

Increasing Demand for Hygienic Latrines in Bangladesh



Limited access to improved sanitation facilities is a continuing challenge in the developing world. While the Millennium Development Goals have highlighted the importance of sanitation and hygiene, more than 2.5 billion people still do not have access to improved sanitation facilities.

Researchers suggest that inadequate sanitation contributes to high rates of diarrheal disease causing 20 percent of diarrheal deaths (approximately 280,000 deaths in 2012)¹. Despite the billions of dollars that governments and multi-lateral donors are spending on sanitation programming around the developing world, there is still disagreement on the fundamental reasons for high rates of inadequate sanitation. The four impediments to sanitation investment that researchers and donors commonly cite are: (i) poverty, (ii) lack of knowledge about the importance of sanitation, (iii) lack of knowledge of and access to markets where sanitation supplies can be purchased, and (iv) collective action and free riding problems associated with a product that generates health benefits which are largely external to the household that incurs the cost of installing the toilet. If poverty is the main constraint, price subsidies should increase sanitation adoption. However, some practitioners express concerns that if poverty is not the constraint then subsidies may undermine motivation in the future by creating dependency. If instead information and knowledge are the key constraints, education campaigns could be a sufficient and cost-effective solution. Collective action problems favor interventions that target groups rather than individuals, and education campaigns that emphasize collective action and require communities to make simultaneous joint commitments to invest.

Without an understanding of the key constraints that deter sanitation investments it is difficult to create a consensus on how to best improve sanitation outcomes in a cost-effective manner. Understanding why there is the low demand for san-

itation is essential to finding an effective strategy to counter open-defecation (OD). To that end, researchers from the University of Maryland and Yale University partnered with Innovations for Poverty Action (IPA), VERC and WaterAid Bangladesh to design, implement and test a range of sanitation marketing strategies in the Tanore district in rural Bangladesh. The result was a large-scale randomized controlled trial covering over 18,000 households in about 380 communities designed to understand the importance of financial and information constraints, and collective action problems, and the effectiveness of different marketing strategies that counter these problems.

PROJECT OVERVIEW

RESEARCHERS

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THEME

Sanitation

POLICY GOAL

Adoption and Use of Hygienic Latrines, Reducing Open Defecation

PARTNERS

Village Education Resource Center (VERC), Bangladesh
 WaterAid, Bangladesh

SAMPLE

18,254 households
 380 neighborhoods
 107 villages

TIMELINE

August 2011 – August 2013

DONOR SUPPORT

The Bill & Melinda Gates Foundation

Context

As of 2012, 43% of the population of Bangladesh still lacked access to improved sanitation facilities according to the WHO and UNICEF's Joint Monitoring Programmeⁱⁱ. This is despite intense focus on the part of the international community through the Millennium Development Goals and the efforts of the government of Bangladesh. Inadequate sanitation and open defecation can lead to contaminated water supplies and are important causes of diarrhea, especially in young children. Diarrheal diseases contribute to high rates of infant and child mortality and low productivity among adults.

With 70% of its population living in rural areas, the rural context is especially important for understanding sanitation in Bangladesh. The WHO reports that approximately 14.4% of rural households in Bangladesh use either hanging latrines or practice open defecationⁱⁱⁱ. Our baseline survey data show that in the Tanore district, about 31% of all households practiced open defecation^{iv}. Table 1 shows rates of latrine ownership and use and rates of open defecation in this area at baseline.

Hygienic latrines protect human health and the water supply by separating human excreta from human contact and from the drinking water supply. Some epidemiologists suggest that without a critical mass of the village population using hygienic

Table 1. Latrine Ownership and Usage Rates at Baseline

Latrine Ownership & Usage	% Households
Own any latrine	64%
Own hygienic latrine	40%
Adults use a latrine for defecation	69%
Adults open defecate or use hanging latrine	31%

Source: Baseline Survey 2011

latrines, health benefits may not become apparent. If neighbors continue to defecate in the open or use hanging latrines (latrines that empty directly into a body of water) then disease transmission will continue to occur through inter-personal contact, flies, or water contamination. These mechanisms may lead to a collective action failure, wherein households choose not to invest in latrines if they are not sure whether enough of their neighbors will also invest. Overcoming the associated free riding problem requires group-level (rather than individual-level) interventions.

