Contracting for Health

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Presentation at the When Institutions Are Weak: Strategies for Change pre-conference
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Collaborators

- Many institutions, people involved
  - Indu Bhushan (ADB), Erik Bloom (ADB), David Clingingsmith (Harvard), Loraine Hawkins (World Bank), Rathavuth Hong (OCR Macro), Elizabeth King (World Bank), Michael Kremer (Harvard), Benjamin Loevinsohn (World Bank), Brad Schwartz (UNC-Chapel Hill)
- Keller and Schwartz 2001; Loevinsohn 2000, 2001; Schwartz and Bushan 2004

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Overview I

- Background on project and context
- Empirical approach
- Results
  - Contracted outcomes
  - Non-contracted outcomes
  - Health facility management
  - Choice of provider, expenditure
  - Consumer perception of care quality

Background: Health care in developing countries

- Government provision terrible
  - Weak provider incentives
  - 35% of health workers absent in surprise visits in six developing countries.
- Private provision terrible
  - Provider incentives distorted under asymmetric information
  - 30%-50% of prescriptions unnecessary or contraindicated in India (Phadke, 1998; Das and Sanchez 2000)
  - Providers may not consider infectious disease externalities
- Contracting: Afghanistan, Bangladesh, Estonia, Haiti, India, Burkina Faso
  - Stronger incentives than government providers
  - Less asymmetry of information
  - In rural context, limited mobility, limited adverse selection

Cambodian health context

- Post-genocide, post-conflict society
  - Only 50 doctors left in country in 1979
  - Fighting until 1998
- 1979-1993 Vietnamese-backed regime
  - Growth of medical staff, though quality low
  - Little rural health infrastructure investment
- 1993 Elections; adoption of market economy
  - Gov't medical staff pay ~40% GDP/cap.
  - Boom in private medical practice, OTC drug sales
  - Most private practitioners also gov't staff
  - Drug sellers get about 33% of curative visits 1997
  - Spending high; health outcomes, coverage poor
  - Huge improvements over study period. Health center construction

The project I

- Management of district-level government health services turned over to NGOs through open tender
  - 12 districts in 3 provinces
  - Total population 1.3 million
  - District the right unit for competition
- Targeted improvement of child and maternal health service coverage levels. Prevention
- Fixed price per capita bids
- 4-year contracts with provision for monitoring and sanctions

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The project II

- Random assignment to tender
  - 8 treatment eligible districts, quasi-stratified by province; 4 comparison districts
- Two treatments
  - Contracting in (CI)
    - Work within government staff and procurement structure
    - Management authority, but can't hire/fire, procure outside
  - Contracting out (CO)
    - Full control of staffing--hire and fire
    - Full control of procurement

The project III

- 10 NGOs submitted 16 bids for the 8 districts
  - Technical criteria and price
  - Bids scored by mixed committee; insiders and outsiders; 8 of 16 bids technically acceptable
  - 4 NGOs won; one got two districts
  - 3 districts got no technically acceptable bids
- Only international NGOs submitted bids
  - Expat staff: between 0.5 and 3.0 per contracted district.
- CO funds all flow from ADB, CI mixed
  - $0.25 per capita budget supplement for CI, comparison; sorting out overall financing
  - Preintervention spending $1-$2 per capita

Contracted outcomes

	Baseline 1997	Goal
Fully immunized child	31%	70%
Children get Vitamin A	43%	70%
Antenatal care	11%	50%
Delivery by trained personnel	28%	50%
Delivery in a health facility	5%	10%
Use modern birth spacing method	15%	30%
Knowledge of birth spacing	23%	70%
Use of public health care facilities	4%	Increase

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What did the NGOs do? I

- Additional compensation in all treated districts
- Two officially banned private practice, three allowed it
- Staff compensation choices
  - Contracting in (CI): Base salary plus performance bonus, no provision for firing
  - Contracting out (CO): high fixed salaries, with possibility of firing nonperformers
- CO attracted some staff from outside district, outside government service

What did the NGOs do? II

- Example: Peareng district, contracting in (CI)
  - Facilities signed annual contracts with NGO, workers 3-mo subcontracts. Private practice banned.
    - Staff motivation viewed as key problem
    - Additional payment on top of government salary
      - Composed of fixed supplement (55%) + punctuality incentive (15%) + performance of facility incentive (30%)
    - 500%-800% increase in official income if full incentive paid
  - Spot checks based on random interviews to enforce accurate reporting by facilities
  - Staff incentives based on targeted outcomes, patient satisfaction, quality of care, and no fraud

Econometric Issues

- Selection into treatment
  - CO: 4 districts tendered, 3 awarded
  - CI: 4 districts tendered, 2 awarded
  - Previous data collection, analysis based on actual treatment status, not initial assignment
  - Perhaps NGOs focused bids on districts where gains would be easiest
- Cluster-level intervention

