Lecture 3: Health Systems and Services

DSE Winter School 2020, Lecture 2

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Intro / road map

- Health services fail populations (esp. the poor) in lower income countries in a number of ways:
  1. Lack of Infrastucture, Trained Professionals, Technology
  2. Poor governance (low effort among providers, corruption)
  3. Lack of appropriate medicines/vaccines

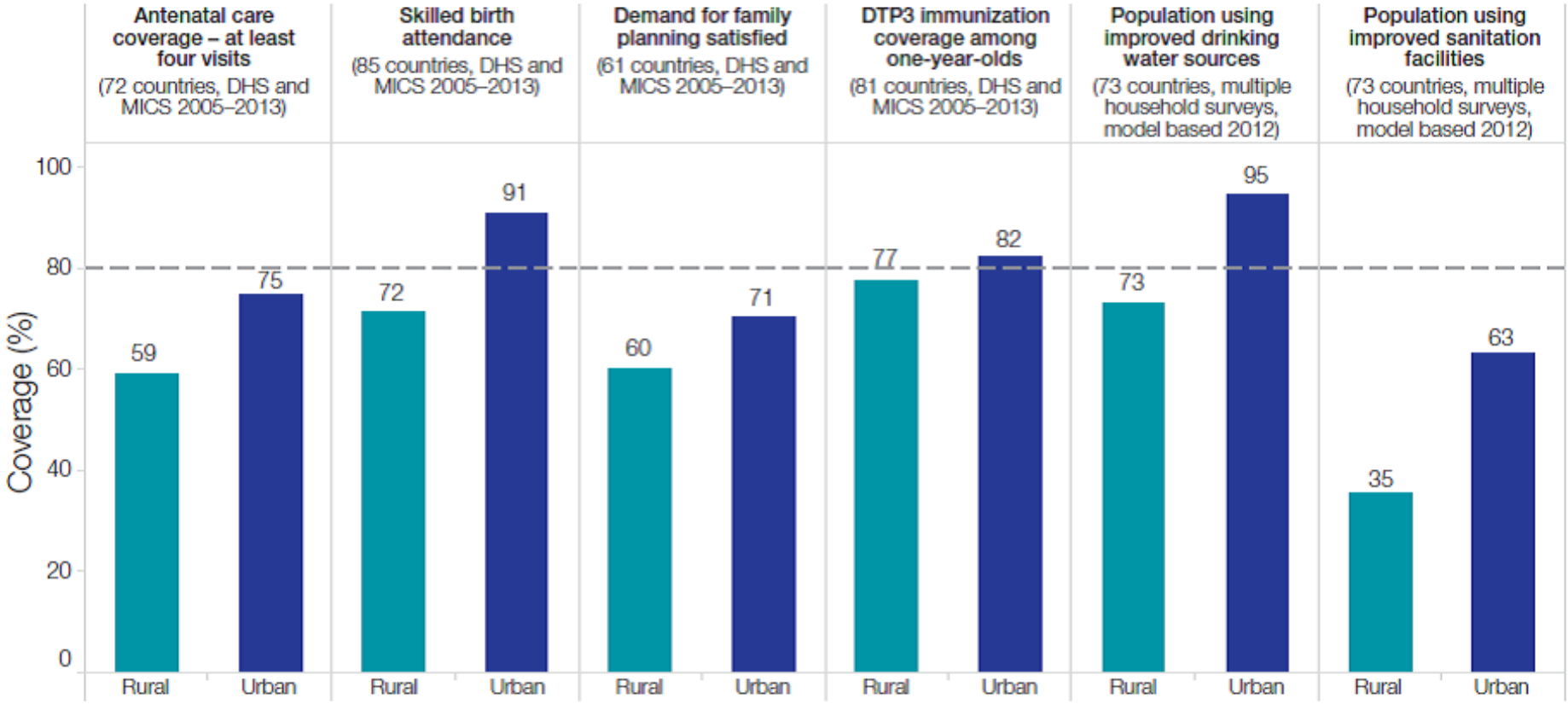
Poor Supply

	USA	France	Kenya	Malawi	Mali	India	Peru	Nicaragua
Health Exp. per cap. (US$)	7,400	4,800	33	18	38	45	201	105
Health Exp., Pub. (% of gov exp)	19	16	5	12	9	4	15	18
Physicians (per 1,000 people)*	2.7	3.3	0.14	0.02	0.08	0.6	1.2	0.4
Nurses (per 1,000 people)*	8.8	6.7	1	1	1	1	1	

Source: World Develpment indicators (WDI) 2009 except * (2004)

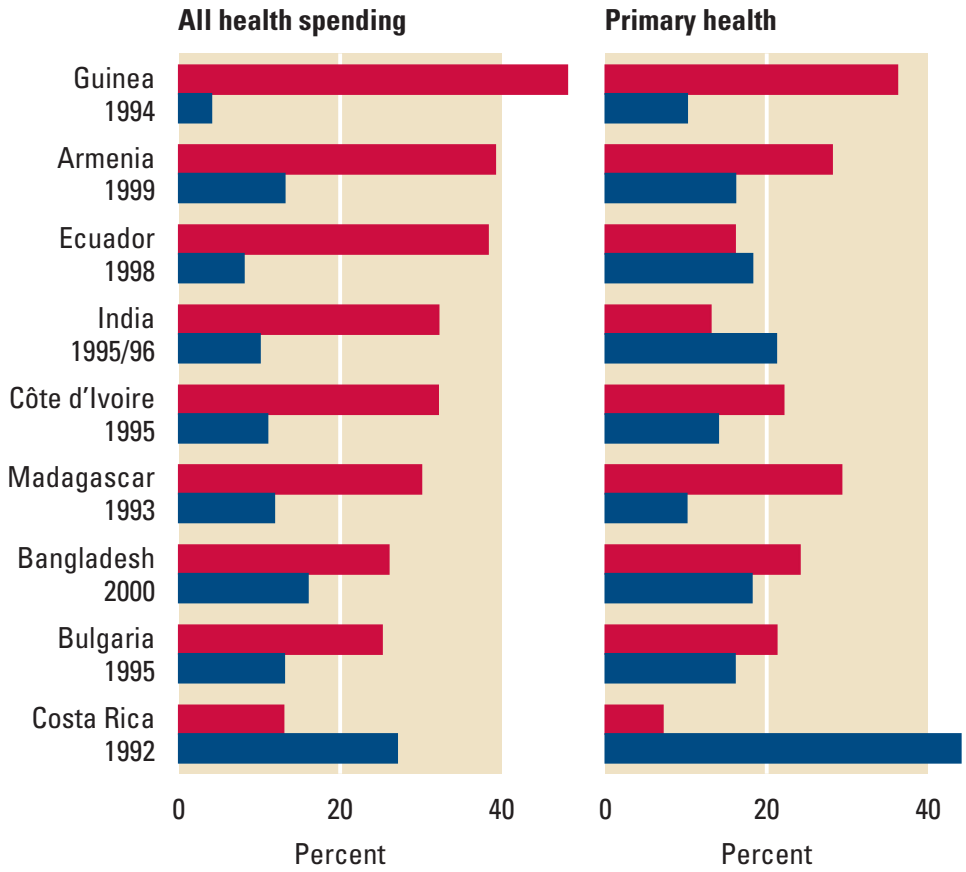
(1a) Lack of access

Figure 2.5. Median coverage of selected health interventions, by place of residence, in low- and middle-income countries



source: World Bank/ WHO TRACKING UNIVERSAL HEALTH COVERAGE report 2015

Figure 2 More public spending for the rich than for the poor
Share of public spending that accrues to the richest and poorest fifths



source: WDR 2004, p.4

Limited Access to Quality Care

Limited Access to Quality Care

- Household survey data suggests that households commonly seek care from private sector
- Sub-Saharan Africa: private sector = mostly informal "drug shops"
- India: private sector = mostly private facilities

Treatment seeking, Sub-Saharan Africa

	Western Kenya	Central Uganda	Eastern Uganda	Western and Southeastern Tanzania
	2009	2010	2011	2011
Provider Choice:				
Health Center Visit	0.41	0.25	0.33	0.42
Drug Shop Visit	0.37	0.66	0.43	0.39
No Care	0.18	0.09	0.22	0.19
Received diagnostic test	0.29	0.15	0.22	0.36

Source for Kenya: Cohen, Jessica, Pascaline Dupas and Simone Schaner (2015). "Price Subsidies, Diagnostic tests, and Targeting of Malaria Treatment". AER. Other countries: see referenes in Table A6 of Cohen et al.

