Do Supply-Side Incentives Improve the Use of Healthcare Services? New Evidence from a Field Experiment

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2020 ASSA Annual Meeting - San Diego, CA

January 2, 2020

Outline

- Motivation
- Institutional Settings
- Literature Review and Theoretical Model
- Experimental Design
- Empirical analysis
- Results
- Policy implications and Conclusions

Motivation

- Maternal mortality ratio and infant mortality rate are shockingly high in Afghanistan. ▸ Figure
  - Lower utilization of healthcare services (National Health Strategy, 2016).
  - Lower quality of delivered services and increasing out-of-pocket healthcare expenditure. ▸ Figure
- **Incentive payments** are among the top public policy instruments.
- Under what circumstance **incentive scheme** works or does not work in Afghanistan context?

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Institutional Settings

- Lower government contribution and heavily depends on international aid
- The **healthcare system** in Afghanistan:
  - The Basic Package of Health Services (BPHS) and the Essential Package of Hospital Services (EPHS)
  - BPHS and EPHS with nearly 2,300 health facilities across the country (NHS, 2016). ▸ Figure
- Service delivery through **contracted-out** and **government-regulated** mechanisms

Literature Review

- Pay-For-Performance (P4P) is defined as conditional transfer of monetary or material incentives (Eichler, 2006).
  - Basinga et al. (2011) studied the effect of P4P on the **demand for maternal and child healthcare** in Rwanda.
  - Van de Poel et al. (2016) investigated the impact of conditional incentives in Cambodia.
  - Peabody et al. (2011) investigated the effects of incentives on **quality of healthcare services**
- How the **current study** contributes to the existing literature?
- Target-income and work-leisure trade-off hypotheses

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Experimental Design

Randomization at health facility, village and household levels with baseline (2010) and endline (2012) ▸ Figure

Health facility:

- All 374 facilities in nine provinces are stratified by the facility type (DH, CHC, BHC and SC).

Village:

- 280 villages are randomly selected; 144 for comparison and 144 for treatment

Household:

- 6,848 households randomly selected, 3,421 treatment, 3, 427 comparison

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Incentive Structure

- Incentive payments 4 times a year conditional on increase in the number of pre-targeted services
- Facility reports the monthly supplied services to its provincial managing office.
- Facility data are subject to quarterly verification process by three different methods:
  1. Random interview of service users;
  2. Random visits to the facility by independent monitoring agents;
  3. Matching the facility monthly report with the registries of health information system

The incentive if received is between 11-28% of the provider's base monthly salary. ▸ Table

Empirical Analysis

Assuming perfect compliance in the experiment:

$$Y_{ijk} = \beta_0 + \beta_1 Treatment + \beta_2 \mathbf{X}_{ij} + \epsilon_{ijk}$$

Where:

- Y_{ijk} is the outcome for observation i, at household j, and village k.
- β_1 is the average causal effect of treatment on the treated.
- X_{ij} is the the vector of sociodemographic controls
- ϵ_{ijk} is the idiosyncratic error term

Relaxing the compliance assumption:

- Y_{ijk} is not independent of $Treatment$
- $Treatment$ is correlated with ϵ_{ijk}, **selection bias!**

Instrumental Variable Framework

Two-Stage Least Square (2LS) estimator- A possible **solution** to noncompliance as:

- Stage I:

$$\widehat{Treatment}_{ijk} = \gamma_0 + \gamma_1 Z + \gamma_2 X_{ij} + \tau_{ijk}$$

- Stage II:

$$Y_{ijk} = \beta_0 + \beta_1 \widehat{Treatment}_{ijk} + \beta_2 X_{ij} + \epsilon_{ijk}$$

Where:

- Z is the instrument-assigned to treatment variable. What about instrument **assumptions?**

Empirical Results

No statistical differences in most of the **observables** between treatment and comparison groups. ▸ Table

- **Maternal health outcomes:** Positive and larger incentive effects for the users of small facilities but opposite for larger facilities. ▸ Table
- **Children health outcomes:** Positive at subcenter and basic health center but negative at comprehensive health centers and district hospitals. ▸ Table
- **Patient satisfaction:** Patient satisfaction is negatively affected at smaller health facilities.

