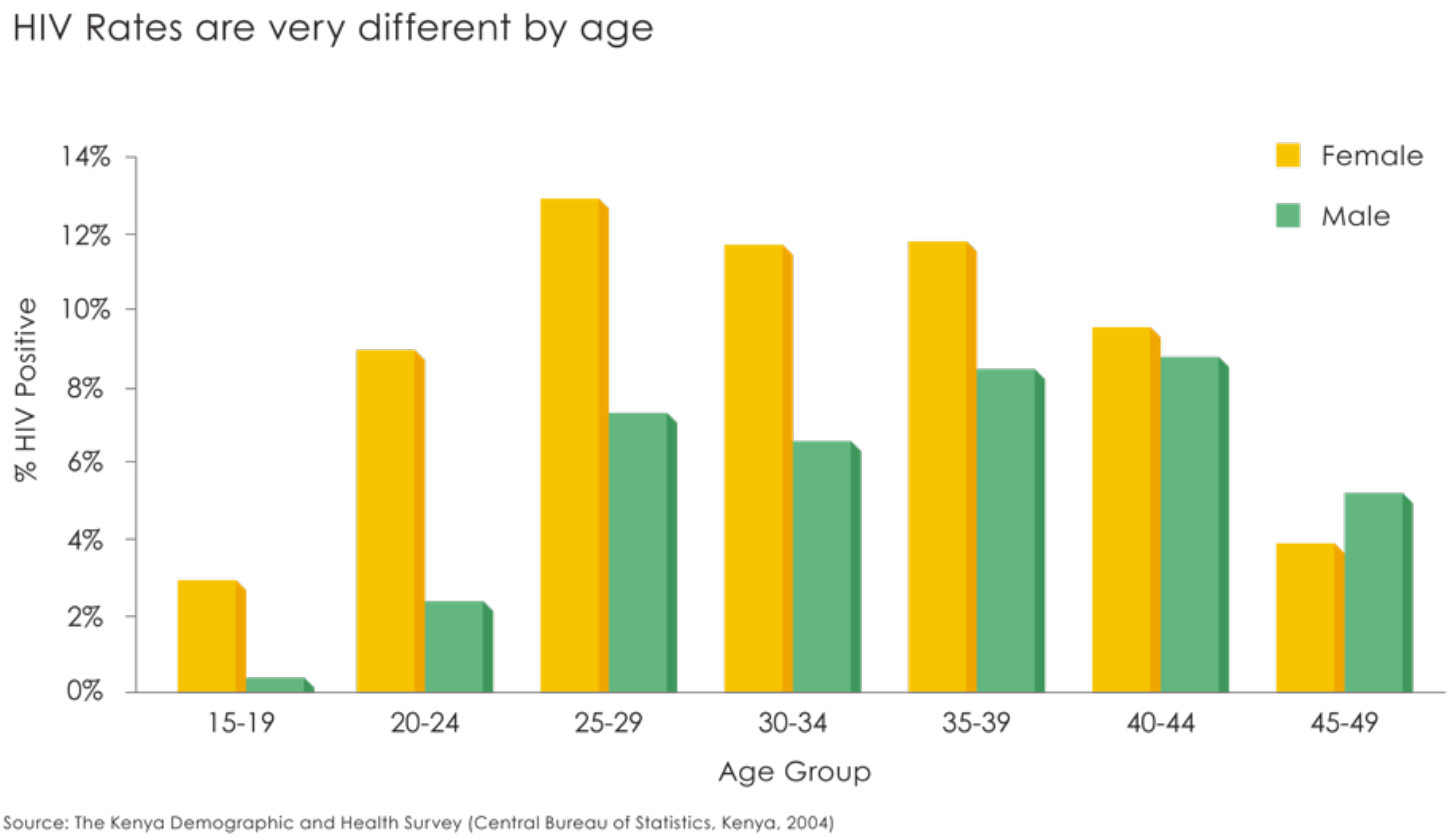
- General debate: Risk avoidance vs. Risk reduction information
- Cautionary Tale: Official HIV prevention curriculum for in Kenya
  - Focuses on abstinence-until-marriage and faithfulness in marriage
  - Doesn't discuss condoms
  - Doesn't discuss another very important dimension along which people can reduce risk: partner choice

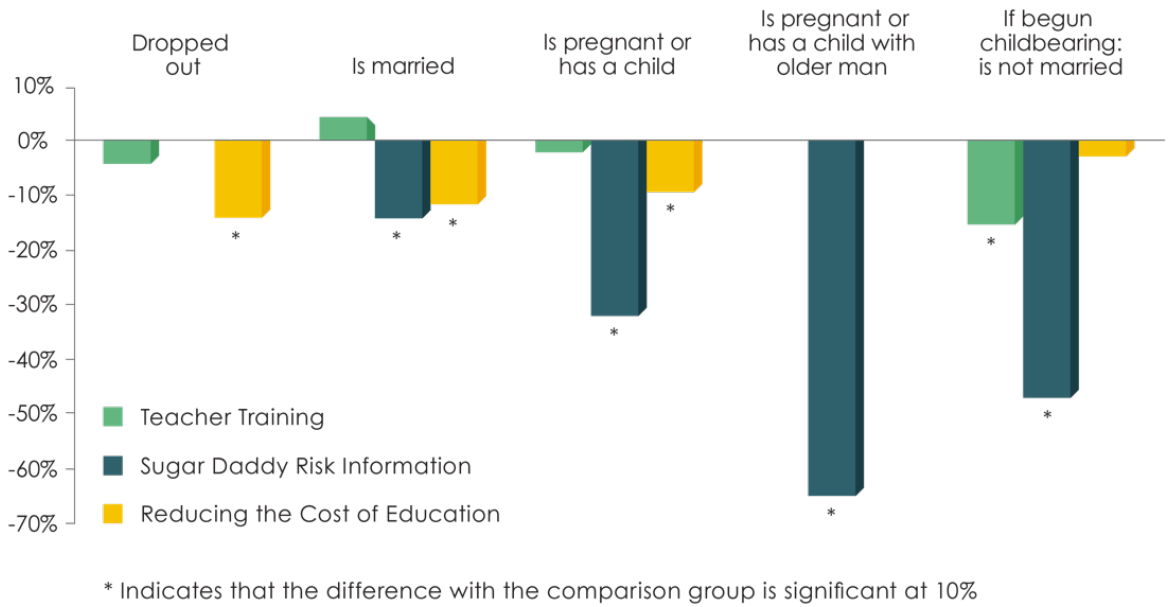
Not all partners are equally risky



Providing the right amount information

- Official curriculum is ineffective at reducing teenage sex
  - In fact, it increases teenage marriage rates (Duflo, Dupas, Kremer AER 2015)
- In contrast, an information campaign that informed girls that having sex with sugar daddies is riskier than having sex with same-age partners led to a large and significant decrease in teenage pregnancies
  - Girls avoided sugar daddies. Instead chose same-age partners, and used condoms to avoid pregnancy (Dupas, AEJ 2011)

Providing the right amount information



- Sugar daddy prevention curriculum adopted by many NGOs since then: Young1ove (Botswana), Jeunes Braves (Togo), Safe Love International (Nigeria), Power2Girls (Ghana)
- Replication/extension in Cameroon (Dupas et al. JEBO 2017): sugar daddy prevention curriculum worked, but did not work better than ABC curriculum. Even simple "in class quiz" led to large reduction in teen chilbearing.

