FINISH Impact Evaluation Report

A collaboration between

FINISH Evaluation Report

Undertaken by:
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Executive Summary

More than 1 billion of the world's population lack access to improved sanitation [JMP, 2012]. Many antipoverty programs have aimed to increase uptake and usage by alleviating informational constraints and fostering demand and perceived need. Other programs have (partly) relaxed resource constraint by providing subsidies and more recently there are also attempts of improving access to formal financial services for individual sanitation needs of the poor.

One of these programs is implemented by the FINISH Society. FINISH stands for Financial Inclusion Improves Sanitation and Health and the programme is a response to the preventable threats posed by poor sanitation and hygiene. It was launched in 2009 as new approach to improve the health and welfare outcomes of poor households. This approach focuses on financial tools to improve the sanitation situation in both rural and urban areas in India.

Programme partners believe in the importance of verifying and demonstrating impact of the intervention at local levels and on a sufficient scale. They therefore engaged with The Centre for Evaluation of Development Policies (EDePo) at the Institute for Fiscal Studies in London, UK and UNU/Merit in Maastricht, the Netherlands to do the same. To this end, a random a randomized control trial with three of the initial seven implementing partners was designed. The three institutions are based in three different states of India, namely Odisha in the Eastern part of the country, Tamil Nadu in the South and Madhya Pradesh in the North of the country. Implementation partners concentrated on rural areas in the former two states and urban areas in the latter.

This document is one of a series of outputs that came and will come out of this evaluation study. Previous outputs are three baseline reports (one for each evaluation study partner) as well as a summary document of these reports. Further outputs include journal articles from separate chapters of this report and studies zooming further in on some of the findings outlines in this report. This report focuses on describing the evaluation study and the general findings that came out of the evaluation study. It also describes the challenges that were faced in the process. These challenges, which were primarily triggered by the Andhra Pradesh microfinance crisis that hit India in 2010, had two vital consequences: For one, it led to significantly slower and lower achievements of the programme and second, it significantly influenced the operations of implementing partners along other dimensions, making the evaluation a secondary concern for them.

The situation of Sambhav, one of the evaluation study partners, is a case in point: Due to the slowness of activities and lending during the microfinance crisis, they were eager for any funds and support and conducted a number of sanitation activities for the government as well as

UNICEF. Unfortunately, when doing so, they did not taking into account the treatment allocation for the FINISH evaluation study. The evaluation study, and particularly the identification strategy that allowed attributing changes to the FINISH program, was hence severely affected. One of the three implementing partners (BISWA) participating in the evaluation study left the program altogether, the second (Sambhav) did not adhere to the treatment allocation, implying that we are not able to attribute any observed changes in outcomes to the FINISH intervention in that study area. The third partner (BWDC) significantly underachieved, which implied that our sample was not sufficiently large to detect small changes had they indeed been achieved.

Work with loan data from BWDC's management information system is currently ongoing to gain a deeper understanding of where and how many loans were provided, both sanitation and other loans, analysing potential crowding out. Results from this analysis will be presented in a separate document.

The structure of the data and the fact that a considerable percentage of households between the two survey rounds made the transition to become toilet owners, however, allows us to analyze determinants of toilet ownership in the two survey rounds as well as determinants of acquisition between them. We are further able to analyze potential impacts of toilet ownership on outcomes by exploring the panel structure of the data, controlling for a large set of covariates, household fixed effects and common time shocks.

Since the rationale for improving the sanitation situation is typically improved health, we look at the relationship between toilet ownership, acquisition and a number of objective and subjective health outcomes. Interestingly, while we do not observe any changes in measures such as health expenditures and diarrhea incidences as well as more objective health measures (such as stool and water samples), we see a strong correlation of toilet ownership with perceived health. This indicates that, while it is often suggested hat health considerations play only a minor role in the decision to acquire sanitation, households that own a toilet do perceive themselves and their family to be healthier than their peers that do not.