Program Design

We tested the efficacy of three main interventions intended to increase hygienic latrine ownership using a randomized controlled trial (RCT). The three interventions are as follows:

- 1. Latrine Promotion Program (LPP)** – This program was designed to address any lack of knowledge on the importance of sanitation and to encourage community coordination to address collective action problems. LPP is an interactive, community based program that teaches the importance of proper sanitation, charts the status of a community's current level of sanitation, and places emphasis on the use of hygienic latrines. LPP was based on the principles of Community Led Total Sanitation (CLTS) programs¹, but modified to place more emphasis on hygienic latrines in particular, rather than simply ending open defecation.
- 2. Supply and Market Access through Latrine Supply Agents (LSA)** – This program was intended to address difficulties faced by households who are willing and financially able to purchase a latrine, but lack the technical knowledge to make an informed decision. A latrine sales agent connected to local masons who were selling latrine parts was deployed in these villages, and the LSA was trained to provide information on where to purchase latrine parts, how

to assess their quality, and how to install and maintain a latrine.

- 3. Latrine Purchase Subsidies** – This program was designed to address financial barriers to latrine purchases. Households in the bottom 75 percent of wealth distribution in their neighborhood group (measured by amount of land owned) were eligible to participate in a lottery for latrine subsidies. These households were near-landless (a straightforward indicator for poverty in rural Bangladesh) according to asset data we collected at baseline, and rates of latrine ownership and usage were much lower among these households. Lottery winners received vouchers redeemable for 75% of the price of any of three models of hygienic latrines. Households were responsible for the cost of transport and installation, so the voucher represents about a 50% discount of the cost of an installed latrine.

The percentage of lottery participants drawn as winners was varied by neighborhood into three intensity groups: Low, Medium, and High, corresponding to 25%, 50% and 75% winners. By varying the proportion of households winning vouchers, the importance of collective action problems and spillovers were examined.

SAMPLE SIZES AND PROGRAM DESIGN

Villages were randomly selected to receive the LPP only, Supply only, Subsidies (always in combination with LPP), a com-

bination of supply and subsidies, or no treatment (the control group). Villages in the subsidy group were randomly selected

1. CLTS programs inform households about the public health threats associated with open defecation and the economic productivity benefits associated with hygienic latrine investments, attempt to make the health and disease transmission risks more salient through demonstration, and encourage all members of the community to make a joint commitment to invest and become open-defecation free. CLTS has become a dominant marketing approach in the sanitation sector, and has been implemented in approximately 60 countries.

as Low, Medium or High intensity, in terms of the proportion of lottery winners among eligible households. Our analysis sample will only include those households in the bottom 75% of the wealth distribution as measured by land owned who were

deemed qualified to participate in the subsidy lotteries. Rates of latrine ownership are much lower among the bottom 75% percent of households. Table 2 shows the distribution of households across the various programs.

Table 2. Sample Sizes by Program Type

Program	# Households	% Households	# Neighborhoods	# Villages
Control	2,419	17.6%	66	22
Supply Only (No Subsidy)	1,248	9.1%	34	10
Latrine Promotion Program (LPP) Only (No Subsidy)	1,875	13.7%	49	12
LPP + Subsidy	3,965	28.9%	115	37
LPP + Subsidy + Supply	4,201	30.6%	116	26
Total	13,708	100%	380	107

Displays sample of households in the bottom 75% of the wealth distribution in their neighborhoods who were eligible for subsidies and included in the subsequent analysis. All 18,254 households were targeted with the non-subsidy interventions.

Results

Approximately 13 months after the LPP and Supply interventions began and subsidy lotteries were held, a follow-up survey was conducted among the original participants to track both latrine ownership and open defecation rates. Figure 1 shows mean access and ownership rates for hygienic latrines 13 months after the interventions began.

While mean rates of hygienic latrine ownership are higher in LPP-only and Supply-only villages than in control villages, the difference from control is not statistically significant. This suggests that lack of knowledge of the importance of sanitation or how to purchase and maintain a latrine are not the strongest factors in limiting demand for latrines in this context, and information alone is not sufficient to increase latrine adoption.