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Providing the right amount information

- Can information sometimes be bad?
- Another cautionary tale
  - Bangladesh Arsenic information campaign: led people to switch from shallow tubewells to deep tubewells or surface water
  - Problem: surface water has higher of fetal contamination, but that problem not made salient at the time of the arsenic information campaign
  - So households that reacted to arsenic information ended up drinking water that was unsafe (if no deep tubewell near their house)
  - Result: 46% higher child mortality rate (Buchmann, Field, Glennerster and Hussam 2019: "Throwing the Baby out with the Drinking Water: Unintended Consequences of Arsenic Mitigation Efforts in Bangladesh")

What can be done?

- Make sure people have information
  - Yes, all of it – don't leave out crucial info (Dupas 2011; Buchmann et al, 2019)
- Incentivize parents to invest in girls?
- Subsidize preventative technologies in the short-run, to put people over the hump?
- Provide credit?

What can be done?

- Make sure people have information
  - Yes, all of it
- Incentivize parents to invest in girls?
  - Haryana program Apni Beti Apna Dhan (My daughter, My wealth) started in 1994; Ladli (beloved daughter) in 2005
    - Rs. 5000/- per family per year, for five years following birth of 2nd girl
    - Conditions: birth is registered, child immunized and both sisters enrolled in school
    - Ng (2020): using DHS data, finds no effect....
  - Buchmann et al. (2018): "Power vs. Money: Alternative Approaches to Reducing Child Marriage in Bangladesh, a Randomized Control Trial"
    - Control group vs. (i) six-month empowerment program vs. (ii) a financial incentive to delay marriage vs. iii) both.
    - 4.5 years after program completion: girls eligible for the incentive for at least two years were 24% (-8.9pp**) less likely to be married under 18, 15% (-4.8pp**) less likely to have given birth under 20, more likely to still be in school
    - The empowerment program did not decrease child marriage or teenage childbearing but increased schooling

What can be done?

- Make sure people have information
  - Yes, all of it
- Incentivize parents to invest in girls?
  - More evidence needed
- Subsidize preventative technologies in the short-run, to put people over the hump?

- Provide credit?

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:

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

  - 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?

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

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- If $take_{inf}$ high $\Rightarrow$ high cost of program

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- If $use_{mar} < take_{mar} \Rightarrow$ subsidy policy induces some people to take input but they end up not using it appropriately
- If b_{mar} low $\Rightarrow$ subsidy policy induces low-return people to take and use input
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Tradeoffs when increasing subsidy level?

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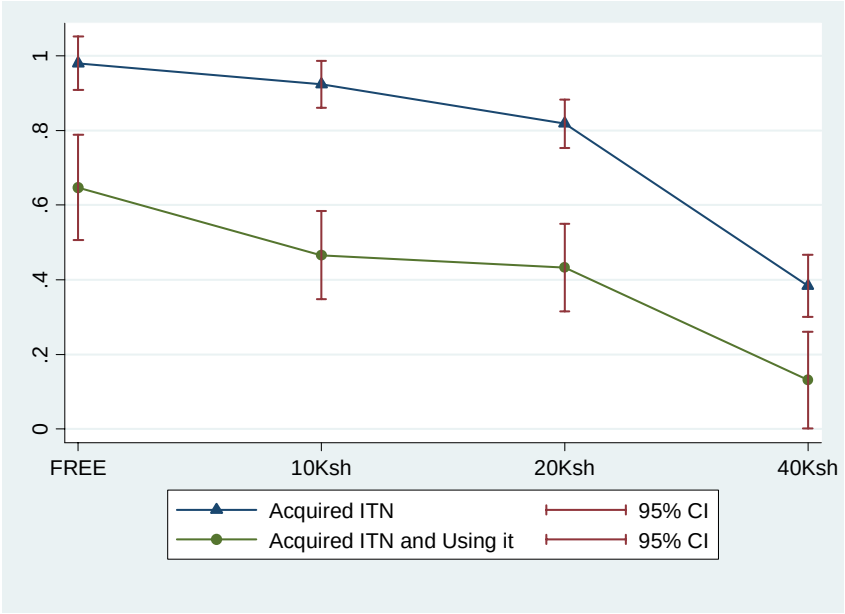
  - Ultimately, relative importance of these problems is an empirical question (and context-specific)

Empirical evidence

Do marginal takers use subsidized inputs?

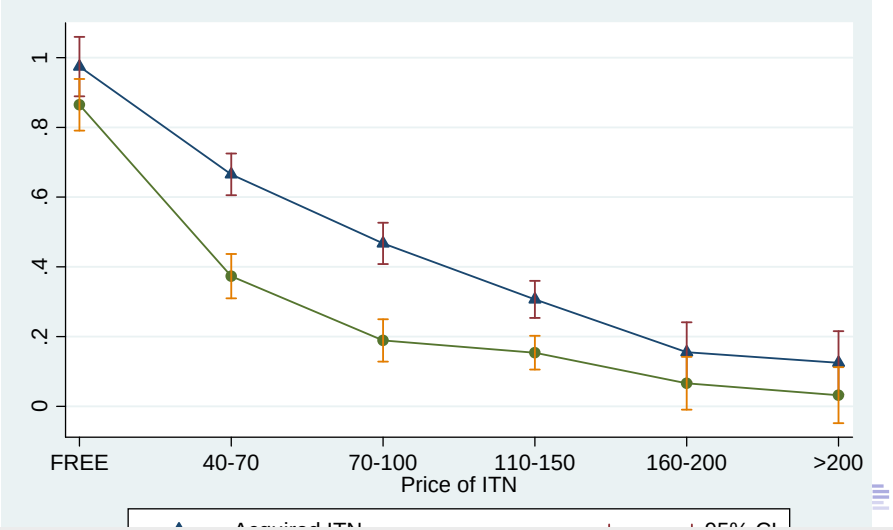
Study 1: *Bed nets*
(*Cohen & Dupas, QJE 2010)*
Kenya, *2006*
Pregnant women
2-mo usage