Heterogeneity and Efficiency Analysis

Heterogenous effects by **financing mechanism:**

Maternal and children health outcomes:

- **Contracted-in** facilities: No effect or negative effects on maternal and children health outcomes. ▸ Table
- **Contracted-out** facilities: Positive effects on most health outcomes of women and children. ▸ Table

Technical efficiency scores of health facilities at the baseline and endline surveys: ▸ Table

Implications and Conclusions

- The bias-corrected causal estimates show that supply-side conditional incentive is associated with an increase in the utilization of health care services
- Increased use of healthcare services is obtained at the cost of worsening patient's satisfaction with physician communication qualities.
- Supply- side incentive has positive effects on technical efficiency of small health facilities.
- In developing countries with weak institutional and organizational capacities, P4P is only effective at smaller and the contracted-out health facilities.

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Thank you!

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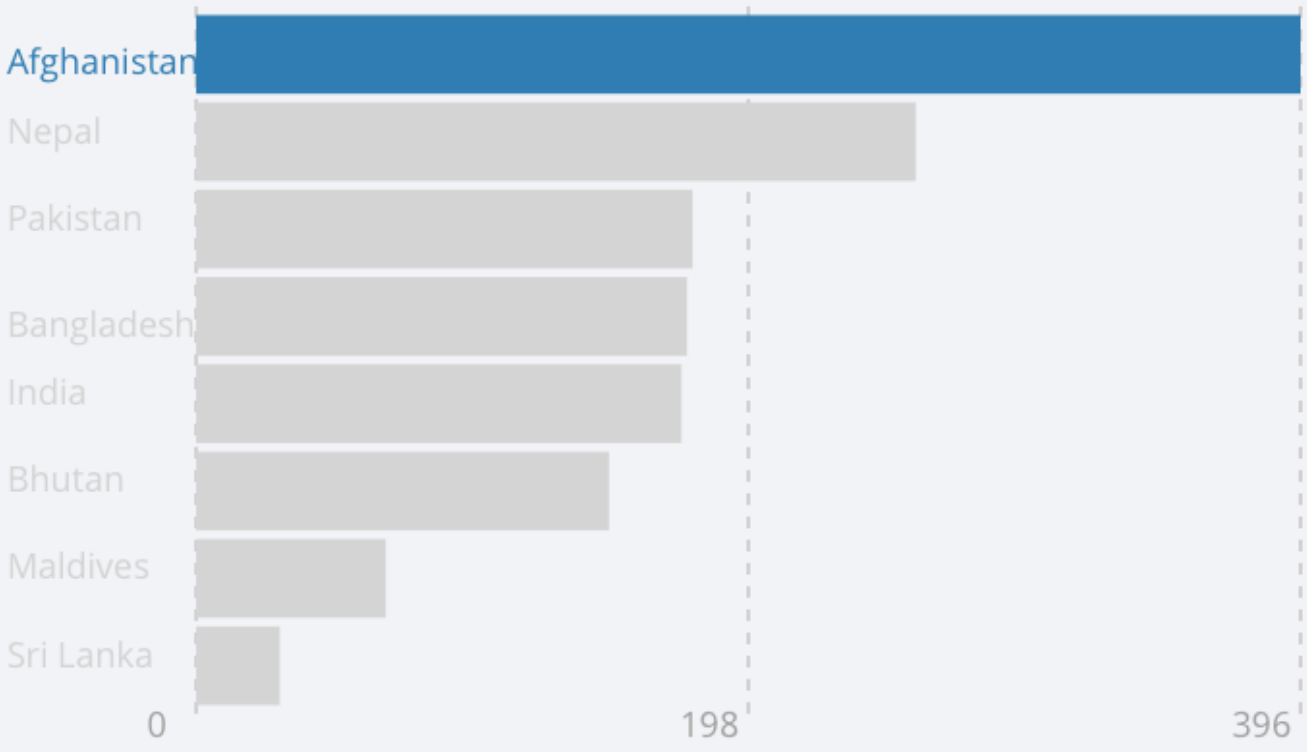
Maternal mortality ratio (modeled estimate, per 100,000 live births)