Our results provide further interesting findings along dimensions less frequently considered in sanitation studies than health outcomes. We provide novel evidence that households with toilets experience gains primarily related to their status and living conditions. We find that the reported value of their dwelling increases significantly. Almost 30 percent of the dwelling's value at the time of the follow-up survey can be attributed to the sanitation facility. In addition, households with sanitation (despite having similar incomes) also own more household and transportation assets, and have higher levels of consumption per capita. Our results further provide evidence that female labor supply was reduced both along the extensive and intensive margin for households that acquired sanitation assets.

One possible explanation that ties these findings together is that anticipated marriage and brides

moving into the house of the groom and his family, are important motivating factors for the acquisition of toilets: Around 80% of toilet owners in sample report that their status in the community increased because of the toilet they constructed and women report that sanitation played an important role in their marriage decision. Data suggests that toilets are more likely to be built in households with a male household member of marriageable age and that toilet construction is related to the household composition changing with an additional female adult member entering the household. Despite having more adult females, average working hours for females in households with toilets are reduced. Such reduction in female labour supply ties in with the idea that households with a toilet care about status given that it is common in India to perceive working to be unnecessary for women if the household can afford it. This is something currently looked at in more detail with the data.

These findings suggest that messaging around status and moving up in society might resonate well with this type of population. Our findings also suggest that campaigns such as the *no loo, no bride* campaign launched by the government of Haryana in 2005 might work particularly well in a more urban setting. A paper by Stopnitzky (2011) shows in line with this that increasing proportions of females with strong sanitation preferences drive male investment in toilets.
Overall, our findings suggest that despite being an investment of considerable size for poor households, they value the decision and perceive to have gained along a number of margins.
We conduct a number of robustness checks on our findings, which show consistency of our results. However, we raise caution that the lack of clear exogenous variation in toilet ownership makes it difficult to attribute observed impacts undoubtedly to toilet ownership.
Any of the findings we present can furthermore not be attributed to the FINISH intervention, due to the reasons discussed. However, we note that during the two data collection rounds sanitation activities under the FINISH program took place and credit was provided. Further, respondents report to have heard, or have participated, in activities closely linked to FINISH (such as film showings). Therefore, while we cannot make any clear statement about the FINISH intervention, we might expect that some of the increase in coverage would be at least partially driven by program activities.

Contents

I. Background and Methodology

FINISH – Financial Inclusion Improves Sanitation and Health - is a joint undertaking of a wide range of actors that came together to address the challenges of sanitation and health in India through the means of microfinance and micro-insurance. It started in 2009 with the **overall goal of building 1 million safe toilets (possibly sanitation systems) in India, a large part of which financed through microfinance loans**.[1]

Programme partners believe in the importance of verifying and demonstrating impact of the intervention at local levels and on a sufficient scale. They therefore engaged with The Center for Evaluation of Development Policies (EDePo) at the Institute for Fiscal Studies in London, UK and UNU/Merit in Maastricht, the Netherlands to do the same.

The aim of the Evaluation Study (ES) was to test whether working through microfinance institutions to improve the sanitation situation in rural as well as urban areas of India is an effective mean in order to: accelerate access by the poor to demand-led sanitation, resulting in health, economic, and social impact; and greater sustainability in sanitation service delivery.

To this end, a random a randomized control trial with three of the initial seven implementing partners was designed. The three institutions are based in three different states of India, namely Odisha in the Eastern part of the country, Tamil Nadu in the South and Madhya Pradesh in the North of the country. Implementation partners concentrated on rural areas in the former two states and urban areas in the latter.

This report will outline the evaluation design and its execution, challenges that were faced and their implications for the research and finally findings from the analysis of the primary data will be discussed.