Bednet



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

Bednet



Study 3

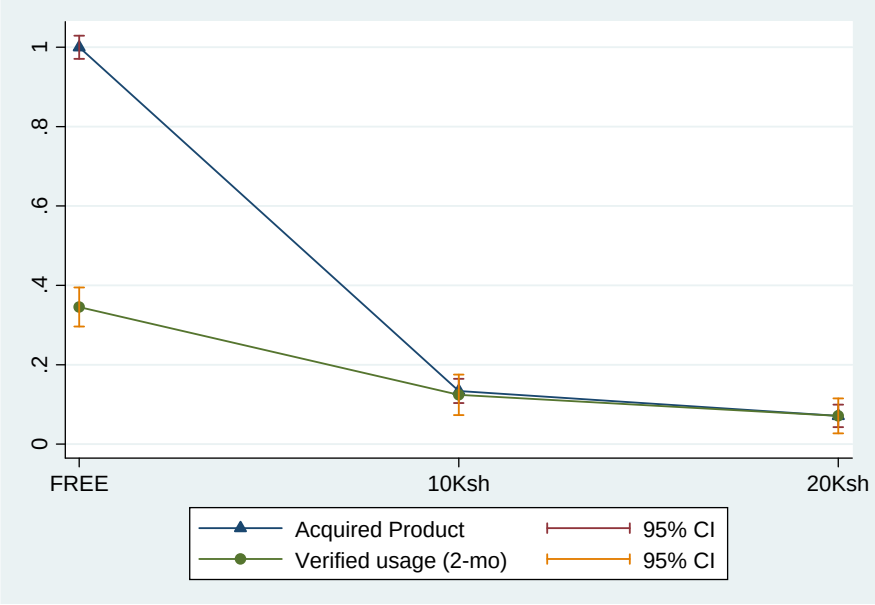
(*Dupas et al., 2015)*

Kenya, *2008*

Mothers of young children

4-mo usage

Water Purification Product (Chlorine)



Do marginal users have lower returns?

Study 1

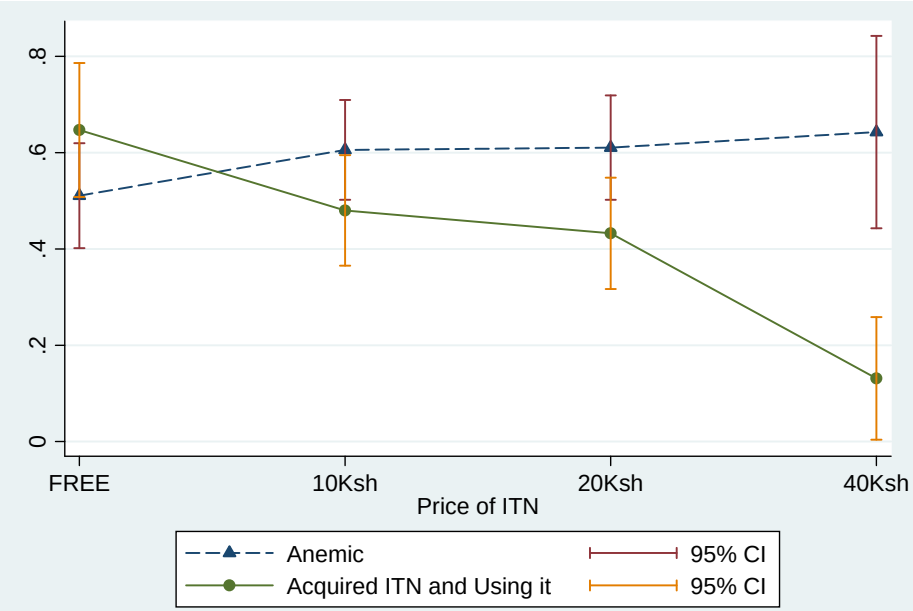
(*Cohen & Dupas 2010*)

Kenya

Pregnant women

2-mo usage

Anemia Rate of Takers



Study 2

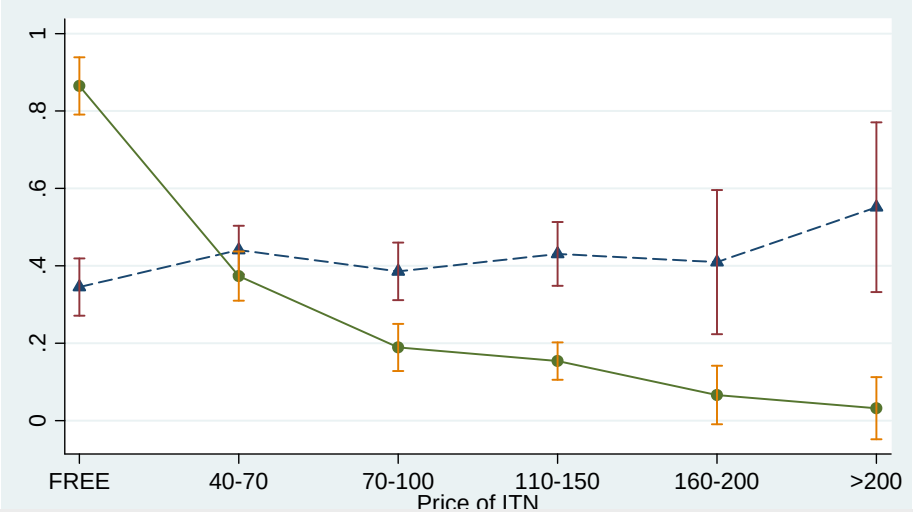
(*Dupas, 2014*)

Kenya

Households

1-year usage

Prior bednet coverage of Takers



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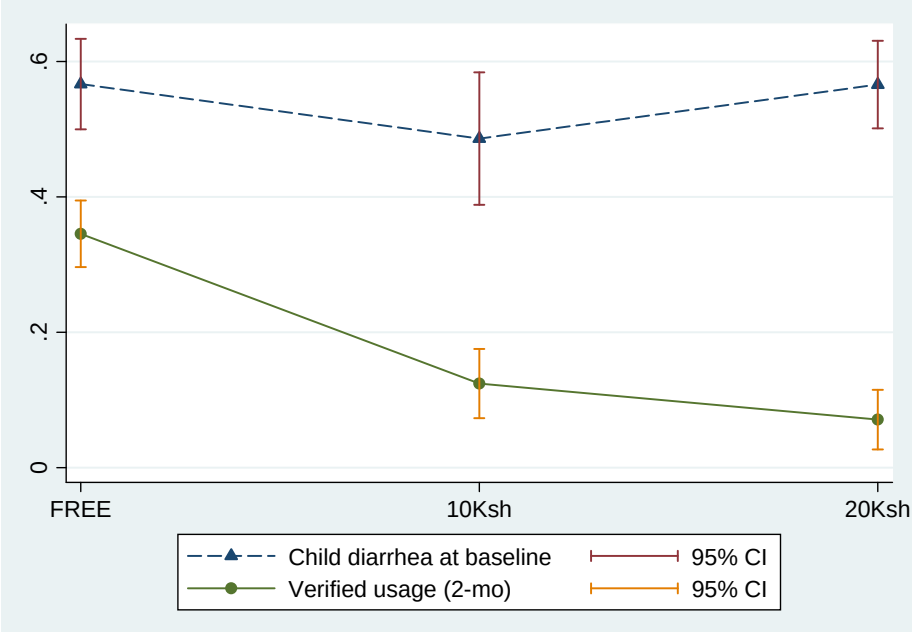
(*Dupas et al., 2015)*