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The data

- Baseline household survey in 1997, follow-up in 2003
  - 30 randomly selected villages in each of 12 districts
  - 7-14 households per village randomly chosen in each survey year
  - Household census, recent illnesses and treatment, program outcomes
  - Follow-up included health service quality module
- Facility survey in 2003

Empirical method I

- District-level intervention with individual outcomes
- Randomly-assigned eligibility an instrument for actual treatment.
- TOT for outcome *k*:

$$y_{idptk} = \beta_{0k} + \beta_{1k} I_d^{CI-T} + \beta_{2k} I_d^{CO-T} + \beta_{3k} I_t^{2003}$$
$$+ \beta_{4k} I_d^{CI-T} \times I_t^{2003} + \beta_{5k} I_d^{CO-T} \times I_t^{2003} + p_{pt} + \varepsilon_{idptk}$$
$$= W\theta_k + \varepsilon_{idptk}$$

- Instruments: $I_d^{CI-R}, I_d^{CO-R},$
$$I_d^{CI-R} \times I_t^{2003}, I_d^{CO-R} \times I_t^{2003}$$

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Empirical method II

- Average effect size (AES) for family of *K* outcomes
  - Kling, Katz, Leibman, and Sonbanmatsu (2003), O'Brien (1984)
- Joint estimation of TOT for *K* outcomes
  - Aggregate to get common unit of observation *v*
  - VCM estimates cross-equation correlation of effects
  - $\left(\bar{y}_{vdt1},\ldots,\bar{y}_{vdtK}\right)' = \left(I_K \otimes W\right)\theta + \mu_{vdtk}$
  - Treatment effects π_k are elements of θ
- AES:

$$\tau = \frac{1}{K}\sum_{k=1}^{K}\frac{\pi_k}{\sigma_k},\quad \sigma_k^2 = Var(\bar{y}_{vdtk} \mid t = \text{baseline}, d = \text{comp.})$$

- τ is the average treatment effect in comparison group standard deviations.

Results in a nutshell

- Both CI and CO had large, positive and significant TOT effects on contracted outcomes, no effects were significantly negative
- Noncontracted outcomes showed gains or no effect. No average effect.
- Increased use of public facilities, mostly at expense of drug sellers
- Facility management improved
- Contracted quality of care perceived as worse than comparison

TOT for changes in targeted outcomes

	Full Immuni-zation	Vitamin A	Antenatal Care	Trained Delivery	Delivery in Facility	Use Birth Spacing	Know Birth Spacing	Use Public Facilities
CI--Treated	-0.099	-0.021	-0.006	0.020	0.021	0.001	0.043	-0.007
	(0.08)	(0.03)	(0.03)	(0.12)	(0.03)	(0.04)	(0.08)	(0.01)
CO--Treated	-0.101	-0.138**	0.030	0.134	0.014	0.116	-0.070	-0.003
	(0.14)	(0.06)	(0.10)	(0.17)	(0.03)	(0.12)	(0.12)	(0.03)
CI--Treated X 2003	**0.139**	**0.091**	**0.364*** **	**0.057**	**0.118**	**0.077**	**-0.022**	**0.176*** **
	(0.08)	**(0.06)**	**(0.08)**	**(0.04)**	**(0.07)**	**(0.06)**	**(0.07)**	**(0.04)**
CO--Treated X 2003	**0.150**	**0.417*** **	**0.263**	**-0.123**	**0.074**	**-0.038**	**0.073**	**0.289*** **
	(0.12)	**(0.09)**	**(0.16)**	**(0.11)**	**(0.07)**	**(0.09)**	**(0.13)**	**(0.05)**
Year 2003	0.297**	0.153***	0.343***	0.203***	0.122	0.148**	0.587***	0.143***
	(0.10)	(0.04)	(0.11)	(0.04)	(0.07)	(0.05)	(0.06)	(0.02)
Constant	0.509***	0.475***	0.132***	0.285**	0.055***	0.084	0.147**	0.023
	(0.10)	(0.03)	(0.04)	(0.13)	(0.01)	(0.06)	(0.06)	(0.01)
Observations	5,100	11,213	4,993	4,993	4,976	6,994	9,537	11,223
R-squared	0.27	0.13	0.25	0.03	0.05	0.02	0.34	0.12
Comparion mean 2003	0.81	0.61	0.35	0.34	0.10	0.23	0.80	0.13
Comparion mean 1997	0.34	0.43	0.09	0.24	0.03	0.13	0.22	0.04

Notes: IV regressions with provinceXyear effects. Standard errors corrected for clustering at the district level. * significant at 10%; ** significant at 5%; *** significant at 1%

