

Community Participation in Decision-Making Evidence from an experiment in safe drinking water provision in Bangladesh

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Figures and Tables

Table 1: Technologies to provide arsenic-safe drinking water

Technology	Cost	Required community contribution per safe water source installed		
		1	2	3
Deep tubewell (DTW)	50,000	4,500	6,000	7,500
Shallow tubewell (STW)	20,000	3,000	3,500	4,000
Arsenic-Iron Removal Plant (AIRP)	60,000	6,000	7,500	N/A
Deep-set tubewell (DSTW)	60,000	6,000	7,500	N/A

Note: All prices in Bangladeshi Taka. 1 US\$ \approx 80BDT.

Table 2: Decision-making structures

Non-participatory	Top Down (TD)	Project staff took all project decisions, after an extended (typically 2-day) period of information gathering, using the following criteria to decide water source location: <ul style="list-style-type: none"> • public/convenient location • population density • existing safe water options
Participatory	Community Participation (CP)	The community took all project decisions using their own (unobserved) decision-making structures, following a community-wide information meeting led by project staff.
	NGO-Facilitated Community Participation (NGO)	The community took all project decisions at a community-wide meeting, following smaller information meetings for different groups. We imposed two decision-making rules. If decisions made did not satisfy these rules, project staff did not implement the decisions: <ul style="list-style-type: none"> • Attendance at the community meeting had to include: at least 10 men, of which 5 had to qualify as poor; and at least 10 women, of which 5 had to qualify as poor. • Decisions had to be unanimous.

Table 3: Treated vs Control
Baseline Randomization Checks

		Control		Treatment - Control		
		(1)	(2)	(3)	(4)	(5)
No of households in village	Mean	243	-26	-26	-22	-28
	s.e.	(21)	(27)	(29)	(27)	(35)
% of water sources arsenic contaminated	Mean	95.50	-0.37	0.52	-0.75	-0.98
	s.e.	(0.65)	(0.84)	(0.81)	(0.83)	(1.08)
Reports using arsenic safe water	Mean	0.55	-0.12***	-0.01	-0.04	-0.06
	s.e.	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
Changed source of drinking water due to arsenic in last 5 years?	Mean	0.49	-0.11***	0.00	-0.04	-0.06
	s.e.	(0.04)	(0.03)	(0.03)	(0.04)	(0.05)
Anyone in household has symptoms of arsenic poisoning?	Mean	0.0086	0.0001	-0.0008	0.0003	0.0004
	s.e.	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Total value of household assets	Mean	572053	-23836	-14356	-22706	-29684
	s.e.	(30542)	(36704)	(41382)	(36599)	(47503)
Access to electricity?	Mean	0.460	-0.065	-0.047	0.001	0.001
	s.e.	(0.03)	(0.04)	(0.05)	(0.04)	(0.06)
Household head literate	Mean	0.608	-0.006	0.007	-0.001	-0.001
	s.e.	(0.020)	(0.026)	(0.030)	(0.026)	(0.033)
Household head Muslim	Mean	0.70	0.02	0.04	0.03	0.03
	s.e.	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)
Household head farmer	Mean	0.42	0.02	0.03	0.02	0.03
	s.e.	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Number of associations in community	Mean	6.24	-0.01	-0.19	-0.21	-0.28
	s.e.	(0.14)	(0.19)	(0.22)	(0.19)	(0.25)
Number of collective actions in community	Mean	0.89	0.15***	0.05	0.06	0.08
	s.e.	(0.08)	(0.06)	(0.05)	(0.06)	(0.07)
F-statistic from Hotelling's T-squared			1.82	0.96	0.61	
Number of villages			227	198	227	227
Number of households			8891	7756	8891	8891
Includes South Matlab?		Yes	Yes	No	Yes	Yes
Treatment variable?		Implemented	Implemented	Implemented	Synthetic	Synthetic
Estimation		OLS	OLS	OLS	OLS	IV

Note: Column 1) shows the mean value in the control group. Columns 2-5) show the regression estimated difference between treatment and control villages, controlling for upazila-level stratification (an indicator for Gopalganj). Data in rows 1) and 2) comes from the Bangladesh Arsenic Mitigation Water Supply Project. All other data is from baseline household surveys. Two villages are missing all baseline data. Data is collapsed to village-level means and standard errors (in parentheses) are robust. F-statistic from Hotelling's T-squared tests equality of means between synthetic or implemented treated and control groups, and do not account for stratification by upazila which may overreject differences. Stars reflect regression-estimated significance of differences between treated and control group. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: Assignment to decision-making structure
Baseline Summary Statistics and Randomization Checks