Kenya

Mothers of young children

4-mo usage

Diarrhea rate of Takers



Evidence from other contexts / products

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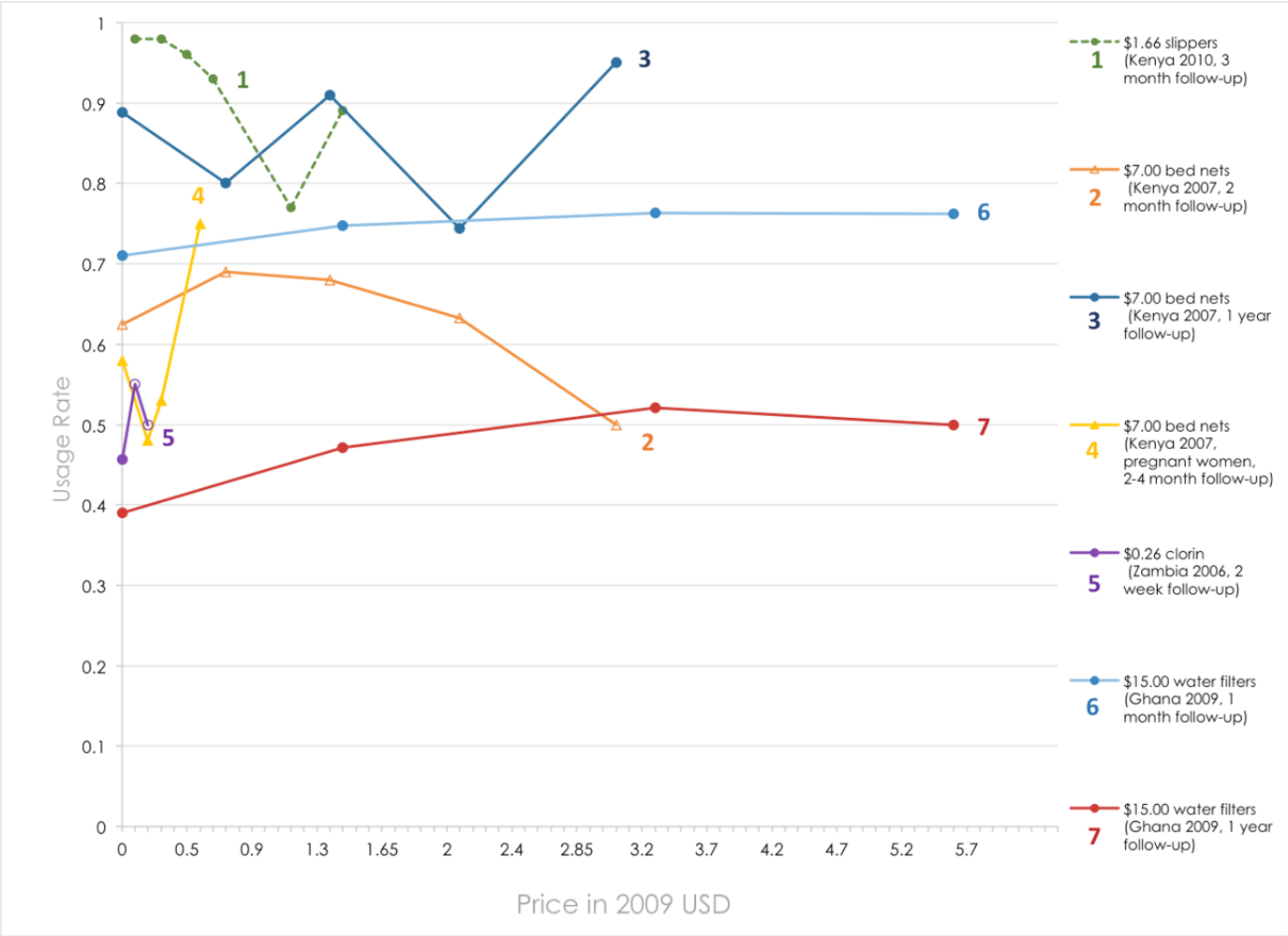
- In most other existing studies, price also appears a poor targeting tool: marginal takers do not seem to have lower usage or lower returns
  - Those more likely to buy deworming medication in Kenya don't have more worms (Kremer and Miguel, 2007)
  - Those with higher WTP for water filters in Ghana 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

And (usage | ownership) doesn't depend on price paid



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- The more attractive the benefit, the greater the ordeal must typically be; may impose a signicant welfare cost
- For many preventive health products, benefit to non-users is very small, so a small ordeal may be sufficient

Subsidy with ordeal

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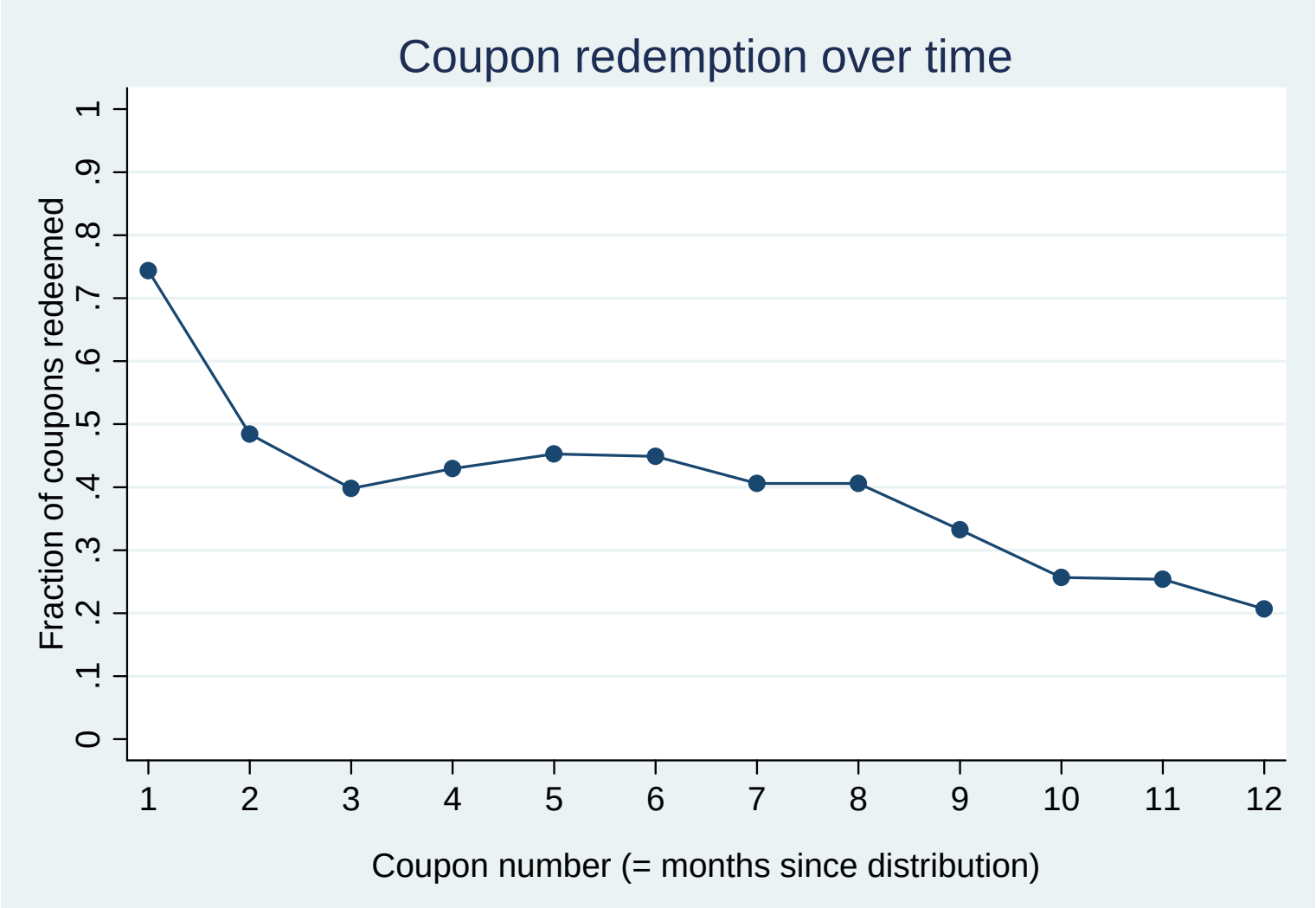
- If there is heterogeneity in relative cost of effort and money (e.g. due to different wage levels), and heterogeneity in willingness to use
  - Joint distribution determines impact of screening through price vs. ordeal.