A. Selection of FINISH partners for the evaluation study

In its beginning stage, and at the time the FINISH evaluation study was designed, FINISH had six implementing partners, each located in a different state of India. Figure 1 below shows the location of the six initial partners. These partners had joined the project, embracing the FINISH concept of increasing sanitation coverage by using microfinance - and at a later stage of the products also insurance products. This concept had been jointly developed by WASTE and project partners based on earlier experiences of WASTE.[2]

In June 2009, two researchers from the Center for the Evaluation of Development Policies (EDePo) at the Institute for Fiscal Studies, London, UK, visited four of these six partners, to discuss the feasibility of conducting a randomized controlled evaluation study. The pre-selection of the four institutions had been made by FINISH, taking primarily their implementation time-line and scope into account, as well as ensuring that the evaluation would cover rural as well as urban areas. The four institutions visited were[3]:

[1] This goal was reduced to building $\frac{1}{2}$ million safe toilets after the MF crisis, which will be discussion in section II.A..
[2] See the website of the FINISH Society, http://www.finishsociety.org/, for more details.
[3] Additional discussions were held with a potential FINISH partner, ESAF in Jaipur, Rajasthan.

- Gwalior, Madhya Pradesh (Sambhav)
- Rajasthan (IIRD)
- Odisha (BISWA)
- Tamil Nadu (BWDC)

The discussions held during this trip and in the weeks thereafter focused on narrowing down the evaluation design and timelines. The discussions revealed that research with IIRD was not feasible within the project's time frame and so the final evaluation was planned with three FINISH implementing partners, namely BISWA, BWDC and Sambhav.

Figure 1: FINISH project Area (as of April 2009)

B. The overarching research question

It was decided that, to the extent possible, the general evaluation design would be the same in all three evaluation areas and the overarching question this design was to answer was: **In how far this 'mainstreamed approach to improving sanitation' leads to desired health, economic, and social impact?**

Outcomes in five different categories were chosen as the main focus, namely: (i) Health, (ii) economic conditions, (iii) social conditions, (iv) behavioural change and (v) demand.

C. The evaluation design

The evaluation design opted for was a randomized controlled trial (RCT), with the community as the unit of randomization. The rationale for doing an RCT is that[4] the approach ensures that intervention and non-intervention communities (also referred to as treatment and control communities[5]) are, on average, statistically the same in terms of observable and unobservable characteristics. In other words, randomisation removes selection bias (i.e. pre-existing differences between the intervention and non-intervention communities, such as different levels of water access which might make the adoption of sanitation on one community more likely than in another). In other words, it allows one to obtain unbiased effects of the intervention on measured outcomes.

The community was chosen as the unit of randomization based on FINISH's approach of targeting a high sanitation density within a communities. Achieving their overarching aim would therefore lead to coverage of a smaller set of communities so as to not having toilets spread over a large area. This is based on the assumption that improved sanitation can only reach its full potential (particularly with respect to achieving health impacts) when open defecation is negligible or non-existent. Assume one household has a toilet but the neighbours continue to defecate in the open, drinking water of the household with a toilet might still be contaminated and so health impacts not achieved.

The choice of a geographical unit was – in Tamil Nadu and Odisha – between the village or the gram panchayat. We decided to go for the latter for two main reasons: First, it is administratively and politically much easier to manage the randomization across gram panchayats than villages. It would have been very impractical and difficult to exclude some villages in a gram panchayat whilst offering loans to other villages, most likely close-by. Second, and more importantly, the FINISH intervention in a village could have effects on villages in that same gram panchayat who do not receive the intervention (spillover effects), invalidating the comparison between treatment and controls. In Gwalior, the unit of randomization was slums in Gwalior as well as semi-urban villages, close to the city. Care was taken for slums not to be close by in order to minimize potential spillover effects.

The number of geographical units in each study site differs depending on the operation area of the institution in general as well as operation area for FINISH of the institution in particular. A power analysis was conducted for each study site to determine the number of randomization units (gram panchayats and slums/peripheral villages) needed to detect expected impacts. Details of the sample sizes (randomization units) are provided in Table 1. The targeted number of interviews within these communities was 2,000 households for all three study areas.

The planned next steps of the evaluation were then as follows:

[4] This is of course conditional on a number of conditions, which will be discussed in more detail later in this report.

[5] The terminology 'treatment' and 'control' stems from the medical literature – where the treatment group are those individuals or areas that are given a treatment (or covered under a programme) and the control group are subjects or areas that do not receive active 'treatment'.