India: Share of out-patient visits to different facilities

Choice of different facilities for outpatient health care in 2014 (and 2004)[a]

Facility Type	Description	Urban		Rural	
		Male	Female	Male	Female
Public	Primary health care[b]	3.5	4.2	10.6	12.3
	Public Hospital	17.4	17.3	15.9	17.5
	Total Share	20.9 (19.2)	21.5 (19.2)	26.5 (21.7)	29.8 (22.9)
Private	Private Doctor/Clinic	48.9	50.8	52.7	48.9
	Private Hospital	30.2	27.7	20.8	21.3
	Total Share	79.1 (80.8)	78.5 (80.8)	73.5 (78.3)	70.2 (77.1)

[a]The values in parentheses are for 2004 while all other values are for 2014

[b]This segment includes all primary health care options: *HSC* Health Sub Center, *PHC* Primary Health Center, *ANM* Auxiliary Nurse Midwife, *ASHA* Accredited Social Health Activist, *AWW*, Anganwadi Worker dispensary, *CHC* Community Health Center, and *MMU* Mobile Medical Unit . All of these are part of the government-funded public health system in India. For further details, the reader is requested to refer to Appendix B of the report 'Key Indicators of Social Consumption in India: Health'

Source: Jana A, Basu R. Examining the changing health care seeking behavior in the era of health sector reforms in India: evidences from the National Sample Surveys 2004 & 2014. *Glob Health Res Policy*. 2017

Why do people favor private sector?

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- Absenteeism in the public sector? ▸ Data
- Because quality is better?
  - Not quite...

Poor Quality

- Fascinating work by Jishnu Das and Jeffrey Hammer:
  - "Which doctor? Combining vignettes and item response to measure clinical competence," *Journal of Development Economics* 2005
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- Setting: Delhi. Both public and private physicians interviewed
- Majority of the private physicians don't have any medical training
- Vignettes to measure health providers' depth of knowledge:
  - Providers know the correct treatment only about 40 percent of the time
- Fake patients sent to measure health providers' practice:
  - in the average interaction, physician sees the patient for 3.8 minutes, asks 3.2 questions and performs less than one examination procedure
  - so not only they don't know much, they don't even use all of their knowledge: there is a "know-do" gap
  - know-do-gap smaller for private providers: they know less but use more of their knowledge!
  - median provider is ranked as "harmful"

Poor Quality

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- Udaipur survey (Banerjee, Deaton and Duflo 2004):
  - Among private practioners who called themselves "doctors":
    - 41% do not have a medical college degree
    - 18% have no medical or paramedical training whatsoever (not even a one-week course)
    - 17% have not graduated from high school

Poor Quality

- Not just India...
- Leonard and Masatu (2007), Doctors in Tanzania
  - similar finding of a know-do gap:

Know-do gap, Tanzania

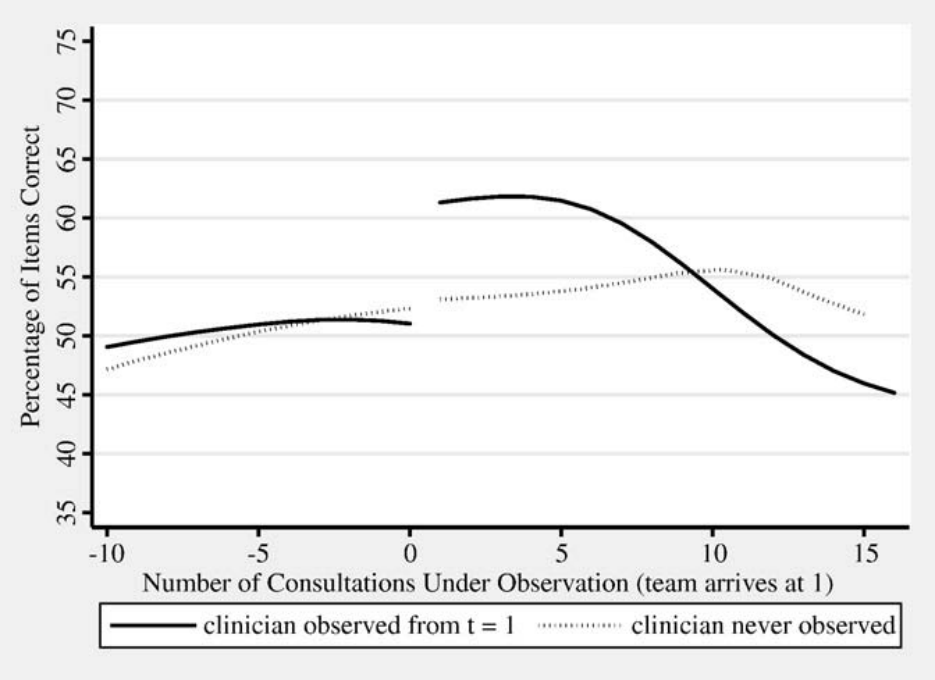

Fig. 1. The Hawthorne effect on quality. The figure shows smoothed average percentage of items required by protocol as measured from patient exit interviews performed immediately after the consultation. The dashed line shows percentage provided for patients seen immediately before and after the research team arrives at a facility who visited a doctor the research team never directly evaluated. The solid line shows the percentage provided for doctors who were observed by the research team starting at $t = 1$.

Know-do gap size depends on incentives

Currie et al. (2011, 2014): China

- public doctors overprescribe antibiotics because they get paid as a function of sales at the public pharmacy.
- overprescription reduces if standardized patient mentions will get drugs from other pharmacy or mentions has relative with medical training

Know-do gap size depends on incentives

Das et al. (AER 2016): India

- around 61% of public providers with a medical degree moonlight (i.e. run a private practice on the side)
- In private clinics, providers are paid on a fee-for-service basis by their customers. also earn a profit from selling medication.
- In contrast, as public servants doctors are paid a salary, and the drugs they prescribe are supposedly free at the public clinic.
- 71 providers in the study were visited by standardized patients *in both their public and private clinics*
- Results:
  - (1) providers exert greater effort when the standardized patient visits their private rather than public practice;
  - (2) the likelihood that the "correct treatment" is prescribed is higher in the private clinic, but total number of drugs prescribed is identical across the two settings.
  - (3) the likelihood of incorrect or even harmful treatment is identical across the two settings.

Poor Quality

- Reviews:
  - Das, J., J. Hammer and Leonard, K.L. (2008) "The Quality of Medical Advice in Low Income Countries," *Journal of Economic Perspectives*
  - Das, J., J. Hammer (2015). *Annual Review of Economics*.
- WDR 2004, p. 25: "A recent study in Benin found that one in four sick children received unnecessary or dangerous drugs from health workers" (Rowe et al. *American Journal of Public Health* 2001)

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- The World Bank started measuring the competence of providers in several countries in Sub-Saharan Africa through its Service Delivery Indicators initiative (www.sdiindicators.org):
  - diagnostic accuracy was 34 percent in Senegal, 57 percent in Tanzania and 72.2 percent in Kenya

Interaction between supply and demand

- Empirical finding in Udaipur: People are less likely to use public facilities whose nurses are absent more.
  - Two possible explanations:
    - Patients are discouraged by high absence rate.
    - Nurses are discouraged by low demand.
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- Leonard (2009): "Idle Chatter or Learning? Evidence of social learning about clinicians and the health system from Rural Tanzania" (*Social Science and Medicine*)
  - Survey evidence that households collect and share information on provider quality
  - Households are less likely to visit a new provider when they hear of bad outcomes and more likely to do so when they hear of good outcomes

Historical Legacies

Lowes, Sara, and Eduardo Montero. 2020 (AER). "The Legacy of Colonial Medicine in Central Africa".

- Between 1921 and 1956, French colonial governments organized medical campaigns to treat and prevent sleeping sickness. Villagers were forcibly examined and injected with medications with severe, sometimes fatal, side effects. ==> greater historical exposure to the campaigns reduces trust in medicine – measured by willingness to consent to a free, non-invasive blood test.

Martinez-Barvo, Monica, and Andreas Stegmann (2020). "In Vaccines we Trust? The Effects of CIA's Vaccine Ruse on Immunization in Pakistan"

- In July 2011, the Pakistani public learnt that the CIA had used a vaccination campaign as cover to capture Osama Bin Laden. The Taliban leveraged on this information and launched an anti-vaccine propaganda campaign to discredit vaccines and vaccination workers. Difference-in-Differences strategy across cohorts and districts ==> vaccination rates declined 12 to 20% per standard deviation in support for Islamist parties.

If quality is low, maybe absenteeism is a good thing?

- Note quite
- Goldstein, et al. (AEJ applied 2013): "The effect of Absenteeism and Clinic Protocol on Health Outcomes: The Case of Mother-to-Child Transmission of HIV in Kenya"
- Compare outcomes of pregnant women who are lucky/unlucky in that the PMTCT nurse is present/absent on the day of their first prenatal visit
  - PMTCT - prevention of mother-to-child transmission of HIV
- PMTCT nurses not absent much, but when they are absent, pregnant women that day don't get tested for HIV
- Effect persists: over course of pregnancy, end up with 58 percentage points lower chance to ever test for HIV and a much lower likelihood to deliver in a hospital (something the PMTCT nurse recommends you do if you have HIV).
- So absenteism has negative consequences

Sometimes low quality public care still better than the alternative...