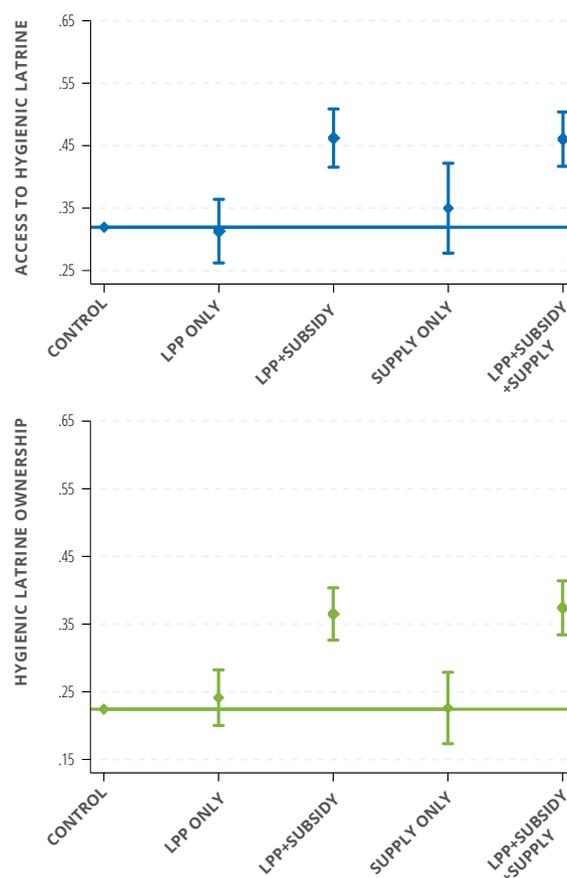
In contrast, the subsidy treatment had a large, statistically significant impact on hygienic latrine ownership. On average, eligible households in subsidy villages (averaging across households that won and lost the lottery) were 16 percentage points more likely than eligible households in control villages to own a hygienic latrine 13 months after the lottery drawings. Households in LPP+Subsidy villages were approximately 14 percentage points more likely to own a hygienic latrine than households that received only the LPP treatment.

Separating results by lottery winners and losers, subsidy winners were 22 percentage points more likely to own a hygienic latrine. Even households that lost the subsidy lottery but lived in subsidy villages were 7 percentage points more likely to own a hygienic latrine at follow-up than households in the control group. These differences are statistically significant with over 99% confidence. The significant increase in toilet investment among lottery losers (who had neighbors winning vouchers) relative to control group or LPP-only households (who faced the exact same toilet price, but did not have neighbors with vouchers) is the first indication that sanitation investment decisions are inter-linked across neighbors.

Figure 1: Hygienic Latrine Access and Ownership Rates

Effect of Demand and Supply Treatments Hygienic Latrine Ownership or Access

Estimates with 95% confidence intervals



Displays estimated share of households with access to or ownership of a hygienic latrine. Includes union fixed effects and controls for neighborhood average access/ownership rates of latrine at baseline. Standard errors are clustered at the group level.

Inter-linked decision making

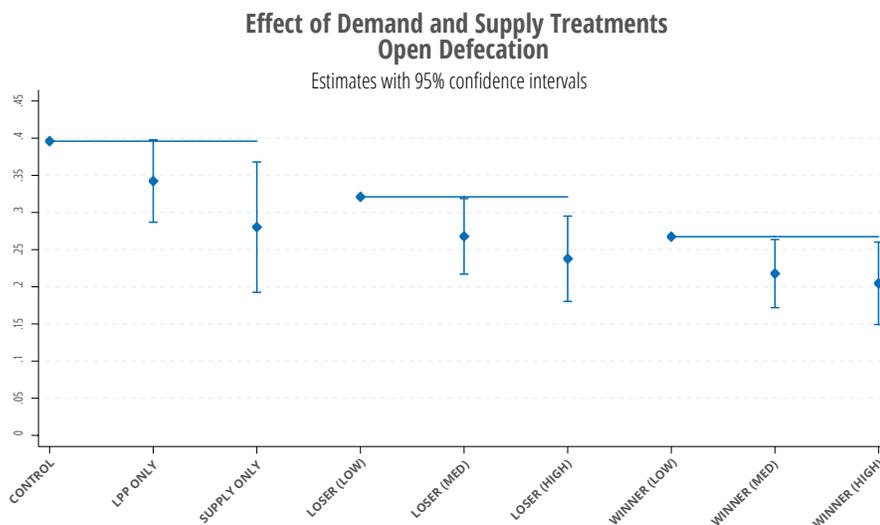
Each neighborhood with a subsidy lottery was randomly assigned to have a low (25), medium (50), or high (75) percentage of lottery participants win a latrine subsidy. We examine how this (random) variation in the proportion of community members who face a low price for a toilet affects each household's decision to invest in a hygienic latrine. Observing strong spillover effects here would suggest that others' investment decisions affect each household's own latrine purchasing decision. Figure 2 shows how the propensity of each household to either get access to, or own hygienic latrines varies with the proportion of neighbors who are receiving vouchers.