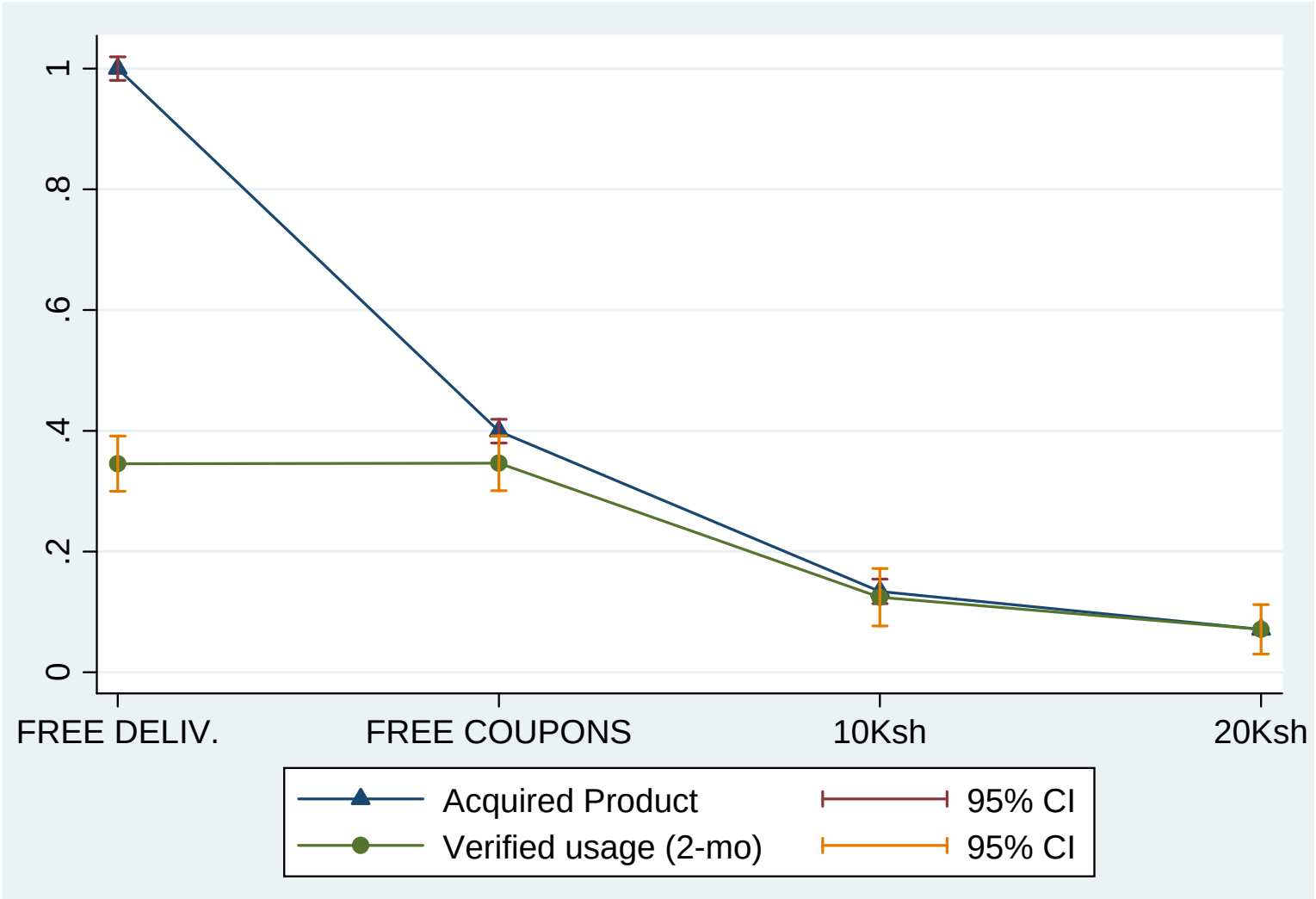
Micro-ordeal and Targeting

- Dupas et al. (Science 2016), 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