- Adhvaryu and Nyshadham (AEJ policy 2015): "Returns to Treatment in the Formal Health Care Sector: Evidence from Tanzania"
  - Examine the effects of treatment following acute illness at formal sector health facilities on short-term health outcomes for young children
  - Use nationally representative data from Tanzania
  - Empirical strategy: Instrument choice of health care following acute illness with the interaction between distance (to the nearest health facility) and rainfall
    - intuition: rainfall generates random variation in the cost (or disutility) of traveling a given distance; heavier rain should discourage individuals who live farther away more than individuals living closer to the nearest health facility.
  - Find positive impacts of visiting formal health care on children health outcomes two weeks later
    - mechanism: children get proper treatment faster when care sought in formal sector

Public health care can work

- Gruber, Hendren, Townsend (AEJ App 2014): "The Great Equalizer: Healh Care Access and Infant Mortality in Thailand"
- Analyze Thailand's 2001 healthcare reform, "30 Baht"
  - Reform that increased funding available to hospitals to care for the poor and reduced copays to 30 Baht (~$0.75)
  - This lead to increased healthcare utilization, especially amongst the poor (and especially among infants and women aged 20-30)
- Study impacts on infant mortality using vital statistics records from the Ministry of Public Health
- To do this, compare poor regions to rich regions
  - poor regions: many households affected by reform; rich regions: fewer
  - So if reform had impact, would expect closing of the gap between poor and rich regions
- That's exactly what they find: before program, infant mortality rate significantly larger for poor areas; after program, complete catch-up.

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  - Study: Monitor performance & corruption at antenatal clinics supposed to give free bed net to pregnant women

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  - Study: Monitor performance & corruption at antenatal clinics supposed to give free bed net to pregnant women
- Audit studies in Ghana (NGO program), Uganda and Kenya (government programs)
- Find pretty high levels of compliance with program and high pass-through of subsidy to intended recipients, minimal leakage
- Does not undermine cost-effectiveness of free distribution

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1. Contracting out?
2. Bottom-up monitoring of quantity/quality: Community empowerment / beneficiary control?
3. Top-down monitoring of quantity/quality: Financial incentives?

Role of Ownership: Government Provision vs Contracting Out

- Basic question: granted that government should subsidize provision of certain goods and services, should it provide these in-house or should it contract it out to a for-profit or non-profit firm?

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Role of Ownership: Government Provision vs Contracting Out

- Basic question: granted that government should subsidize provision of certain goods and services, should it provide these in-house or should it contract it out to a for-profit or non-profit firm?
- Without any contracting problems, organization design would not have allocative implications
- But there is an important contracting problem in the provision of health (similiarly education) services: what are the incentives to undertake investments that will improve quality and/or reduce costs if those cannot be well monitored?

Government Provision vs Contracting Out

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  - Competition can only ensure quality if beneficiaries are able to discern quality (vote with their feet)
- What could be potential problem with non-profits?
  - They may not be as efficient in cutting costs
  - Indeed, NGOs are mostly praised for their commitment to the cause even though in terms of efficiency it might be dominated by a for-profit firm or by the public sector

Kremer et al "Contracting for Health: Evidence from Cambodia" (2006)

- In 1999, Cambodia contracted out management of government health services to NGOs in five randomly chosen districts out of twelve
- The contracts specified targets for maternal and child health service improvement.
- Targeted outcomes improved by about 0.5 standard deviations relative to comparison districts.
  - The receipt of vitamin A by children under 5 was increased by 42 percentage points
  - The receipt of antenatal care by pregnant women was increased by 36 percentage points
- The project improved the management of government health centers:
  - availability of 24-hour service
  - actual presence of staff scheduled to be there
  - supervisory visits
  - presence of supplies and equipment.

- The program did not have large effects on health services indicators not explicitly mentioned in the contract. (No increase, but no decrease either (no crowding out))
- There is some limited evidence the program improved self-reported health
- The program led individuals to shift curative care visits to public facilities, and reduce visits to untrained service providers such as unlicensed drug sellers and traditional healers. This reduced their costs.
- The program involved increased public health funding, but led to roughly offsetting reductions in private expenditure for individuals
- Conclusion from the Cambodia paper: contracting health care delivery out to NGOs doesn't seem like a bad idea...

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- Rajasthan BSBY scheme:
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- Con: outsourcing service delivery to private sector agents comes with its own governance challenges
  - information asymmetries (between the government and provider as well as between provider and patient) can lead to fraud and overprovision (Dranove 1988, Bourgeon and Picard 2014).

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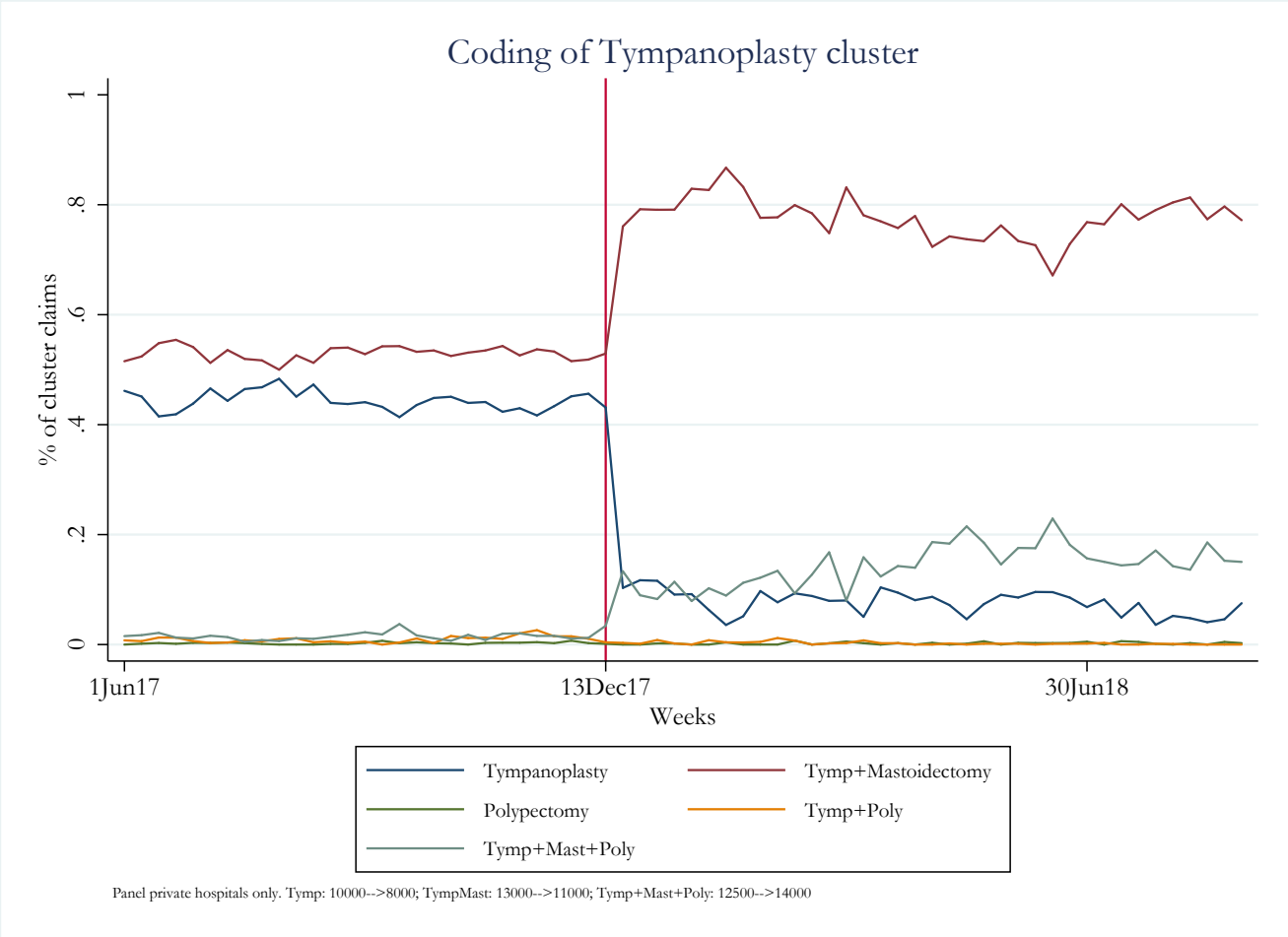
  - June 2017-June 2018: Called patients with a recent claim to conduct "audit"; e.g. check whether patient had to pay
  - Exploit sudden change in repayment rates on Dec. 13, 2017 to back out rates of upcoding, pass-through
    - Rates change by varying magnitudes for different 'packages' changes relative prices
    - Costs of provision unlikely to change discontinuously, so rate change = shock to relative profitability of different packages
    - "Difference-in-differences" empirical strategy taking advantage of variation in rate changes and 6 months pre/post reform data

Evidence from Audits Survey

- Significant out-of-pocket (OOP) payment requests made by hospitals to patients:
- E.g women coming for delivery: 48% pay OOP ($75 on average among payers)
  - Wealthier, educated patients pay LESS
    - Explained by differences across hospitals
  - Informed patients pay LESS
    - across and within hospitals
  - Patients with longer stays pay more
- Are private hospitals double-billing or balance-billing?
  - (definition of balance billing= charge difference to patient if true costs higher than reimbursement rate)
- Can exploit policy change to get traction on this

Coding changes after policy change: Ear surgery



- Tympanoplasty is the surgical operation performed for the reconstruction of the eardrum (tympanic membrane);
- Tympanoplasty with mastoidectomy = surgery performed to correct middle ear problems in both the eardrum and the small bones of the middle ear (mastoid bone).