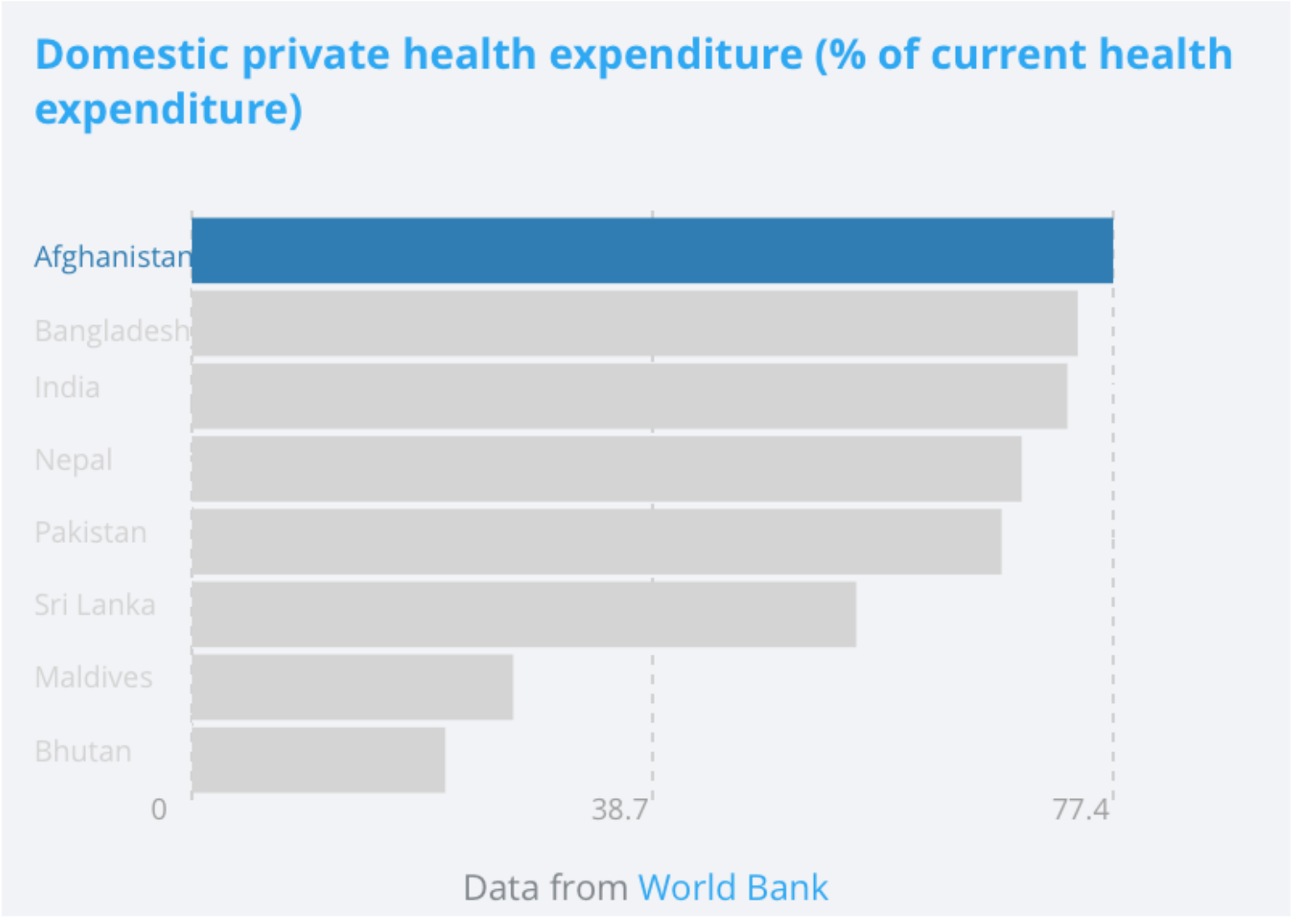