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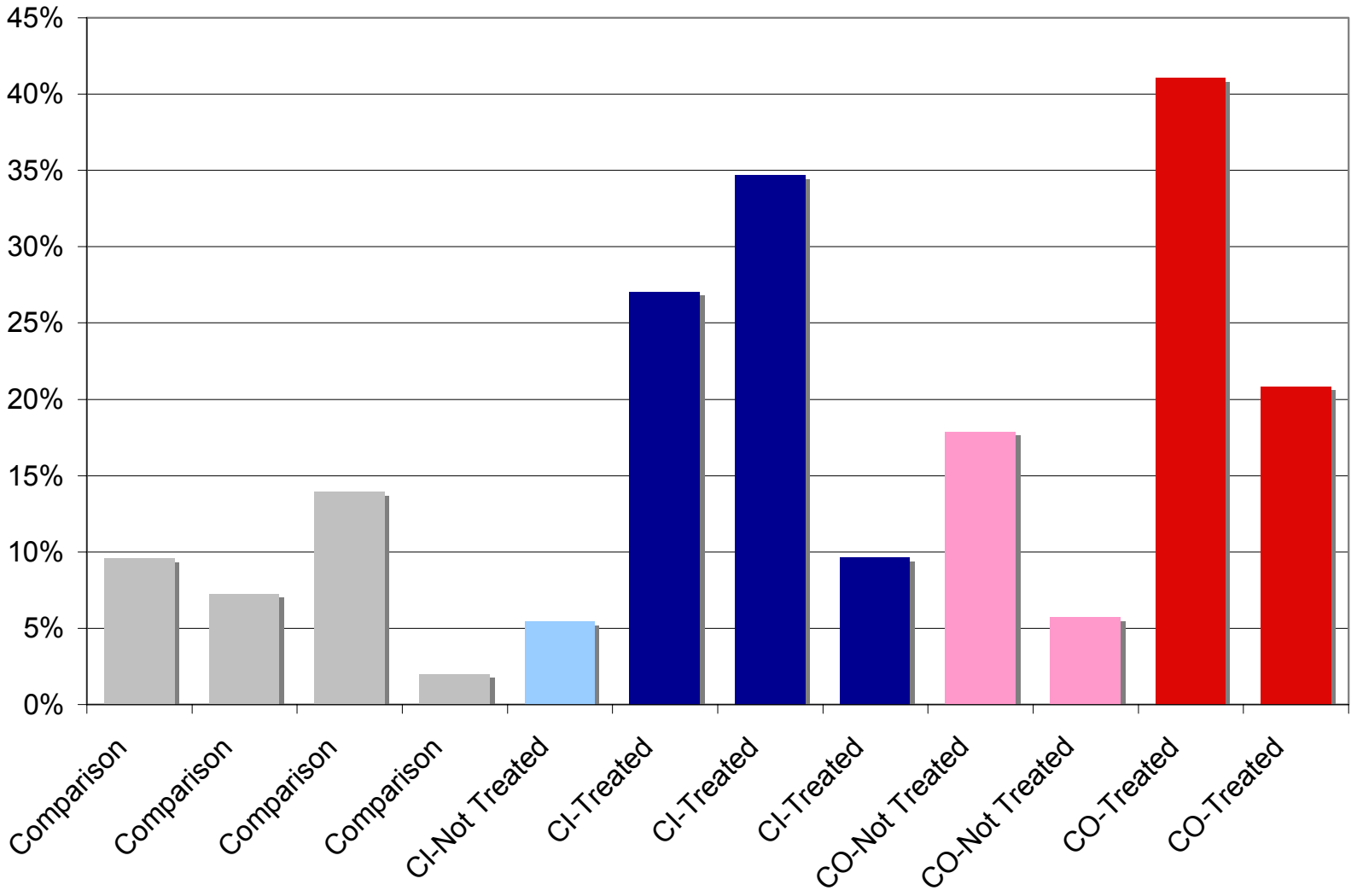
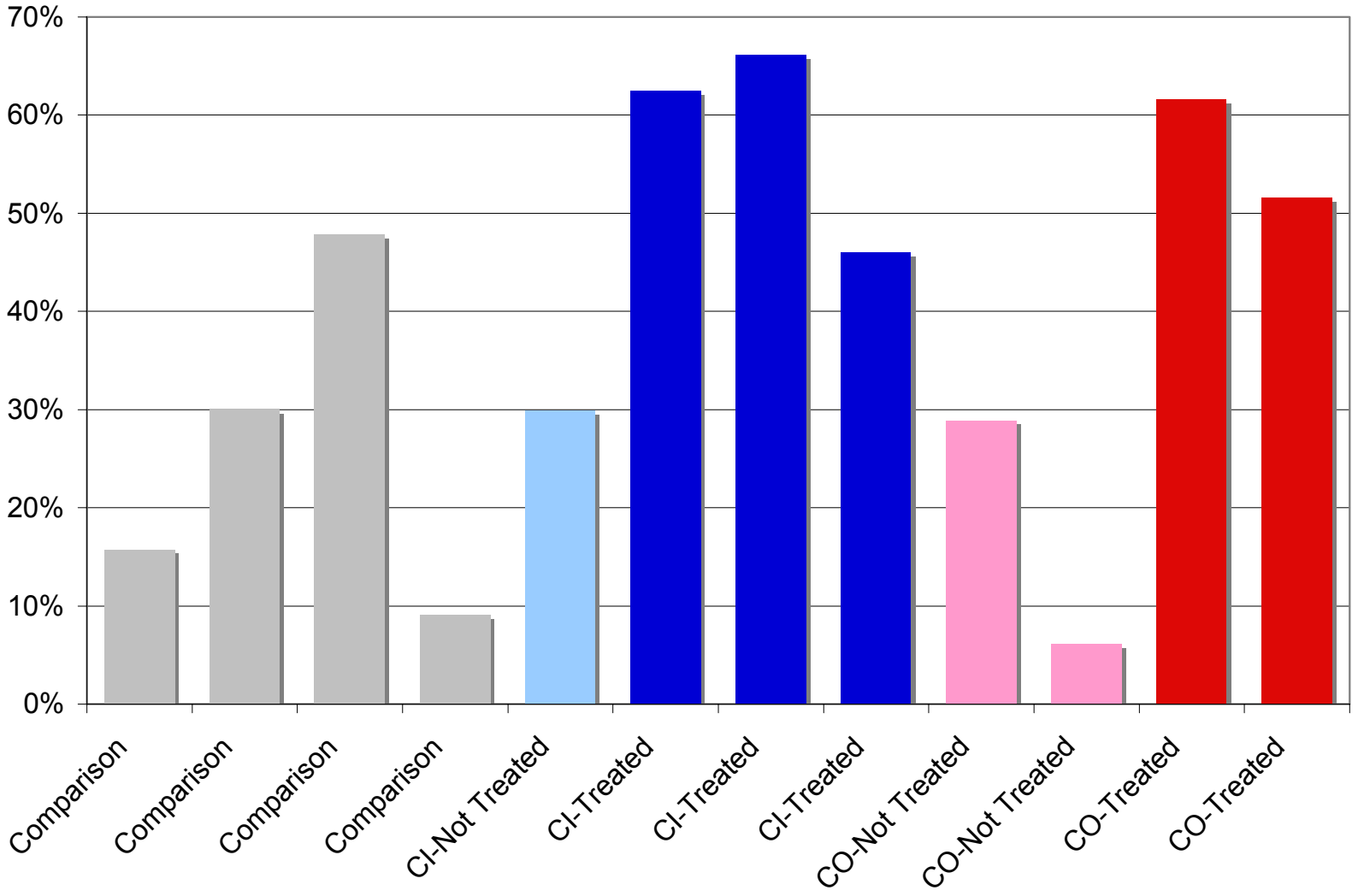
Change in District Average: Use of Public Facilities