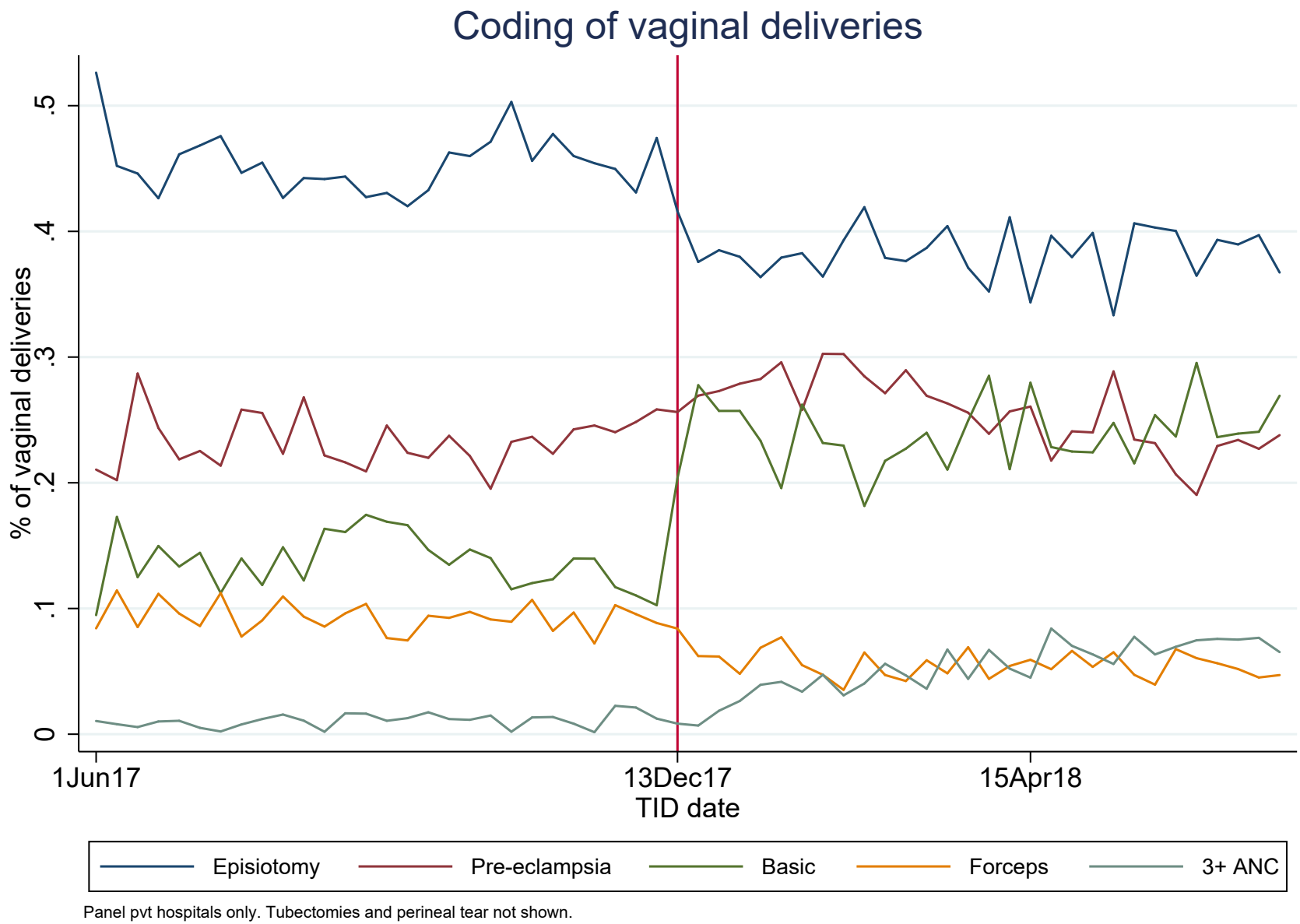
Coding changes: interpretation?

- Changes in relative prices incentivize
  - Real changes in care provided
    - Hospitals attract patients needing profitable types of services ("selection")
  - Change service without change in underlying patient need ("under/over-provision")
  - And/or pure coding changes to maximize reimbursements (upcoding)
    - Could be compensating for too-low package rates (upcoding is substitute for COOP) OR simply double-charging to increase profits
- Need to disentangle these
  - To understand effects of changes in relative prices on care provided – is supply responsive?
  - To estimate the incidence of government subsidies and pass-through