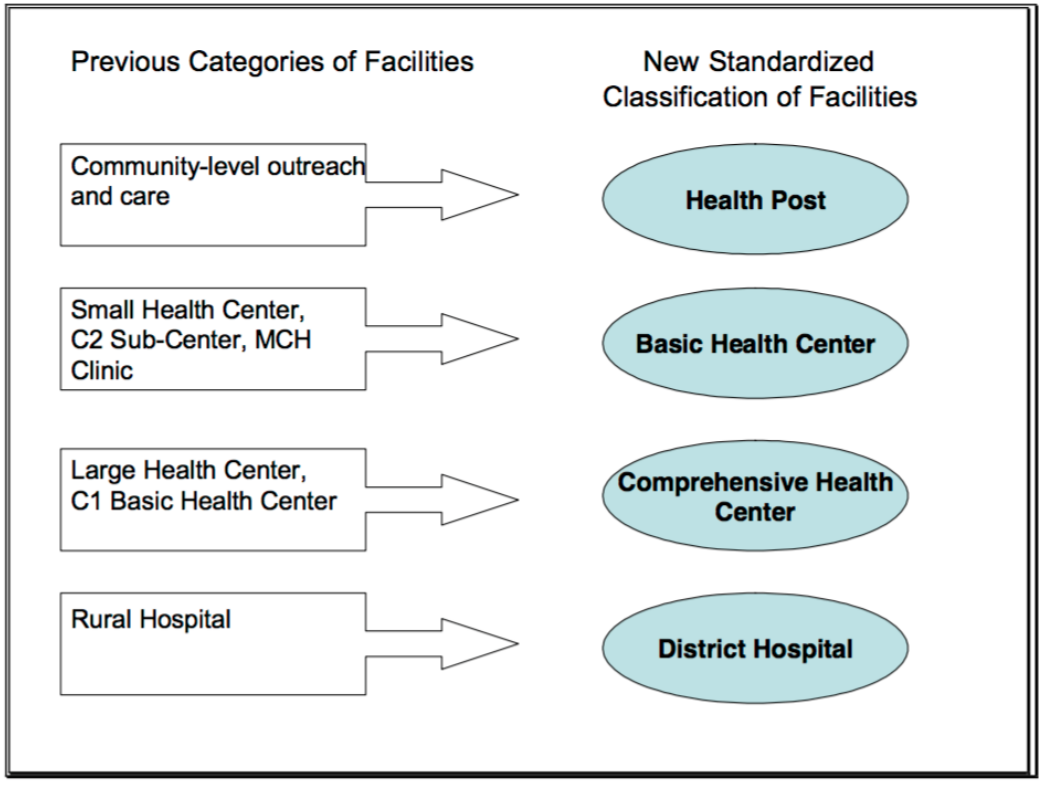