Change in District Average: Antenatal Care



TOT for changes in targeted outcomes without provinceXyear effects

	Full Immun.	Vitamin A	Antenatal Care	Trained Del.	Del. in Facility	Use Birth Spacing	Know Birth Spacing	Use Public Facilities
CI--Treated	-0.077	0.058	0.035	0.044	0.035	-0.009	0.065	-0.003
	(0.14)	(0.09)	(0.07)	(0.12)	(0.04)	(0.02)	(0.13)	(0.02)
CO--Treated	-0.068	-0.015	0.091	0.171	0.035	0.102	-0.039	0.005
	(0.20)	(0.16)	(0.14)	(0.22)	(0.04)	(0.11)	(0.11)	(0.03)
CI--Treated X 2003	**0.079**	**-0.150**	**0.338****	**0.040**	**0.106**	**0.062**	**-0.051**	**0.126**
	(0.15)	**(0.34)**	**(0.12)**	**(0.08)**	**(0.08)**	**(0.06)**	**(0.11)**	**(0.08)**
CO--Treated X 2003	**0.061**	**0.048**	**0.225**	**-0.149**	**0.057**	**-0.063**	**0.031**	**0.227****
	(0.21)	**(0.45)**	**(0.20)**	**(0.16)**	**(0.09)**	**(0.13)**	**(0.12)**	**(0.09)**
Year 2003	0.468***	0.183	0.256***	0.099**	0.074	0.102***	0.582***	0.091***
	(0.10)	(0.17)	(0.08)	(0.04)	(0.04)	(0.03)	(0.05)	(0.02)
Constant	0.341***	0.425***	0.089**	0.239***	0.032***	0.131***	0.221***	0.035***
	(0.10)	(0.05)	(0.03)	(0.07)	(0.01)	(0.01)	(0.04)	(0.01)
Observations	5,100	11,213	4,993	4,993	4,976	6,994	9,537	11,223
R-squared	0.25	0.02	0.23	0.01	0.04	0.01	0.33	0.10

Notes: IV regressions. Standard errors corrected for clustering at the district level. * significant at 10%; ** significant at 5%; *** significant at 1%