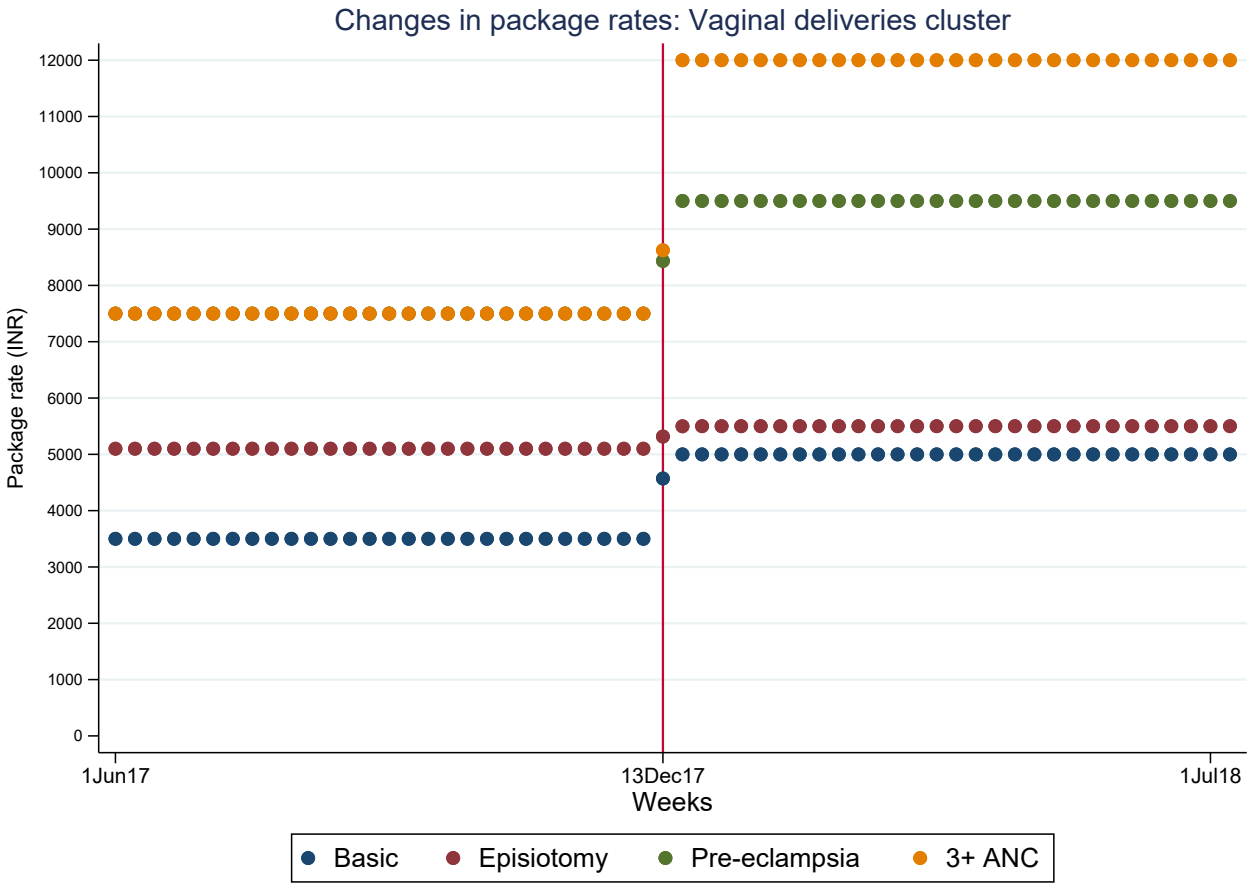
Ruling out selection

- Can compare patient characteristics, find no difference

Evidence from Rate Change: Deliveries

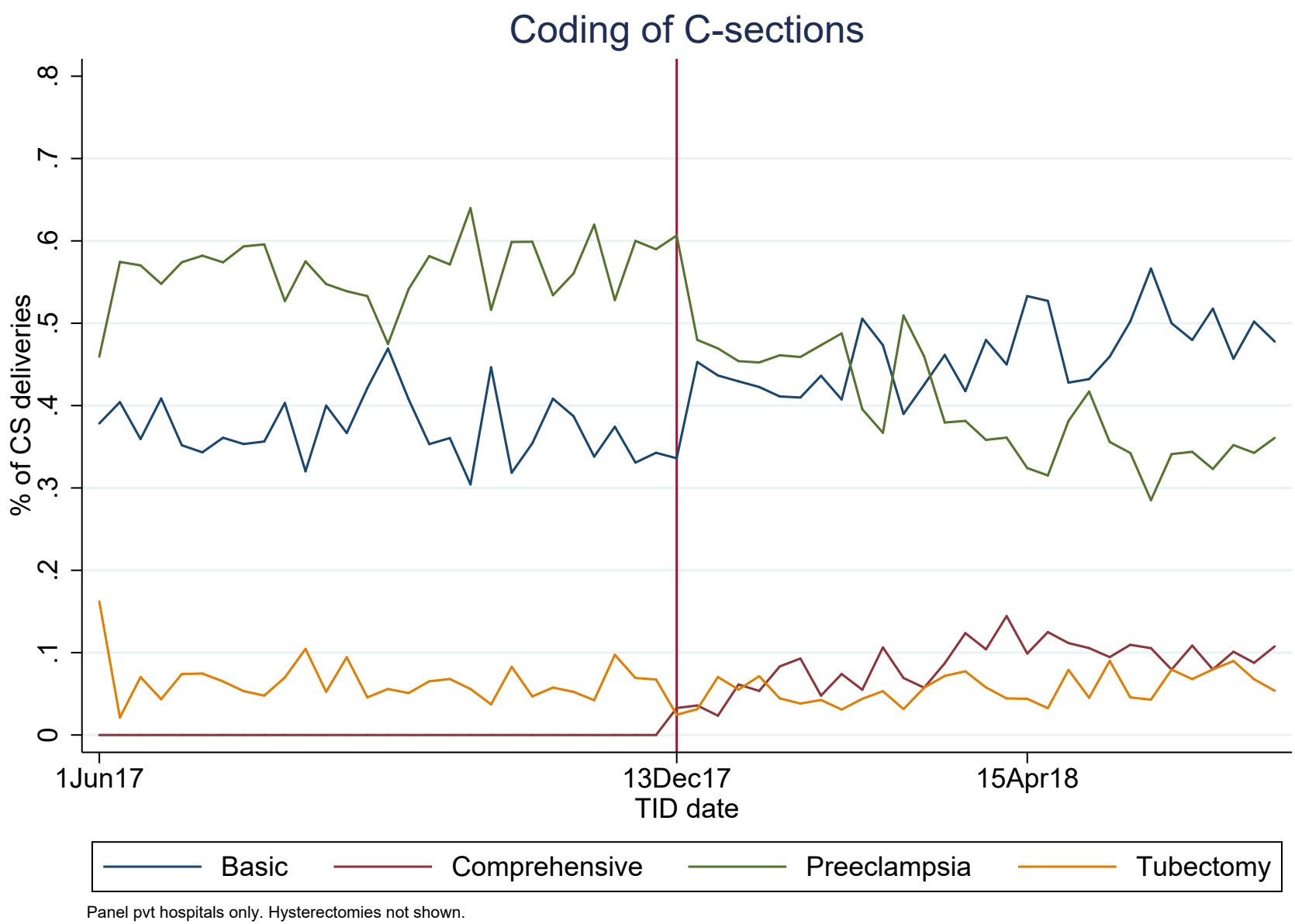


Policy Change

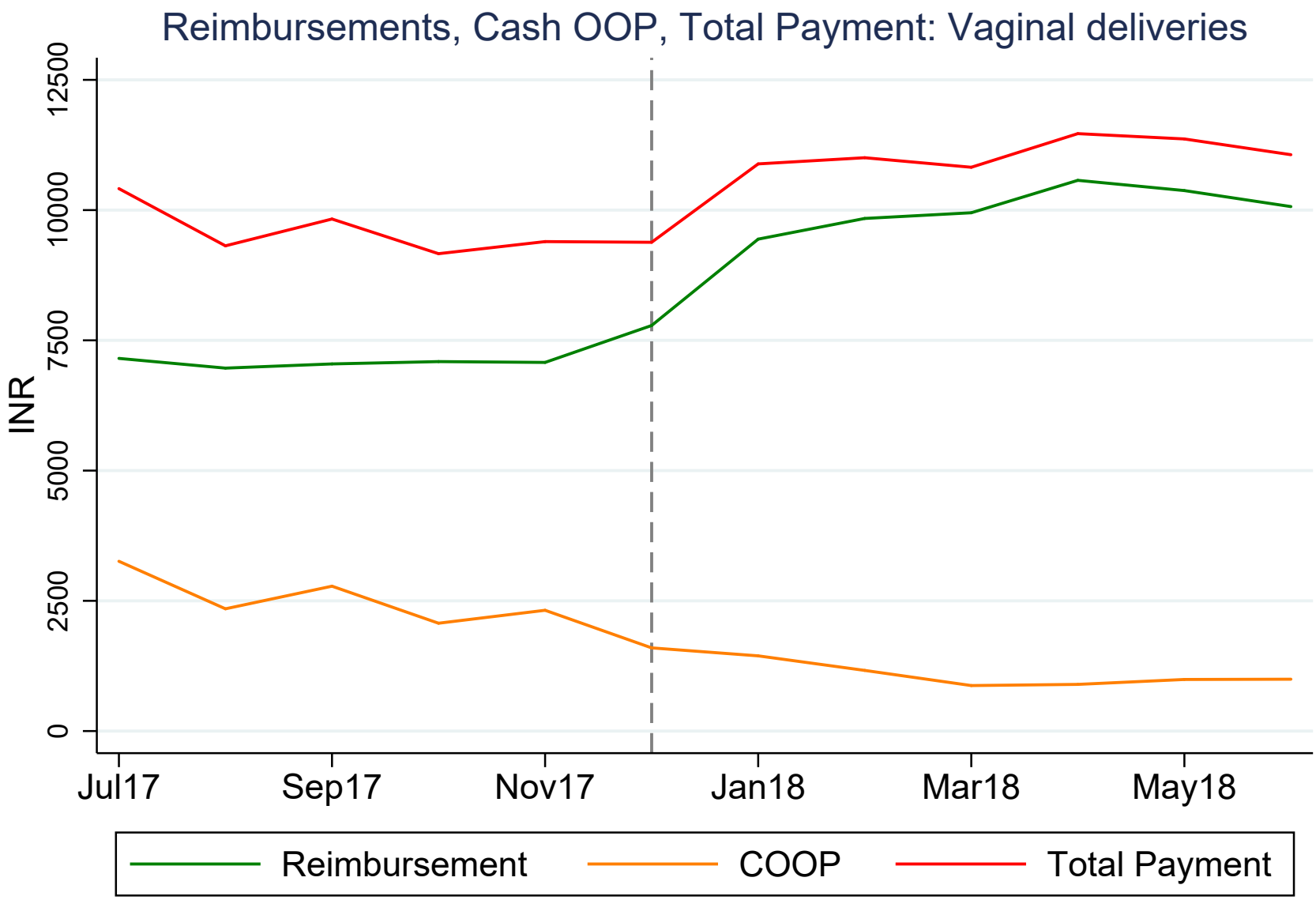


Note: Pre-eclempsia at 7,500 in pre-period

Coding of C-sections



Pass-through



OOP trimmed at 97th percentile. Jun17 and Jul17 samples combined. All hospitals.

BSBY ongoing work: take-aways so far

- Evidence of pure coding changes to maximize reimbursements (upcoding)
  - Seem to be in part compensating for too-low package rates (upcoding is substitute for COOP)
    - but only partial pass-through
    - could it be because quality increases in response? No evidence for this in surveys, but hard to measure

BSBY ongoing work: take-aways so far

- First systematic evidence of hospitals charging for care that should be free under insurance
  - One explanation for why insurance programs have had limited effects despite increases in utilization
- Some hospitals charge to compensate for too-low reimbursements
  - non-compliance may be compensating for poor program design
  - Simply increasing monitoring without understanding costs may drive hospitals out, reduce patient welfare
- Yet a substantial share of public subsidies is accruing to hospitals rather than benefiting patients
  - simply increasing reimbursements without monitoring may worsen this

It sometimes work, but when it's broken, how to fix the supply?

1. Contracting out?
2. Bottom-up monitoring of quantity/quality: Community empowerment / beneficiary control?
3. Top-down monitoring of quantity/quality: Financial incentives?

Empowering Beneficiaries?

- The users have the biggest stake in quality of public services
- So why can't we harness the end users' interest in order to monitor providers?
- Main problems:
  - Performance of providers can be hard to measure (how do you know if your doctor gives you the wrong remedy?)
  - Returns realized later: by the time you realize your child learned nothing in school, it's too late to do something about it
  - Efforts to increase information about performance could help?

Bottom-up Monitoring: Beneficiary Control?

- Elections give citizens some control over politicians
- But public service providers are civil servants: no reelection incentives
- How to harness the end users' interest in order to monitor providers?

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  - same in education: returns realized later: by the time you realize your child learned nothing in school, its too late to do something about it

Bottom-up Monitoring: Beneficiary Control?

- Elections give citizens some control over politicians
- But public service providers are civil servants: no reelection incentives
- How to harness the end users' interest in order to monitor providers?
- Main problem: performance of providers can be hard to measure
  - how do you know if your doctor gives you the wrong remedy?
  - same in education: returns realized later: by the time you realize your child learned nothing in school, its too late to do something about it
- Efforts to increase information about performance could help?
  - maybe telling households they should expect more from local providers would be equally successful?