Domestic private health expenditure (% of current health expenditure)
Afghanistan
Bangladesh
India
Nepal
Pakistan
Sri Lanka
Maldives
Bhutan
0
38.7
77.4
Data from World Bank

Figure 1. Standardized system of names for health facilities



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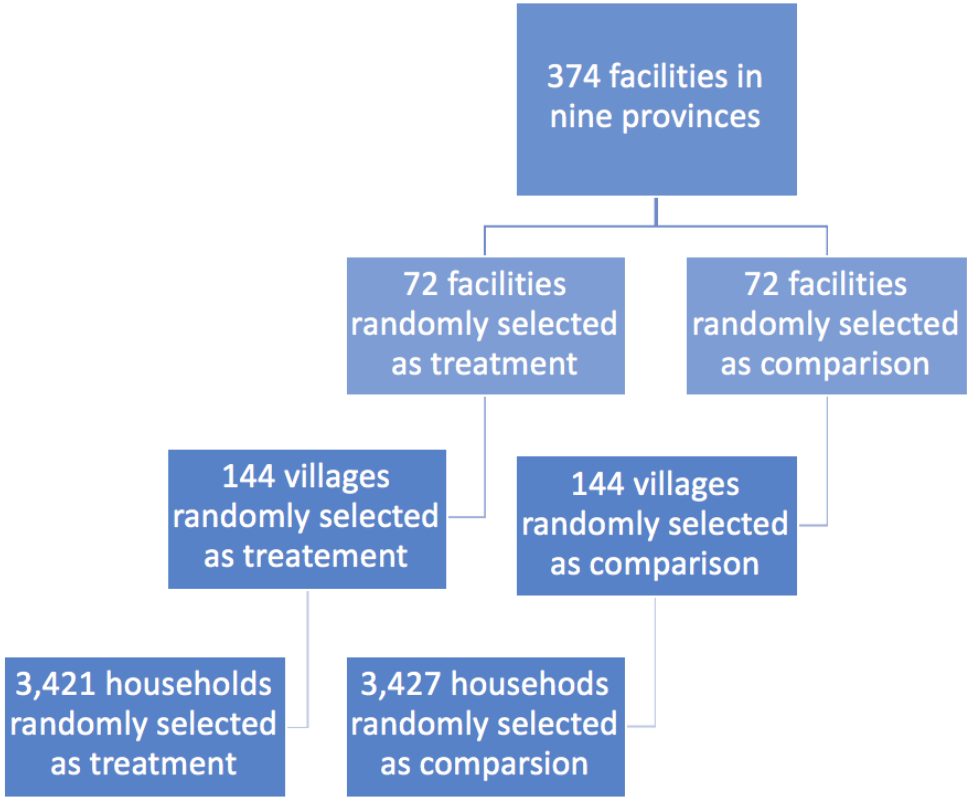

Figure 1: Schematic illustration of the randomization process

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Table 1. Performance indicators and payments

Maternal and Child Health Services	Amount paid per unit per quarter/unit cost	
	Initial rate	Revised rate
1. First antenatal care visit (ANC1)	USD 1·30	USD 2·67
2. Second antenatal care visit (ANC2)	USD 1·30	USD 2·67
3. Third antenatal care visit (ANC3)	USD 1·30	USD 2·67
4. Fourth antenatal care visit (ANC4)	USD 1·30	USD 2·67
5.Skilled birth attendance cases (SBA)	USD 10·37	USD 35·63
6. First postnatal care visit (PNC1)	USD 1·30	USD 2·67
7. Second postnatal care visit (PNC2)	USD 1·30	USD 2·67
8. Pentavalent3 vaccination	USD 3·00	USD 3·00
9. Tuberculosis (TB) case detection	USD 5·00	USD 5·00

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Table 2 Observable characteristics of Women and Infants at treatment and control groups before and after incentive program

	Before incentive			After incentive		
	Control	Treatment	Difference	Control	Treatment	Difference
	(1)	(2)	(3)	(4)	(5)	(6)
average age	32.50	32.51	0.013	31.50	31.76	0.259
			(0.23)			(0.254)
Education						
No school	3,694	3,710	16	3,781	3,717	-64
Primary	110	136	26	273	238	-35
Higher	62	85	23	78	86	-8
Pregnancy						
Yes	494	573	79	624	646	22
No	3,315	3,285	-30	3,451	3,342	-109
Not sure	41	47	6	50	44	-6
Household	9.62	10.16	0.542*	8.14	8.31	0.174
size (Mean)			(0.299)			(0.195)
Household wealth						
Poorest	648	700	52	665	637	-28
Second	788	671	-117	1,019	798	-221
Third	865	744	-121	1,025	908	-117
Fourth	785	789	4	799	826	27
Richest	779	1027	248	624	873	249

Standard errors are reported in parentheses. The sample is consisted of 8, 174 women at child-bearing age. Significance levels are indicated as ***1%, **5%, *10%.