Household wealth controls

- Household wealth controls could help absorb time-varying district level shocks
- Bias should go against finding a positive treatment effect

Changes in targeted outcomes with wealth controls

Panel A: Average Effect Size for 15 Wealth Measures

	Contracting In (CI)	Contracting Out (CO)	H_0: CO=CI, p-value
Average Effect	0.018	-0.052	0.41
SE	(0.05)	(0.06)	

Panel B: TOT Estimates

	Full Immuni-zation	Vitamin A	Antenatal Care	Trained Delivery	Delivery in Facility	Use Birth Spacing	Know Birth Spacing	Use Public Facilities
CI--Treated	-0.097	-0.022	-0.001	0.026	0.023	0.006	0.045	-0.004
	(0.07)	(0.03)	(0.04)	(0.10)	(0.03)	(0.04)	(0.08)	(0.01)
CO--Treated	-0.097	-0.133*	0.025	0.138	0.013	0.120	-0.065	-0.002
	(0.13)	(0.07)	(0.09)	(0.15)	(0.03)	(0.11)	(0.12)	(0.03)
CI--Treated X 2003	0.141*	0.091	0.368***	0.067	0.124*	0.085	-0.021	0.173***
	(0.08)	(0.06)	(0.08)	(0.05)	(0.07)	(0.06)	(0.07)	(0.04)
CO--Treated X 2003	0.157	0.412***	0.267	-0.110	0.078	-0.028	0.075	0.288***
	(0.12)	(0.08)	(0.16)	(0.12)	(0.06)	(0.09)	(0.14)	(0.05)
Year 2003	0.261**	0.145***	0.286**	0.121**	0.084	0.127**	0.568***	0.140***
	(0.10)	(0.04)	(0.10)	(0.05)	(0.06)	(0.05)	(0.06)	(0.02)
Constant	0.462***	0.462***	0.076**	0.197*	0.029	0.062	0.128**	0.017
	(0.09)	(0.03)	(0.03)	(0.11)	(0.02)	(0.05)	(0.06)	(0.02)
Observations	5,084	11,178	4,979	4,979	4,962	6,975	9,510	11,191
R-squared	0.28	0.14	0.27	0.09	0.08	0.03	0.34	0.12
Comparion mean 2003	0.81	0.61	0.35	0.34	0.10	0.23	0.80	0.13
Comparion mean 1997	0.34	0.43	0.09	0.24	0.03	0.13	0.22	0.04

Notes: IV regressions with provinceXyear effects. Standard errors corrected for clustering at the district level. * significant at 10%; ** significant at 5%; *** significant at 1%

AES for changes in eight targeted outcomes

Contracting In (CI)	0.995*
	(0.17)
Contracting Out (CO)	1.093*
	(0.26)
H_0: CO=CI, p-value	0.69

Notes: Average differential increases caused by treatment in baseline comparison-group standard deviations. Joint estimation corrected for clustering at the district level. * significant at 10%; ** significant at 5%; *** significant at 1%.

TOT for non-contracted outcomes

	Child <1 Alive|Age	Diarrhea Incidence (0/1)	Diarrhea Treatment (0/1)	Additional Antenatal Checks	Village Visit <4wk	Breastfeed Newborn within 6h	Give <1 Month Old Water	AIDS knowledge
CI--Treated	0.026	-0.013	-0.003	0.370	-0.097**	0.010	0.007*	-0.016
	(0.02)	(0.06)	(0.04)	(0.40)	(0.04)	(0.03)	(0.00)	(0.05)
CO--Treated	0.030	0.166	-0.144**	0.556	-0.113	0.067	0.000	-0.075
	(0.02)	(0.15)	(0.06)	(0.97)	(0.09)	(0.07)	(0.01)	(0.07)
CI--Treated X 2003	**-0.011**	**0.010**	**0.018**	**1.119****	**0.180***	**0.015**	**0.037**	**0.211****
	(0.02)	**(0.06)**	**(0.04)**	**(0.39)**	**(0.08)**	**(0.07)**	**(0.03)**	**(0.07)**
CO--Treated X 2003	**-0.043**	**-0.252**	**0.144***	**0.578**	**-0.029**	**-0.064**	**0.093**	**0.196**
	(0.03)	**(0.19)**	**(0.08)**	**(01.23)**	**(0.07)**	**(0.15)**	**(0.06)**	**(0.12)**
Year 2003	0.016	-0.026	0.059	2.864***	0.201***	0.438***	-0.090***	0.269***
	(0.02)	(0.07)	(0.06)	(0.59)	(0.04)	(0.08)	(0.03)	(0.07)
Constant	0.962***	0.258***	0.880***	0.733	0.659***	0.044	0.996***	0.254***
	(0.02)	(0.08)	(0.05)	(0.46)	(0.03)	(0.04)	(0.00)	(0.04)
Observations	4,930	9,850	2,962	4,993	9,582	4,942	4,884	8,775
R-squared	0.01	0.01	0.03	0.25	0.05	0.13	0.01	0.10
Comparion mean 2003	0.97	0.26	0.93	2.79	0.77	0.35	0.95	0.42
Comparion mean 1997	0.97	0.35	0.89	0.65	0.76	0.08	1.00	0.20