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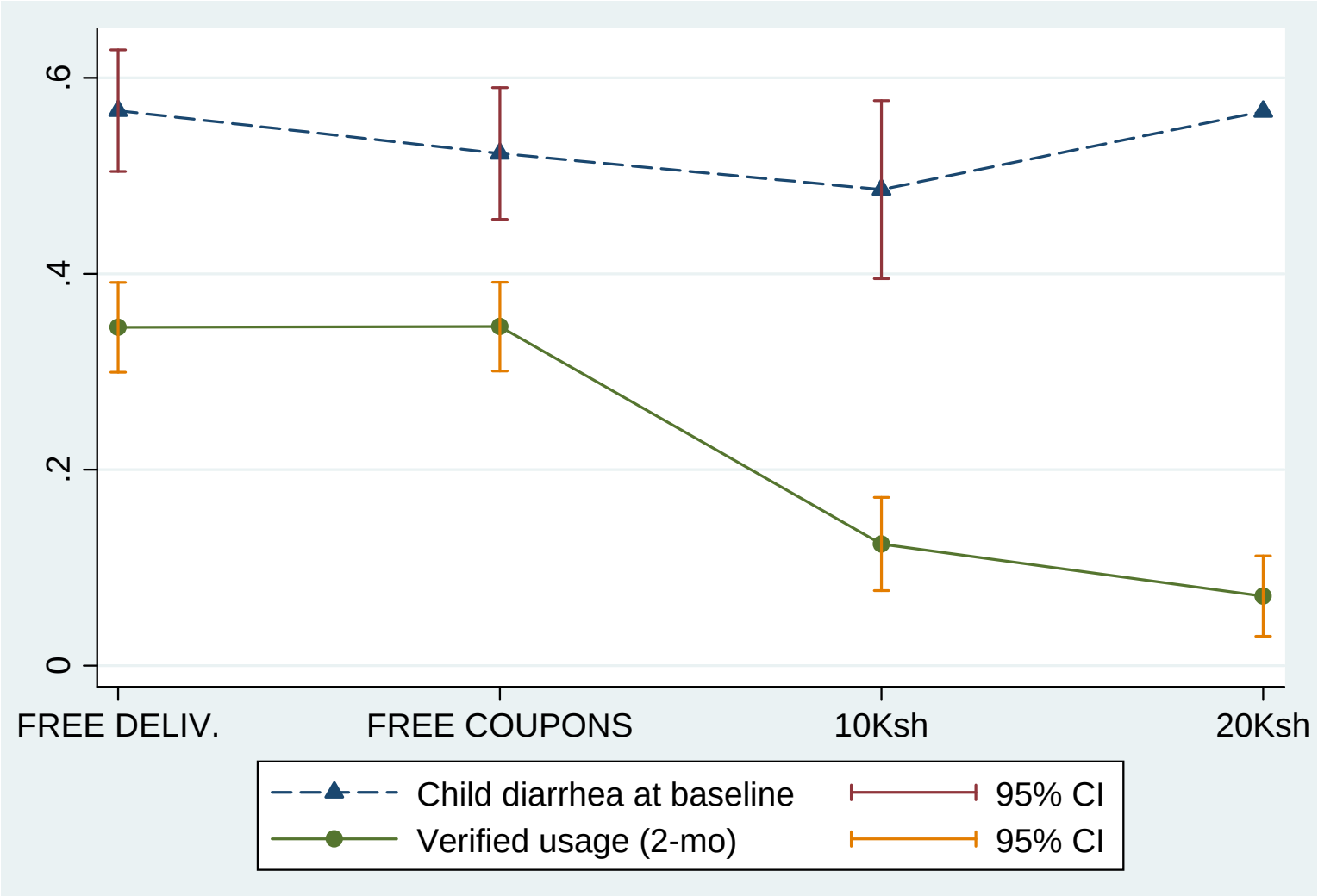

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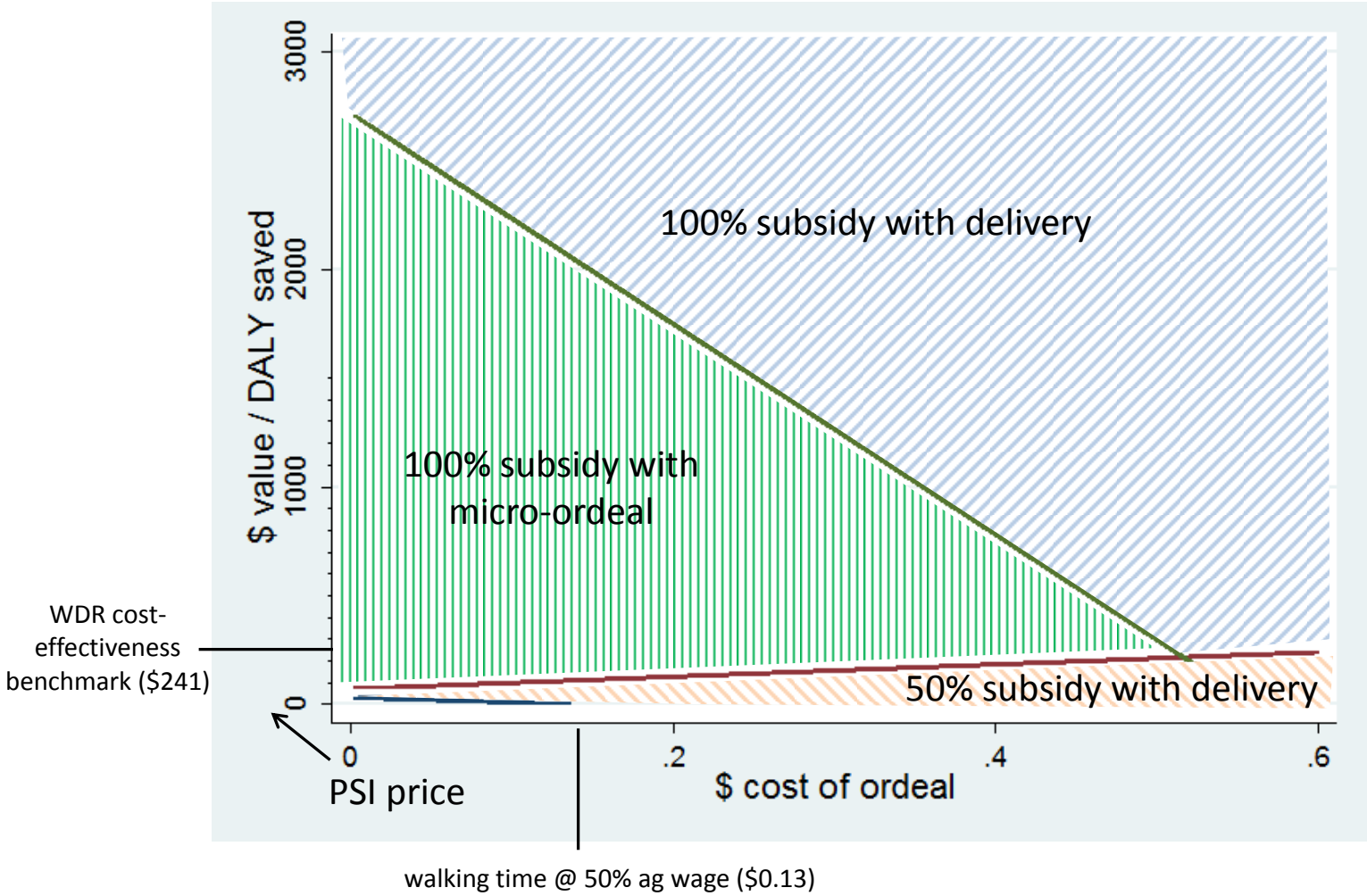
	Redeemed coupon month of survey	Positive chlorine test
Redeemable at nearest market	0.514	0.377
Not redeemable at nearest market	0.382	0.337

Preferred policy?