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- Following WDR, multiple attempts have been made – not many of them successful
- We'll review:
  - Early success of beneficiary control program in improving health quality in Uganda, but not much success this then

Power to the people and Health in Uganda

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  - provider performance low to start with (e.g., absence rate in health centers: 47% in Chaudhury et al. 2006)
- Intervention started with a household survey to collect data on experience with public health facilities
- Then, community organizations facilitated three meetings: a community meeting, a meeting at the health center, and an interface meeting

Power to the people and Health in Uganda

- Intervention included:
  - (i) information provision ("report cards" on performance of local health center + info on what services should be available)
  - (ii) hands-on mobilization of community members to encourage them to use the information they received to scrutinize the behavior of their local health providers and hold them accountable for poor performance

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- The outcome was an action plan on how to improve the situation, and how the community members would monitor the facilities

Program Impacts

TABLE II
PROGRAM IMPACT ON MONITORING AND INFORMATION

Dependent variable	Suggestion box	Numbered waiting cards	Poster informing free services	Poster on patients' rights	Average standardized effect
Specification:	(1)	(2)	(3)	(4)	(5)
Program impact	0.32***	0.16*	0.27***	0.14	2.55***
	(0.08)	(0.09)	(0.09)	(0.10)	(0.55)
Mean control group	0	0.04	0.12	0.12	—
Observations	50	50	50	50	50

Program Impacts

TABLE IV
PROGRAM IMPACT ON IMMUNIZATION

Group	Newborn	Under 1 year	1 year old	2 years old	3 years old
Specification:	(1)	(2)	(3)	(4)	(5)
Average standardized effect	1.30*	1.44**	1.24**	0.72	2.01***
	(0.70)	(0.72)	(0.63)	(0.58)	(0.67)
Observations	173	929	940	951	1,110

Program Impacts

TABLE VI
PROGRAM IMPACT ON HEALTH OUTCOMES

Dependent variable	Births	Pregnancies	U5MR	Child death	Weight-for-age z-scores	
Specification:	(1)	(2)	(3)	(4)	(5)	(6)
Program impact	−0.016	−0.03**	−49.9*		0.14**	0.14**
	(0.013)	(0.014)	(26.9)		(0.07)	(0.07)
Child age (log)						−1.27***
						(0.07)
Female						0.27***
						(0.09)
Program impact × year of birth 2005				−0.026**		
				(0.013)		
Program impact × year of birth 2004				−0.019**		
				(0.008)		
Program impact × year of birth 2003				0.003		
				(0.009)		
Program impact × year of birth 2002				0.000		
				(0.006)		
Program impact × year of birth 2001				0.002		
				(0.006)		
Mean control group 2005	0.21	0.29	144	0.029	−0.71	−0.71
Observations	4,996	4,996	50	5,094	1,135	1,135

Program Impacts

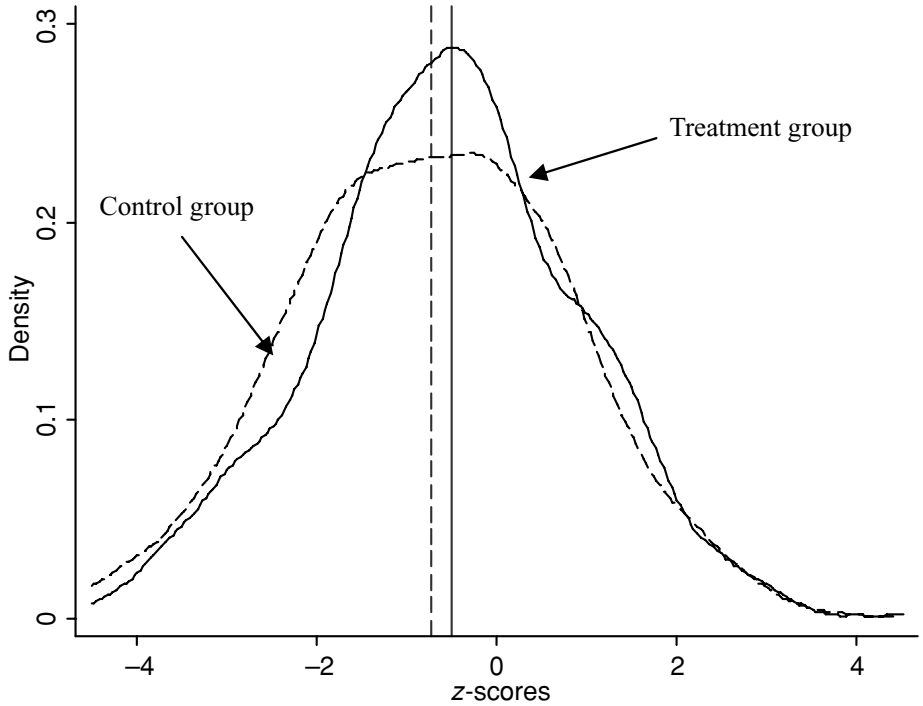
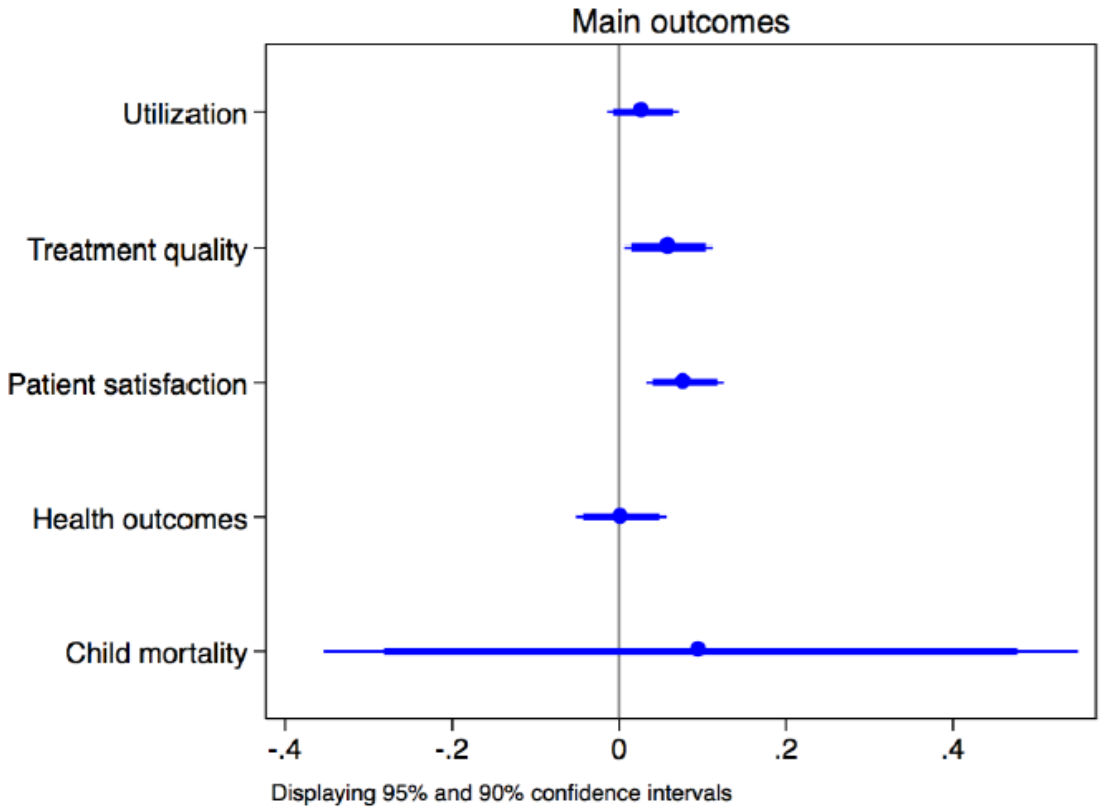


FIGURE II
Distributions of Weight-for-Age z-Scores for Treatment and Control Groups

- Recent follow-up paper find evidence that effects persist over time (Bjorkman, De Walque and Svensson, AEJ applied 2018)
- But large scale replication done 10 years later in the same country (Uganda) with a much larger sample size finds very precise null effect on health outcomes: Raffler, Posner and Parkerson (2018): "The Weakness of Bottom-Up Accountability: Experimental Evidence from the Ugandan Health Sector".