		TD (1)	CP (2)	NGO (3)
Proportion of villages in Gopalganj	Mean s.e.	0.56 (0.08)	0.55 (0.08)	0.55 (0.08)
Proportion of villages in South Matlab	Mean s.e.	0.23 (0.06)	0.21 (0.06)	0.24 (0.07)
No of households in village	Mean s.e.	236 (32)	213 (24)	213 (33)
% of water sources arsenic contaminated	Mean s.e.	95 (1.0)	95 (0.9)	96 (0.9)
AIRPs only feasible technology	Mean s.e.	0.14 (0.05)	0.14 (0.05)	0.10 (0.05)
Reports using arsenic safe water	Mean s.e.	0.44 (0.05)	0.41 (0.05)	0.36 (0.05)
Changed source of drinking water due to arsenic in last 5 years?	Mean s.e.	0.37 (0.05)	0.35 (0.05)	0.32 (0.05)
Anyone in household has symptoms of arsenic poisoning?	Mean s.e.	0.012* (0.003)	0.009 (0.003)	0.004** (0.002)
Total value of household assets	Mean s.e.	531500 (30342)	547704 (41943)	544360 (39772)
Access to electricity?	Mean s.e.	0.42 (0.05)	0.39 (0.05)	0.37 (0.05)
Household head literate	Mean s.e.	0.62 (0.02)	0.58 (0.03)	0.60 (0.03)
Household head Muslim	Mean s.e.	0.73 (0.06)	0.70 (0.06)	0.69 (0.07)
Household head farmer	Mean s.e.	0.44 (0.02)	0.46 (0.02)	0.44 (0.03)
Number of associations in community	Mean s.e.	6.45 (0.31)	6.04 (0.19)	6.35 (0.25)
Number of collective actions in community	Mean s.e.	0.97 (0.15)	1.00 (0.16)	0.91 (0.14)
F-statistic from Hotelling's T-squared		0.55	0.29	0.64
Number of villages		43	42	42
Number of households		1703	1635	1638

Note: Table shows means of baseline variable in model villages. Data from household surveys except rows 1), 2) and 5) which come from project records and rows 3) and 4) which come from the Bangladesh Arsenic Mitigation Water Supply Project. Baseline data for one CP village is missing. Data is collapsed to village-level means and standard errors (in parentheses) are robust. Stars reflect regression-estimated significance of differences between villages treated under one model and the remaining treated villages. F-statistic from Hotelling's T-squared tests equality of means on all tests between villages treated under one model and the remaining treated villages. Pairwise Hotelling's T-squared tests yield F-statistics as follows: NGO = TD 0.75; CP = NGO 0.50; TD = CP 0.32. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Number of water sources installed

		Maximum possible no. sources		Water sources installed		Proportion installed	
		(1)	(2)	(3)	(4)	(5)	(6)
All treated	Mean	2.60	2.73	2.14	2.45	0.83	0.93
	s.e.	(0.05)	(0.04)	(0.10)	(0.08)	(0.04)	(0.03)
TD	Mean	2.58	2.75	2.00	2.36	0.77	0.88
	s.e.	(0.10)	(0.07)	(0.18)	(0.16)	(0.07)	(0.06)
CP	Mean	2.69	2.81	2.21	2.53	0.81	0.91
	s.e.	(0.07)	(0.07)	(0.17)	(0.14)	(0.06)	(0.05)
NGO	Mean	2.52	2.65	2.21	2.46	0.91	0.98
	s.e.	(0.10)	(0.08)	(0.16)	(0.13)	(0.07)	(0.06)
NGO = CP	p-value	0.173	0.134	1.000	0.718	0.288	0.437
CP = TD	p-value	0.364	0.576	0.394	0.428	0.706	0.739
TD = NGO	p-value	0.674	0.351	0.376	0.624	0.169	0.296
TD = pooled	p-value	0.820	0.790	0.322	0.467	0.311	0.417
CP = pooled	p-value	0.167	0.216	0.606	0.498	0.694	0.783
NGO = pooled	p-value	0.332	0.170	0.591	0.927	0.160	0.295
N		127	109	127	109	125	109
Sample		Treated	Tubewell	Treated	Tubewell	Treated	Tubewell

Note: P-values test i) pairwise significance of the difference between the means across models indicated, from a regression of the outcome variable on indicators for the three types of treatment (with no constant) ii) significance of the difference between means under one model and the remainder of the treated villages. Robust standard errors shown in parentheses. In two villages, no safe drinking water technology was feasible to implement.