Notes: IV regressions with provinceXyear effects. Standard errors corrected for clustering at the district level. * significant at 10%; ** significant at 5%; *** significant at 1%

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AES for 8 non-contracted outcomes

Contracting In (CI)	0.181
	(0.27)
Contracting Out (CO)	-0.115
	(0.06)
H_0: CO=CI, p-value	0.46

Notes: Joint estimation corrected for clustering at the district level. * significant at 10%; ** significant at 5%; *** significant at 1%.

- Infant survival
- Diarrhea incidence
- Proper treatment diarrhea
- Number of antenatal services
- Village outreach last month
- Breastfeeding newborn <6h
- No water to infant
- Knowledge of HIV risks

TOT for health center management I

	Facilities and Staffing						Delivery		User Fees	
	Permanent HC building open	24 hour service at HC	Unann. visit: HC open w/ patients	Unann. visit: All sched staff present	HC support from other NGOs?	Registers match HIS reports	Delivery services offered?	HC has user fee system	User fees clearly posted	User fee income (2003 US$)
CI--Treated	**0.236** **(0.08)**	**0.826***** **(0.11)**	**0.477**** **(0.22)**	**0.496**** **(0.17)**	**-0.061** **(0.31)**	**0.308** **(0.19)**	**0.246** **(0.16)**	**0.164** **(0.15)**	**0.238**** **(0.09)**	**93.925** **(82.83)**
CO--Treated	**0.170** **(0.22)**	**0.467** **(0.27)**	**0.711** **(0.44)**	**0.787***** **(0.24)**	**0.245** **(0.80)**	**0.127** **(0.36)**	**0.403** **(0.36)**	**0.301** **(0.23)**	**0.284*** **(0.15)**	**92.345** **(81.63)**
Constant	0.766*** (0.08)	0.095 (0.06)	0.441*** (0.13)	0.235** (0.09)	0.487*** (0.16)	0.542*** (0.15)	0.673*** (0.15)	0.745*** (0.08)	0.818*** (0.06)	134.737** (58.37)
Observations	143	121	143	143	143	143	143	143	108	89
R-squared	0.23	0.57	0.52	0.43	0.2	0.25	0.02	0.31	0.17	0.19
Comparison Mean	0.74	0.21	0.45	0.24	0.45	0.67	0.52	0.71	0.77	92.83

Notes: All columns are IV regressions in levels with province fixed effects. Standard errors corrected for clustering at the district level. Random assignment to treatment serves as an instrument for actual treatment. * significant at 10%; ** significant at 5%; *** significant at 1%

TOT for health center management II

	Supervisor visits				Outreach			Equipment and Supplies		
	Number supervisor visits last 3m	Last visit: discuss MOH programs	Last visit: discussed problems	Last visit: went on outreach	Number outreach scheduled last mo.	Number outreach last month	Outreach: actual less scheduled	HC equipment index	HC supplies index	All child vaccs available at HC
CI--Treated	**0.028**	**0.102**	**0.090**	**0.021**	**-3.760*** **	**-2.690**	**0.193** **	**3.530*** **	**5.531*** **	**-0.155***
	(0.49)	**(0.09)**	**(0.08)**	**(0.04)**	**(01.21)**	**(02.06)**	**(0.07)**	**(0.66)**	**(01.37)**	**(0.08)**
CO--Treated	**5.654*** **	**0.197**	**-0.123**	**0.079**	**1.010**	**3.414**	**0.139**	**2.990***	**8.863** **	**0.146**
	(1.34)	**(0.19)**	**(0.18)**	**(0.07)**	**(2.35)**	**(3.19)**	**(0.12)**	**(1.37)**	**(3.10)**	**(0.18)**
Constant	2.191***	0.684***	0.669***	0.994***	13.898***	13.519***	-0.042	14.890***	24.068***	0.296***
	(0.33)	(0.04)	(0.05)	(0.01)	(0.69)	(1.05)	(0.06)	(0.40)	(1.06)	(0.04)
Observations	143	112	116	121	124	143	124	143	143	143
R-squared	0.51	0.12	0.13	0.08	0.15	0.16	0.02	0.33	0.38	0.3
Comparison Mean	2.52	0.77	0.81	0.97	15.43	14.31	-0.06	15.02	25.02	0.36

Notes: All columns are IV regressions in levels with province fixed effects. Standard errors corrected for clustering at the district level. Random assignment to treatment serves as an instrument for actual treatment. * significant at 10%; ** significant at 5%; *** significant at 1%

AES for 11 health center management outcomes

Contracting In (CI)	0.599***
	(0.12)
Contracting Out (CO)	1.128***
	(0.23)
H_0: CO=CI, p-value	<0.01

Notes: Joint estimation corrected for clustering at the district level.
* significant at 10%; ** significant at 5%; *** significant at 1%.