Voucher winners in the medium and high-intensity villages (with 50% or 75% of the poor, eligible community members also receiving vouchers) are approximately 7 percentage points more likely to convert their voucher into a hygienic latrine investment than voucher winners in the low-intensity villages (with 25% of the community receiving vouchers). The same trend can also be observed among voucher losers: eligible households who lost the lottery in high-intensity villages are approximately 5 percentage points more likely to own a hygienic latrine than losers in low-intensity villages. The price of toilets faced by each household is being held constant in each of these two comparisons, and the only variation is in the proportion of neighbors who got lucky with vouchers. These results show that households base their latrine purchasing decisions in part on the contemporaneous decisions of those around them, even controlling for the price they personally face for a latrine.

These treatments not only induced latrine construction, but also their use, as evidenced by the data we collected on the prevalence of open defecation across all villages:

Each household's propensity to continue practicing open defecation depends on how many of their neighbors got lucky and received toilet vouchers (and therefore became more likely to invest in latrines). The OD propensity of a household decreased from 40% in the control to 21% in the most intensive treatment.

Figure 3

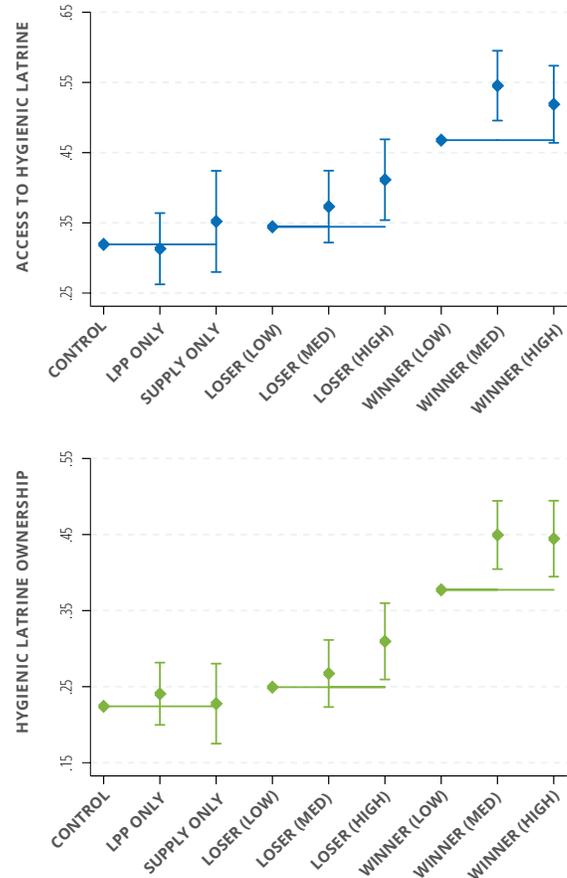


Displays estimated rates of open defecation. Includes union fixed effects and controls for cluster average OD and hanging latrine use at baseline. Standard errors are clustered at the group level.

Figure 2: Hygienic Latrine Access and Ownership Rates by Proportion of Lottery Winners

Effect of Demand and Supply Treatments on Hygienic Latrine Ownership or Access

Estimates with 95% confidence intervals



Displays estimated share of households with access to or ownership of a hygienic latrine. Includes union fixed effects and controls for neighborhood average access/ownership rates of latrine at baseline. Standard errors are clustered at the group level.