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Table 3 Effects of incentive scheme on the use of maternal health indicators across different health facilities

	Sub Center (SC)		Basic Health Center (BHC)		Comprehensive Health Center (CHC)		District Hospitals (DH)	
Dependent Variables	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Prenatal care	1.192	2.161**	0.861	1.094***	0.914***	0.707**	-2.406	-2.702*
	(1.011)	(0.857)	(0.722)	(0.165)	(0.269)	(0.337)	(2.931)	(1.485)
Postnatal care	-6.007**	1.587**	-2.922**	1.352***	-2.024	0.709*	-4.874	-4.635**
	(2.761)	(0.636)	(1.425)	(0.125)	(2.008)	(0.346)	(4.398)	(2.069)
Skilled birth attendance	0.059*	0.091*	0.045	0.042*	-0.029	-0.061	0.085	-0.074*
	(0.032)	(0.058)	(0.031)	(0.023)	(0.048)	(0.045)	(0.081)	0.043
Birth in health facility	0.053	0.032**	0.129	0.024***	-0.052	-0.087	-0.118	-0.179**
	(0.038)	(0.016)	(0.196)	(0.036)	(0.082)	(0.230)	(0.192)	(0.082)
Contraceptive use	-0.147***	-0.107	-0.026	0.712	-0.034	-0.009	-0.198*	-0.197*
	(0.054)	(0.071)	(0.037)	(0.629)	(0.058)	(0.072)	(0.117)	(0.102)

All regressions include the following observables: Women's age an educational background, household size, wealth quantile. The dependent variables are responses to endline survey questions elicited post incentive scheme. Standard errors are reported in parentheses clustered at village level. OLS and IV stand for ordinary least square and instrumental variables models, respectively. The sample is consisted of 8, 174 women at child-bearing age.
Significance levels are indicated as ***1%, **5%, *10%.

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Table 4 Effects of incentive scheme on the use of children health indicators across different health facilities

	Sub Center (SC)		Basic Health Center (BHC)		Comprehensive Health Center (CHC)		District Hospitals (DH)	
Dependent Variables	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Visit health facility	0.111*** (0.046)	0.147** (0.052)	0.116** (0.041)	0.127*** (0.054)	-0.152*** (0.032)	-0.146*** (0.035)	-0.1633* (0.088)	-0.155* (0.091)
BCG vaccine	0.039** (0.017)	0.025 (0.019)	0.021* (0.01)	0.027 ** (0.013)	0.045** (0.019)	0.043 (0.121)	0.065 (0.049)	-0.091** (0.046)
OPV vaccine	0.119 (0.107)	0.262** (0.112)	-0.331** (0.155)	0.186*** (0.079)	-0.238 (0.213)	-0.262 (0.236)	-0.423 (0.553)	-0.283 (0.583)
Penta vaccine	0.810** (0.388)	0.179*** (0.049)	0.126** (0.054)	0.119** (0.059)	-0.288** (0.129)	-0.296** (0.145)	-0.051 (0.141)	-0.005 (0.149)
Measles vaccine	-0.027 (0.024)	-0.039 (0.027)	0.019 (0.016)	0.029* (0.018)	0.045* (0.025)	0.055** (0.028)	0.055 (0.069)	-0.111* (0.071)
Use of Vitamin A	0.047** (0.019)	0.066*** 0.022	-0.011 (0.014)	-0.002 0.016	-0.005 (0.011)	0.022 0.022	0.148** (0.061)	0.154** 0.073

All regressions include the following observables: Mother's age an educational background, household size, wealth quantile and infant's gender. The dependent variables are responses to endline survey questions elicited post incentive scheme. Standard errors are reported in parentheses clustered at village level. OLS and IV stand for ordinary least square and instrumental variables models, respectively. The sample is consisted of 7, 806 infants who are under five years old.