- HC open with patients
- All scheduled staff present
- Child delivery service available
- User fees clearly posted
- Number of supervisor visits
- Number of outreach trips
- Index of equipment installed and functional
- Index of drugs and other supplies available
- All childhood immunizations available

TOT for changes in care-seeking outcomes, all household members

			Was any provider consulted in the past month?				
	Reported ill during past month	Total spent curative care past month (2003 USD)	None	Traditional Healer	Drug Seller	Qualified Private Provider	Qualified Public Provider
CI--Treated	0.004	0.278	-0.010	-0.004	0.029	-0.016	0.000
	(0.04)	(0.53)	(0.04)	(0.00)	(0.02)	(0.01)	(0.00)
CO--Treated	0.135	3.951**	-0.120	0.006	0.075	0.041	0.014
	(0.10)	(1.35)	(0.10)	(0.00)	(0.06)	(0.03)	(0.01)
CI--Treated X 2003	**0.001**	**-0.304**	**0.003**	**0.003**	**-0.046***	**0.007**	**0.032*****
	(0.03)	**(0.40)**	**(0.03)**	**(0.00)**	**(0.03)**	**(0.01)**	**(0.01)**
CO--Treated X 2003	**-0.145**	**-4.679*****	**0.118**	**-0.005**	**-0.103**	**-0.077***	**0.050*****
	(0.10)	**(1.34)**	**(0.09)**	**(0.01)**	**(0.07)**	**(0.04)**	**(0.01)**
Year 2003	0.077	0.228	-0.077*	-0.003	0.052	0.006	0.047***
	(0.04)	(0.62)	(0.04)	(0.00)	(0.04)	(0.01)	(0.01)
Constant	0.162**	1.502*	0.858***	0.012***	0.037	0.092***	0.003
	(0.06)	(0.80)	(0.05)	(0.00)	(0.03)	(0.02)	(0.01)
Observations	54,062	54,062	54,062	54,062	54,062	54,062	54,062
R-squared	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Comparison mean 2003	0.19	1.07	0.83	0.01	0.08	0.08	0.03
Comparison mean 1997	0.20	1.66	0.82	0.01	0.08	0.08	0.01

Notes: IV regressions with provinceXyear effects. Standard errors corrected for clustering at the district level. * significant at 10%; ** significant at 5%; *** significant at 1%

TOT for changes in care-seeking outcomes, visits to a provider

	Consultation Expenditures (2003 US$)	Transport Expenditures (2003 US$)	Total Expenditures (2003 US$)	Traditional Healer	Drug Seller	Qualified Private Provider	Qualified Public Provider
CI--Treated	0.806	0.143	0.981	-0.019	0.100**	-0.076**	-0.006
	(1.12)	(0.10)	(01.15)	(0.02)	(0.04)	(0.03)	(0.01)
CO--Treated	9.859***	0.218	9.875***	-0.009	0.069	-0.063	0.003
	(2.86)	(0.25)	(2.94)	(0.03)	(0.08)	(0.07)	(0.04)
CI--Treated X 2003	**-1.178**	**-0.139**	**-1.351**	**0.013**	**-0.213****	**0.029**	**0.171*****
	(1.53)	**(0.10)**	**(1.53)**	**(0.02)**	**(0.08)**	**(0.08)**	**(0.03)**
CO--Treated X 2003	**-12.712*****	**-0.224**	**-12.736*****	**0.011**	**-0.189**	**-0.101**	**0.279*****
	(2.83)	**(0.23)**	**(2.88)**	**(0.04)**	**(0.14)**	**(0.12)**	**(0.05)**
Year 2003	-2.315**	0.026	-2.344*	-0.031	0.046	-0.144	0.129***
	(1.05)	(0.08)	(01.07)	(0.03)	(0.10)	(0.09)	(0.02)
Constant	8.305***	0.437***	8.796***	0.064**	0.318***	0.549***	0.069***
	(1.04)	(0.09)	(01.07)	(0.02)	(0.05)	(0.04)	(0.02)
Observations	11,889	11,882	11,889	11,879	11,879	11,879	11,879
R-squared	0.01	0.01	0.01	0.01	0.03	0.02	0.09
Comparison mean 2003	4.93	0.40	5.34	0.03	0.41	0.41	0.16
Comparison mean 1997	7.47	0.34	7.81	0.07	0.43	0.44	0.06

Notes: IV regressions with provinceXyear effects. Standard errors corrected for clustering at the district level. * significant at 10%; ** significant at 5%; *** significant at 1%

AES for change in provider choice, expenditure savings

	Expenditure Saving (2 outcomes)	Provider Choice (4 outcomes)
Contracting In (CI)	0.072	0.322***
	(0.05)	(0.05)
Contracting Out (CO)	0.408***	0.383***
	(0.13)	(0.13)
H_0: CO=CI, p-value	0.03	0.60

Notes: Average differential increases caused by treatment in baseline comparison-group standard deviations. Provider choice codes drug seller and traditional healer visits as negative and qualified private and public provider visits as positive. Regressions include province-by-year fixed effects. Joint estimation corrected for clustering at the district level. * significant at 10%; ** significant at 5%; *** significant at 1%.