Table 6: Estimates of average treatment effect

		OLS (1)	OLS (2)	IV (3)	OLS (4)	OLS (5)	IV (6)	OLS (7)
Panel A: Reported access to safe drinking water at follow-up								
Treated	Coeff.	0.05	0.14***	0.12***	0.04	0.15***	0.12**	-0.01
	s.e.	(0.03)	(0.03)	(0.05)	(0.04)	(0.04)	(0.05)	(0.08)
Gopalganj	Coeff.	-0.46***	-0.57***	-0.46***	-0.41***	-0.52***	-0.41***	
	s.e.	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	
Constant	Coeff.	0.76	0.82	0.73	0.77	0.82	0.72	0.20
	s.e.	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.06)
First-stage F-test				306	195			
Hausman test p-value				0.004	0.006			
	N	225	196	225	191	162	191	32
Panel B: Change in reported access to safe drinking water								
Treated	Coeff.	0.17***	0.15***	0.17***	0.18***	0.16***	0.20***	0.01
	s.e.	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)	(0.09)
Gopalganj	Coeff.	-0.02	-0.01	-0.02	0.02	0.04	0.02	
	s.e.	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	
Constant	Coeff.	0.00	-0.01	-0.01	-0.01	-0.02	-0.02	-0.04
	s.e.	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.05)
First-stage F-test				303	193			
Hausman test p-value				0.701	0.523			
	N	224	195	224	190	161	190	32
Feasible technology	All	All	All	Tubewell	Tubewell	Tubewell	AIRP	
Sample	All	No S. Matlab	All	All	No S. Matlab	All	Gopalganj	
Control villages	All	All	All	Matched	Matched	Matched	Matched	

Note: Treatment is instrumented using synthetic assignment to treatment in Matlab in columns 3) and 6). In columns 4) to 7) the control group is matched to the subset of treated villages using baseline propensity score matching. Data is collapsed to village-level means and robust standard errors are shown in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7: Comparison of access to safe drinking water by decision-making model

		Followup (1)	Change (2)	Followup (3)	Change (4)	Followup (5)	Change (6)
TD	Coefficient s.e.	0.56 (0.05)	0.12 (0.04)	0.62 (0.05)	0.14 (0.04)	0.19 (0.08)	-0.02 (0.12)
CP	Coefficient s.e.	0.55 (0.05)	0.12 (0.04)	0.59 (0.05)	0.15 (0.04)	0.28 (0.13)	-0.02 (0.16)
NGO	Coefficient s.e.	0.57 (0.05)	0.21 (0.05)	0.62 (0.05)	0.24 (0.05)	0.07 (0.03)	-0.09 (0.09)
NGO = CP		0.779	0.181	0.732	0.120	0.139	0.675
CP = TD		0.841	0.934	0.650	0.929	0.548	0.974
TD = NGO		0.932	0.151	0.908	0.108	0.218	0.637
TD = pooled		0.944	0.341	0.735	0.272	0.930	0.874
CP = pooled		0.782	0.430	0.652	0.339	0.316	0.841
NGO = pooled		0.830	0.121	0.886	0.079	0.067	0.567
N		126	125	109	108	16	16
Feasible technology		All	All	Tubewell	Tubewell	AIRP	AIRP
Control villages		All	All	Matched	Matched	Matched	Matched

Note: Measure of reported access to safe drinking water is at follow-up (columns 1, 3 and 5) or the change in reported access (columns 2, 4 and 6). Data is collapsed to village level means and robust standard errors are in parentheses. In columns 3) to 6) the control group is matched to the subset of treated villages using baseline propensity score matching. P-values test i) pairwise significance of the difference between the means across models indicated, from a regression of the outcome variable on indicators for the three types of treatment (with no constant) ii) significance of the difference between means under one model and the remainder of the treated villages.

Appendices