Significance levels are indicated as ***1%, **5%, *10%.

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Table 6 Effects of conditional incentive on maternal health outcomes by the type of financing mechanisms

	Contracted-in facility beneficiaries		Contracted-out facility beneficiaries	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Prenatal care	0.636	1.798	0.884*	0.517***
	(1.145)	(1.552)	(0.519)	(0.026)
Postnatal care	-5.799*	-1.964	2.91***	2.763**
	(3.282)	(4.403)	(0.994)	(1.182)
Skilled birth	-0.161	0.067	0.517	1.806***
attendance	(0.153)	(0.118)	(0.466)	(0.473)
Birth in health	0.120	0.139	0.129	0.760*
facility	(0.13)	(0.134)	(0.453)	(0.456)
Contraceptive use	-0.125**	-0.083	-0.060**	-0.059*
	(0.055)	(0.078)	(0.021)	(0.035)

All regressions include the following observables: Women's age and educational background, household size, wealth quantile. The dependent variables are responses to endline survey questions elicited post incentive scheme. Standard errors are reported in parentheses clustered at village level. OLS and IV stand for ordinary least square and instrumental variables models, respectively. The sample is consisted of 8, 174 women at child-bearing age. Significance levels are indicated as ***1%, **5%, *10%.

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Table 7 Effects of incentive on children health outcomes by the type of financing mechanisms

	Contracted-in facility beneficiaries		Contracted-out facility beneficiaries	
Dependent Variable	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Visit health facility	0.089*	0.102	-0.051	0.047*
	(0.052)	(0.080)	(0.056)	(0.028)
BCG vaccine	-0.014	-0.032*	0.046***	0.051***
	(0.017)	(0.011)	(0.001)	(0.010)
OPV vaccine	-0.118	-0.131	-0.084	-0.036
	(0.109)	(0.121)	(0.103)	(0.112)
Penta vaccine	0.296	0.509	0.027	0.043
	(0.383)	(0.449)	(0.108)	(0.119)
Measles vaccine	-0.025	-0.031	0.026*	0.034**
	(0.024)	(0.029)	(0.013)	(0.015)
Use of Vitamin A	0.001	0.017	0.011	0.025**
	(0.023)	(0.027)	(0.011)	(0.012)

All regressions include the following observables: Mother's age an educational background, household size, wealth quantile and infant's gender. The dependent variables are responses to endline survey questions elicited post incentive scheme. Standard errors are reported in parentheses clustered at village level. OLS and IV stand for ordinary least square and instrumental variables models, respectively. The sample is consisted of 7, 806 infants who are under five years old.
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Table 8 Effects of incentive on the technical efficiency of health facilities

Type of health facility	Baseline Survey		Difference	Endline Survey		Difference
	Comparison	Treatment		Comparison	Treatment	
Sub center (SC)	0.637	0.646	0.0091	0.653	0.709	0.056*** (0.061)
Basic Health Center (BHC)	0.814	0.824	0.011 (0.001)	0.809	0.869	0.060*** (0.143)
Comprehensive Health Center (CHC)	0.859	0.810	-0.049* (0.0017)	0.846	0.913	0.067** (0.140)
District Hospitals (DH)	0.882	0.868	0.014 (0.012)	0.991	0.991	0.008 (0.0008)

Independent group *t-test* is performed to test the mean difference of technical efficiency between treatment and comparison health facilities at baseline and endline surveys. Standard errors clustered at the village level. The distribution of test statistics is bootstrapped using wild-cluster bootstrap technique (Cameron, Gelbach, & Miller, 2008). Input-oriented technical efficiency scores are estimated using data envelopment approach (Tone, 2001).

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