Annual per-capita health spending (2003 USD)

	Mean Public			Mean Private			Mean Total			Median Private		
	1999	2003	Chng	1997	2003	Chng	1997/9	2003	Chng	1997	2003	Chng
Comparison	1.36	2.02	0.66	33.60	20.63	-12.98	34.97	22.65	-12.32	9.89	6.04	-3.85
CI-Treated	2.04	3.62	1.58	37.49	22.93	-14.56	39.53	26.55	-12.98	9.27	5.64	-3.64
CO-Treated	3.56	5.03	1.46	92.92	17.71	-75.21	96.48	22.73	-73.75	17.62	4.36	-13.26
Not Treated	0.94	2.10	1.17	43.73	17.57	-26.15	44.66	19.68	-24.99	11.13	5.03	-6.09

Notes: Public spending from Ministry of Health administrative records. Private from household survey.

TOT for health spending per capita (2003 USD)

	Per Capita Health Spending in 2003 (2003 USD)			Change in Spending (2003 USD)		
	Total	Private	Public	Total 1997/9 -2003	Private, 97-03	Public, 99-03
CI--Treated	**1.355**	**0.248**	**1.107**	**-2.55**	**-2.980**	**0.430**
	(3.95)	**(4.23)**	**(0.95)**	**(10.77)**	**(11.62)**	**(1.15)**
CO--Treated	**-5.603**	**-9.293**	**3.690****	**-57.026****	**-59.054****	**2.028**
	(6.29)	**(6.72)**	**(1.51)**	**(17.14)**	**(18.49)**	**(1.83)**
Constant	21.751***	19.887***	1.863*	2.155	1.981	0.174
	(3.85)	(4.12)	(0.93)	(10.51)	(11.34)	(1.12)
Observations	12	12	12	12	12	12
R-squared	0.65	0.63	0.68	0.67	0.64	0.64

Notes: IV regressions with provinceXyear fixed effects. Random assignment to treatment serves as an instrument for actual treatment. * significant at 10%; ** significant at 5%; *** significant at 1%

TOT for consumer perception of quality

	Staff more honest, polite, and caring than avg.	Staff more competent than avg.	Facility/service supplied better than avg.	Cost below avg.
		A. Health Center		
CI--Treated	**-0.076**	**-0.052**	**-0.048**	**0.009**
	(0.07)	**(0.06)**	**(0.05)**	**(0.05)**
CO--Treated	**-0.199***	**-0.175****	**-0.119***	**0.037**
	(0.09)	**(0.07)**	**(0.06)**	**(0.06)**
Constant	0.828***	0.710***	0.680***	0.879***
	(0.05)	(0.05)	(0.04)	(0.05)
Observations	2526	2499	2479	2524
R-squared	0.07	0.13	0.12	0.01
Comparison Mean	0.63	0.50	0.50	0.87
		B. Outreach		
CI--Treated	**-0.081**	**-0.033**	**-0.073**	**0.009**
	(0.07)	**(0.04)**	**(0.04)**	**(0.01)**
CO--Treated	**-0.164**	**-0.08**	**-0.068**	**-0.011**
	(0.15)	**(0.08)**	**(0.06)**	**(0.02)**
Constant	0.857***	0.661***	0.673***	0.989***
	(0.06)	(0.04)	(0.03)	(0.01)
Observations	4376	4303	4173	4381
R-squared	0.12	0.16	0.2	0
Comparison Mean	0.58	0.42	0.43	0.99

Notes: IV regressions with province effects. Standard errors corrected for clustering at the district level. * significant at 10%; ** significant at 5%; *** significant at 1%

AES for consumer perception of quality

	Health Centers (4 outcomes)	Outreach (4 outcomes)
Contracting In (CI)	-0.128	-0.041
	(0.10)	(0.09)
Contracting Out (CO)	-0.249*	-0.263
	(0.14)	(0.21)
H_0: CO=CI, p-value	0.38	0.29

Notes: Joint estimation corrected for clustering at the district level.
* significant at 10%; ** significant at 5%; *** significant at 1%.

- Staff more honest, caring, polite than average
- Staff more competent than average
- Facility/service better supplied than average
- Cost below average

Conclusion

- Contracting with NGOs improved health care service delivery
- CI vs. CO
- Total health spending flat or declined
- Perceptions worse
- Channels?
- Generalizability?
  - Lancet Article