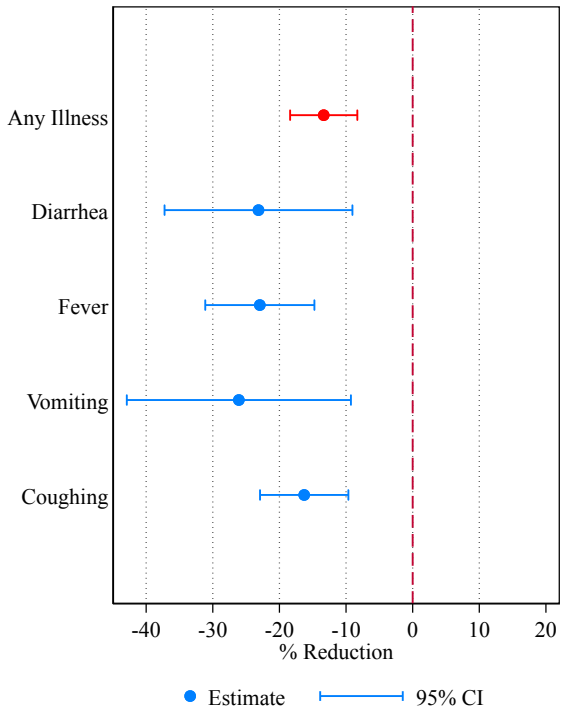
- Can calibrate model with assumptions on health impact of water treatment, cost of policy Assumptions
- Identify regions of parameter space (principal's valuation of health benefit, utility cost of ordeal) over which each policy is preferred
- For plausible range of valuations of DALY and ordeal cost,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

Preferred Policy



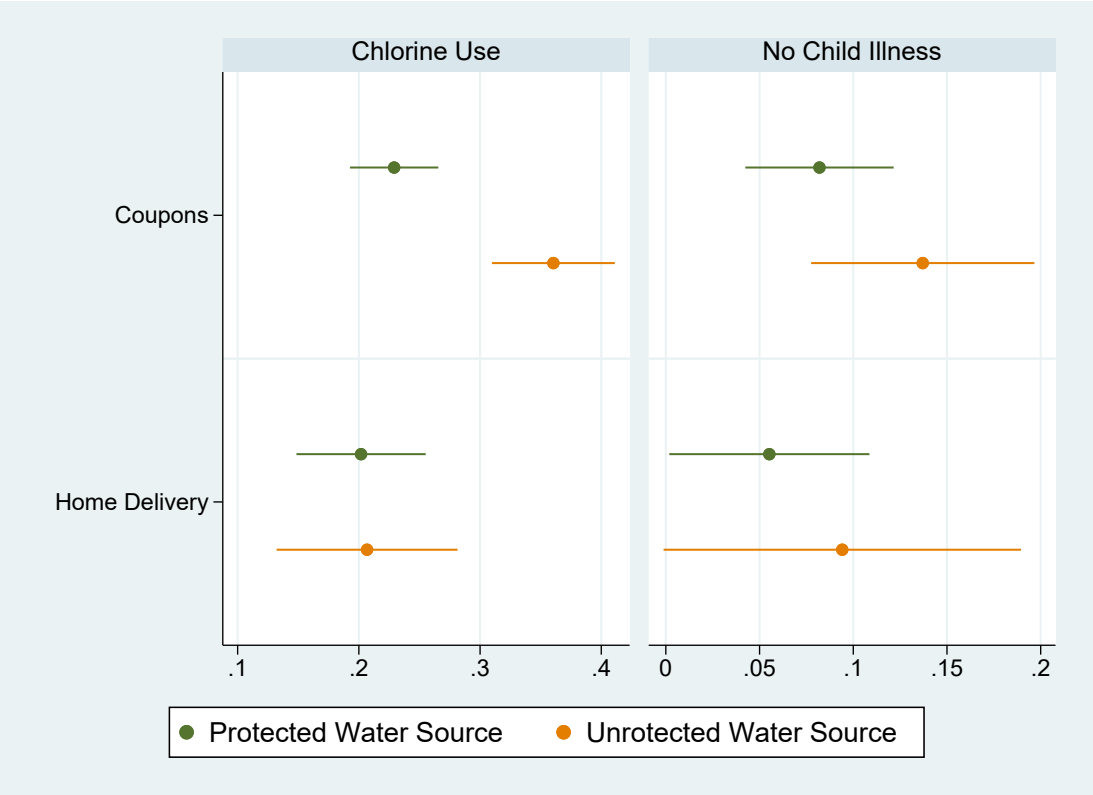
Replication + extension in Malawi (2018-2019)

- Dupas, Nhlema, Wagner, Wroe and Wolf (2020): "Expanding Access to Safe Water to the Rural Poor: Experimental Evidence from Malawi"
- Find identical results on targeting impacts of coupon compared to home delivery. Effects sustained over time.
- Add measurement of health impacts:



Replication + extension in Malawi (2018-2019)

- Heterogeneity by water source:



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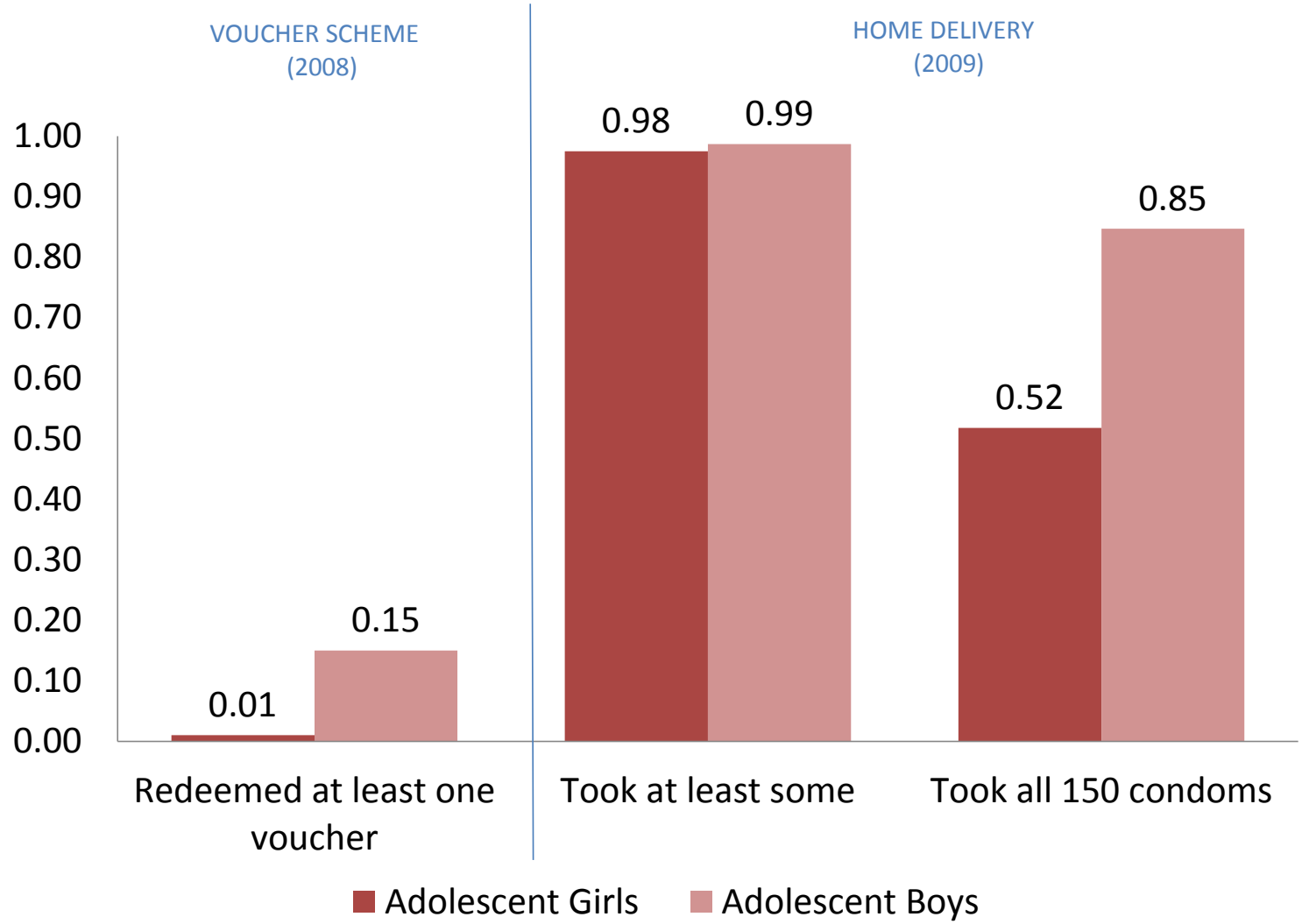
    - Pb there is lack of access to reliable diagnostic test
- Sometimes the ordeal can be too costly (because of the nature of the product, e.g. family planning product that people may be embarrassed to obtain from a local store) and it reduces take-up considerably even among high-return folks

When coupons are socially too costly to redeem...

- Product considered: Male Condoms, Kenya



Free is not always enough

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- Individuals may face:
  - social barriers to take-up
  - lack of information on benefits
  - hassle costs that are too big
- Sometimes need to incentivize people to do the right thing (=subsidy $> 100\%$)

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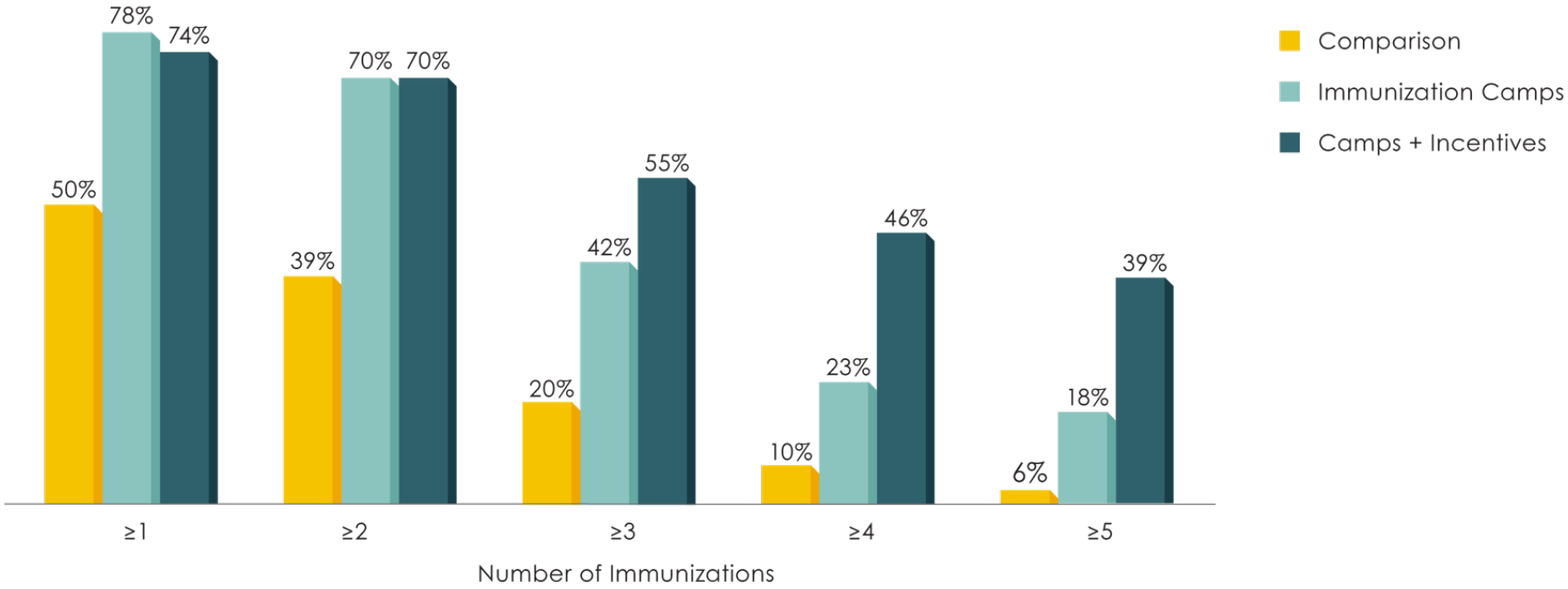
- Example: Udaipur, India. Fraction of Children Fully Immunized (5 immunizations over 1 year)



Source: Banerjee, Abhijit, Esther Duflo, Rachel Glennerster, and Dhruva Kothari (2010). "Improving Immunization Coverage in Rural India: A Clustered Randomized Controlled Evaluation of Immunization Campaigns with and without Incentives." *British Medical Journal* 340:c2220.

What can be done?

- Make sure people have information
- Incentivize parents to invest in girls
- Subsidize preventative technologies in the short-run, to put people over the hump
- Provide credit
  - Not much evidence on this: studies of credit expansion haven't focused on health investments/outcomes

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- In the US, most improvements in health came through big pushes, e.g. clean water infrastructure in cities (Cutler and Miller, *Demography* 2005)

Conclusion

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  - folks in high-income countries don't do that
  - they have a malaria-free environment, clean water coming out of the pipe
    - they don't have to worry about much at all (in normal times)
- It's good that the international community is distributing bednets and water purifiers in the meantime, but ...
- To really improve health outcomes once and for all, need to focus more on big returns ticket: malaria eradication, drug development

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APPENDIX SLIDES

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% U5MR x 20% x 39% x 30.28 DALYs x 1.7 children/5 years = 0.068 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

Back