Further, we collected detailed social network data on inter-relationships between households at baseline. This allows us to directly examine the impact of an identified friend or neighbor winning the subsidy lottery on each household's propensity to invest. These results, derived using instrumental variables techniques using the lottery outcomes as instruments, show that Tanore households were more likely to own a hygienic latrine if their social connections also invested hygienic latrines as a result of receiving a subsidy through the random lottery draw (see Table 3). To measure sanitation-relevant social connections, all households were asked to list up to four other households that they interact with in each

of four social situations: parents of their children’s playmates, households they visit with frequently, community leaders who they would approach to resolve conflicts, and households they would go to for technical advice.

The effect of treating a household’s social contacts is approximately 29% as strong as treating a household itself. Imagine households A and B are connected because their children play together. Household B becomes 16 percentage points more likely to own a hygienic latrine as a result of winning the subsidy lottery, and household A becomes 4.6 (0.29 x 16) percentage points more likely to own a hygienic latrine, regardless of its own lottery outcome. Relative to the control group, this represents a 21% increased probability of owning a hygienic latrine for household A. These results are purely spillover effects, holding constant the price of latrine parts faced by each household.

All of these results provide strong evidence in favor of inter-linked decision making. The timing of the interventions, purchasing decisions and follow-up surveys suggest that households base their decisions on the contemporaneous investment decisions of their neighbors and social connections.

Discussion and Policy Implications

The small effects of the LPP Only and Supply Only treatments indicate that lack of information about the benefits of improved sanitation or lack of access to markets for toilet components are not the key deterrents to sanitation investments in this setting. The increase in ownership among voucher recipients suggests that financial constraints are an important limiting factor. The increased probability of latrine ownership among lottery subsidy losers suggests that the purchasing decisions of one’s neighbors affect one’s own purchasing decisions – even without a price incentive. Further, the pattern of increased investment rates as the proportion of voucher recipients in a neighborhood increases suggests the presence of spillover effects and inter-linked decision making.

The presence of collective action problems and interlinked decision-making has specific implications for the design of ef-

Future Research

There are several possible explanations for the observed spillover effects. It could be that households understand that the health benefits of latrines are larger when neighbors also simultaneously invest in and utilize these latrines. Alternatively, there could be social learning spillovers or demonstration effects with a new technology. If the more intensive interventions succeeded in changing social norms about open defec-

Table 3. Instrumental Variables Estimates: Effect of neighbors’ latrine ownership on a household’s probability of latrine ownership

	Any Latrine Ownership	Hygienic Latrine Ownership
<i>Latrine Ownership rate among:</i>		
Children’s Playmates	0.391** (0.128)	0.293** (0.116)
Households Interacted with Frequently	0.0850 (0.138)	0.0432 (0.138)
Conflict Resolving Households	-0.0120 (0.108)	0.0283 (0.0814)
Technical Advice Households	0.148** (0.0535)	0.170** (0.0643)
Observations	6,321	6,321
R-squared	0.088	0.118
Control Mean	0.456	0.222

** $p < .01$

fective marketing and latrine promotion strategies. Sanitation interventions will be more cost-effective if they can identify the relevant externality network, and target that group jointly rather than each household individually. Inducing households to invest in isolation will be very expensive and wasteful. If neighbors’ decisions are inter-linked, smaller subsidies targeted to multiple households in a network can generate more investment than large subsidies deployed to a few in an uncoordinated manner. Asking community members to make a joint investment commitment is a good idea, but our results suggest that this should be accompanied by subsidies targeted to the poorest members of the community. Future programs could further attempt to harness the interplay between subsidies and interlinked decision-making by combining financial incentives with a forum for community cooperation.

tion behavior, then some households may newly feel shamed about not owning a latrine. We are conducting further research to determine the precise mechanism by which these spillover effects are realized. The research team has also designed and implemented further interventions to test ways to increase community involvement.

¹ Prüss-Ustün, Annette, et al (2014). Burden of disease from inadequate water, sanitation and hygiene in low and middle income settings: a retrospective analysis of data from 145 countries. *Tropical Medicine & International Health*.

² WHO/UNICEF (2014). Progress on drinking water and sanitation: 2014 update. Geneva: World Health Organization and UNICEF.

³ WHO/UNICEF (2014). Estimates on the use of water sources and sanitation facilities: Bangladesh. Available: <http://www.wssinfo.org/>

⁴ Baseline Survey Data, 2011.