Raffler, Posner and Parkerson (2018)



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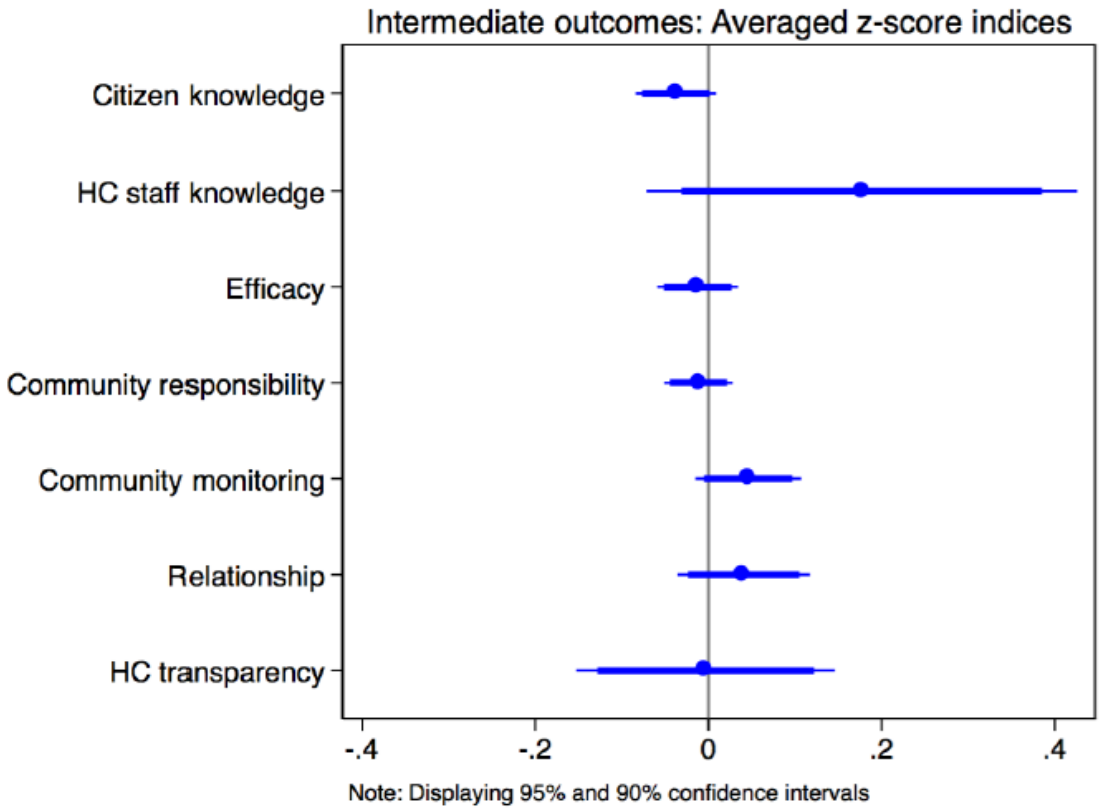

Figure 5: Treatment effect on intermediate outcomes at endline

Why "Power to the People" doesn't quite replicate?

- Difference in implementation quality?
  - Unlikely, process evaluation suggests quality of implemention in replication was very high
- Floor effects? 10 years later, mortality is much lower so impacting mortality is much harder?
  - Likely explanation, thoughRaffler et al. find no effect even in districts with high mortality at baseline

Road Map

1. Role of Ownership?
2. Role of Beneficiary Control?
3. Role of Incentive Pay?

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  1. What to tie the rewards to? behavior (effort, input) or output?
     - Worry with indexing reward on output: If the provider's job includes multiple tasks, but the performance measures of these tasks are not equally good, then it may not be efficient to give explicit incentives (Holmstrom and Milgrom, *Journal of Law, Economics, and Organization* 1991)

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  2. Who is in charge of monitoring the performance? does the monitor need to be incentivized too?

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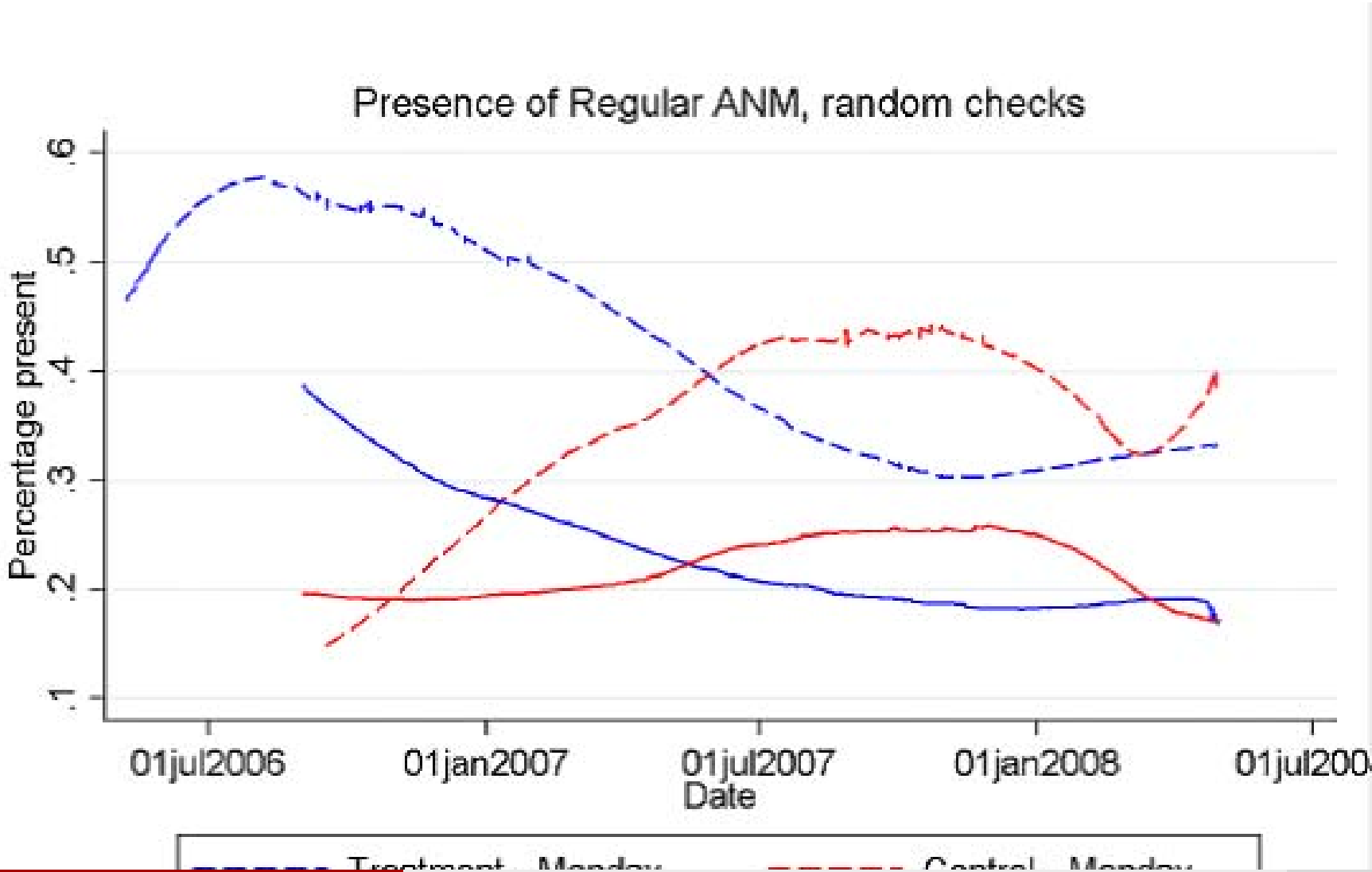
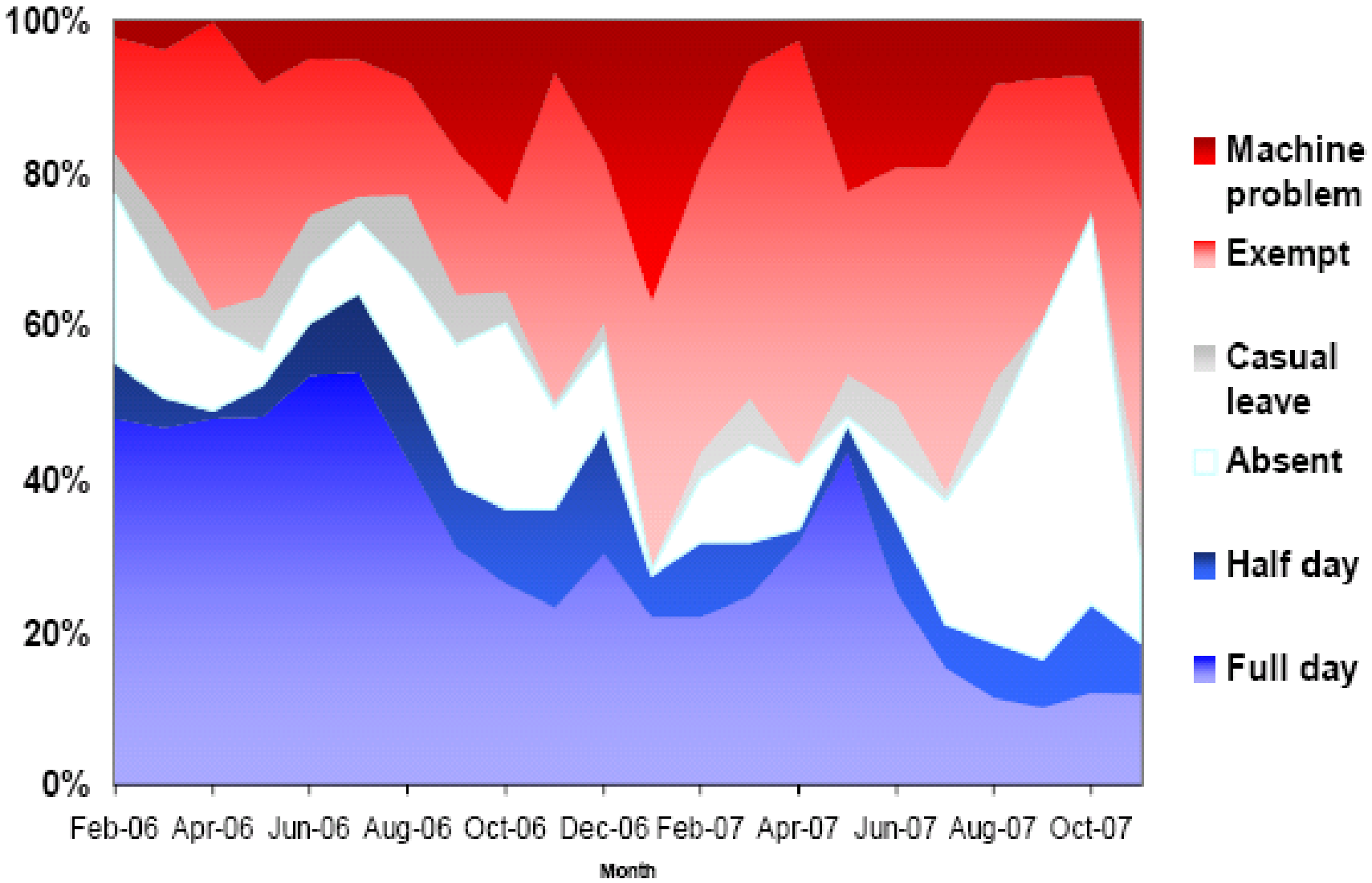
- Independently, research team performed regular unnanounced checks

Results of the Nurse Monitoring Program

- Banerjee, Duflo, Glennerster (2008): "Putting a bandaid on a corpse" (JEEA. 2008 ; 6(2-3): 487–500)



From Absences to Exemptions



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  - Early on, large impact: Nurses are sensitive to incentives
  - However, as time goes on, attendance declined in monitored group
  - At the end, attendance was higher in the non-monitored group!
  - What happened?
    - Answer can be found in the nurse register indicating reason for absences....
    - Absence became "exempted days" (and "broken machines")

Political Commitment to a Monitoring System is Key

- The public health system was not committed to implementing the monitoring of nurses, despite commitment at the top.
  - Did not implement sanctions...
    - So nurses quickly learned that the commitment to Monday presence was not a real priority

Option 2: Indexing pay on output

- Here again, both success and failure stories
  - Indonesia: +ve (modest) impact of performance pay for local governments (health) – no effect on education
  - Rwanda: +ve impact of pay for performance for health providers
  - DRC: no impact of pay for performance for health providers

Pay for Performance: the Indonesia experiment

- Olken, Ben, Junko Onishi and Susan Wong (Feb 2012). "Should Aid Reward Performance? Evidence from a Field Experiment on Health and Education in Indonesia"
- RCT in Indonesia with 264 subdistricts
- Performance incentives to villages for improvements in specific health outcomes led to an increase in labor supply from health providers. No crowding out of effort on non-incentivized outcomes.
- Impact of incentives seems to be primarily occurring by speeding up program impacts on the targeted indicators, rather than changing ultimate long run outcomes

Pay for Performance: the Rwanda experiment

- Gertler and Vermeersch (WP May 2013): "Using Performance Incentives to Improve Medical Care Productivity and Health Outcomes"
- RCT of performance pay for medical care providers in Rwanda
- Find large effect:
  - significant improvements in child health
    - + 0.53 SD in the weight-for-age of children 0-11 months and + 0.25 SD in the height-for-age of children 24-49 months
  - Pathways: increased preventative care utilization + improved clinical quality of care
    - 20% decrease in gap between provider knowledge and actual practice of appropriate prenatal care clinical procedures
  - But evidence of strong complementarity between performance incentives and baseline provider skill
    - So incentivizing low-quality providers does not help
    - Could explain lack of impact of similar program in rural DRC (Huillery and Seban 2016)

Road map

- Health services fail populations (esp. the poor) in LMICs in a number of ways:
  - Lack of Infrastucture, Trained Professionals, Technology
  - Poor governance (low effort among providers, corruption)
  - Lack of appropriate medicines/vaccines

Barriers to product development?

- Pharmaceutical firms have low incentives to invest in R&D for diseases that only the poor have, since the poor can't pay much
  - Michael Kremer's Advanced Market Commitment idea = international community commits to purchase a given stock of vaccines for a given price, to spur R&D
  - Kremer has a bunch of papers on this on his website, also review chapter in *Understanding Poverty* book on syllabus
  - First "pilot" AMC – for pneumococcal vaccine – developed 7 or so years ago, quite successul so far
    - http://www.gavialliance.org/funding/pneumococcal-amc/

Barriers to product development?

- Kremer, Michael, and Christopher M Snyder. QJE 2015. "When Is Prevention More Profitable than Cure? The Impact of Time-Varying Consumer Heterogeneity"
  - If consumers vary only in disease risk, revenue from treatments— sold after the disease is contracted, when disease risk is no longer a source of private information—always exceeds revenue from preventives
  - Numerical example to see this:

- Suppose a monopoly pharmaceutical manufacturer sells directly to 100 rational, risk neutral consumers, who will suffer harm quantified as \$100 from contracting the disease.
  - The firm can develop a treatment or a preventive; both are costless to manufacture, are perfectly effective, and have no side effects.
  - Consumer heterogeneity: 90 have a 10% chance of contracting a disease while 10 have a 100% chance.
  - Expected revenue from treatment: $19 * 100$=\$1,900
  - Expected revenue from preventive:
    - if sells at \$100, only sell to 10 high-risk folks
    - if sells at \$10, sells to everyone
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- Not all numerical examples involve such a large gap between drug and vaccine revenue.
- Consider another example in which all 100 consumers now have the same 19% chance of contracting the disease (a number picked to maintain the disease prevalence in the population from the first example). A vaccine manufacturer can now earn \$1,900 by charging the \$19 expected avoided harm to all 100 consumers, matching drug revenue.

- There is a special feature of the first numerical example that not only leads to a bias against vaccines, but makes it something of a worst-case scenario.
  - numerical example is a special case of a power law, called a Zipf distribution, in which the values and probabilities scale in exact inverse proportion. In particular, moving from low- to high-risk consumers increases disease risk by a factor of ten but reduces the number of consumers having at least that disease risk by the same factor of ten.
- Theoretical result in the paper: when the risk distribution has a Zipf shape, manufacturers may not be able to extract much revenue from a vaccine (or preventive more generally), while a drug (or more generally any treatment sold after disease status is realised) may still be quite lucrative

Barriers to Product development: Counterfeits

- NIH study in 2012: collected surveys examining 2,634 malaria drug samples across 21 sub-Saharan African countries
  - Of those tested, over one-third "failed on the basis of chemical analysis" - meaning that they were either expired or of poor quality
  - about 20% were found to be counterfeits.
- WHO estimates that anything between 30% and 60% of the continent's total drugs - both branded and generic - could be fake.
- Consequences:
  - WHO estimates that around 100,000 deaths a year in Africa are linked to the counterfeit drug trade
  - R&D incentives further reduced if patents not enforce

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- Note: many of the issues discussed today are similar / relevant for education sector

APPENDIX TABLES

Poor Supply

	USA	France	Kenya	Malawi	Mali	India	Peru	Nicaragua
Health Exp. per cap. (US$)	7,400	4,800	33	18	38	45	201	105
Health Exp., Pub. (% of gov exp)	19	16	5	12	9	4	15	18
Physicians (per 1,000 people)*	2.7	3.3	0.14	0.02	0.08	0.6	1.2	0.4
Nurses (per 1,000 people)*	8.8	6.7	1	1	1	1	1	

Source: World Develpment indicators (WDI) 2009 except * (2004)

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Health Worker Absenteism around the world

Absence rate observed a public health centers during random spot checks:

	Absence Rate (%)
Bangladesh	35
India	40
Indonesia	40
Peru	25
Uganda	37
Weigthed average	35

Source: Chaudury et al., 2006. Missing in Action: Teacher and Health Worker Absence in LMICs," Journal of Economic Perspectives 20 (1) (2006): 91–116

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ANC nurses performance

	(1)	(2)	(3)	(4)	(5)
Data Source:	Surveys with ANC Registrants				
Dependent Variable:	Avg. minutes spent with nurse during ANC checkup	Palpated by nurse during visit to ANC[a]	Average wait time for checkup	Had all key fields filled in ANC register[b]	% of key fields filled in in ANC register[b]
Kenya average	27.498	0.896	72.070	0.774	0.964
	[1.667]	[0.017]	[4.739]	[0.031]	[0.005]
Ghana differential	-15.203	0.012	-14.170	0.034	-0.000
	[1.758]	[0.023]	[6.584]	[0.041]	[0.009]
Uganda differential	-6.541	0.063	-6.329	0.005	0.000
	[1.951]	[0.019]	[7.920]	[0.041]	[0.007]
Observations	2,278	2,410	2,241	2,615	2,615
Dep. Var. Mean	18.48	0.917	63.60	0.792	0.964

Notes. Data comes from from surveys with ANC registrants conducted in Kenya, Uganda, and Ghana. Standard errors for regressions clustered at clinic level. Includes all clinics. There are 168 clinics in the sample.
a. Not conditional on receiving a checkup, so lower bound since some patients may have not wanted to get a checkup. We do not condition on saying that they received a checkup in case patients only call a visit a checkup if they have been palpated.
b.Key fields are name, reg date, ANC card #, address, # children, and gestational age at registration.

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