Table 1: Study areas and sample sizes

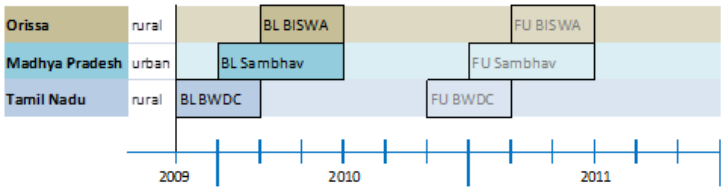
State	Implementing Partner	Unit of randomization	No of districts covered	Sample size		
				FINISH	Control	Total
Odisha	BISWA	GP	15	66	34	100
Madhya Pradesh	Sambhav	slum/village	1	29	28	57
Tamil Nadu	BWDC	GP	1	38	38	76

1. Identification of study sample (communities and respondent households).
2. Collection of baseline data in these selected communities. These first two points are discussed in the following section.
3. Randomization of communities into treatment and control areas and checking whether the randomization was successful. This point is discussed in detail in the baseline reports.
4. Implementation of the FINISH intervention in treatment areas. Problems that were encountered with this step are discussed in detail in section II.A, and the resulting challenges posed to the evaluation study are discussed in section II.B. as well as section IV.
5. Collection of follow-up data approximately one year after the baseline survey and possibly a second follow-up survey to determine longer-term impacts of the intervention.[6]
6. Analysis of the data. The outcome of this step is reported in the remainder of this document.

The baseline survey

Baseline surveys (BL) took place between November 2009 and June 2010 as indicated in Figure 2 below, also showing the initially planned dates for the follow-up survey (FU).[7]

Figure 2: Data collection timeline (as of 2009)



[6]Since only one follow-up survey was conducted we refer to this second survey interchangeably as endline and follow-up survey.

[7]Baseline surveys were managed by a locally trained and hired survey manager. Recent graduates were hired and trained to conduct the interviews. In Tamil Nadu, we collaborated with a local college.

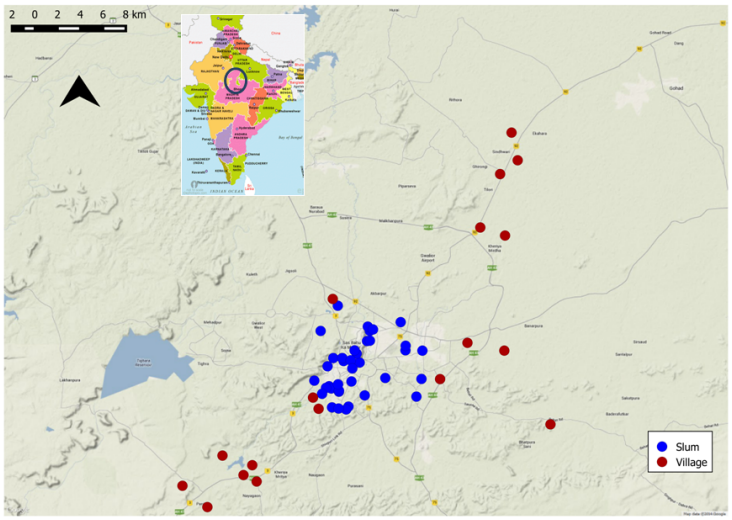
The survey instruments administered include a household questionnaire, a special section for the main woman in the household, the collection of anthropometric information on the main women as well as children in the households and, depending on the evaluation site, stool samples were taken and analysed. Finally, a questionnaire on community characteristics was administered.

For an in-depth look at the extensive baseline data collected we refer the reader to the baseline reports for the three study sites. Apart from giving a detailed picture on the study areas and the status of sanitation, the main purpose was to check the success for the randomization (check that treatment and control communities are - statistically speaking - the same along a wide range of observable characteristics. All three evaluation baseline reports give a great degree of confidence that the randomisation and sampling has been carried out appropriately and has laid down the best possible foundation for analysing the impacts of FINISH in the programme evaluation areas.

Study location

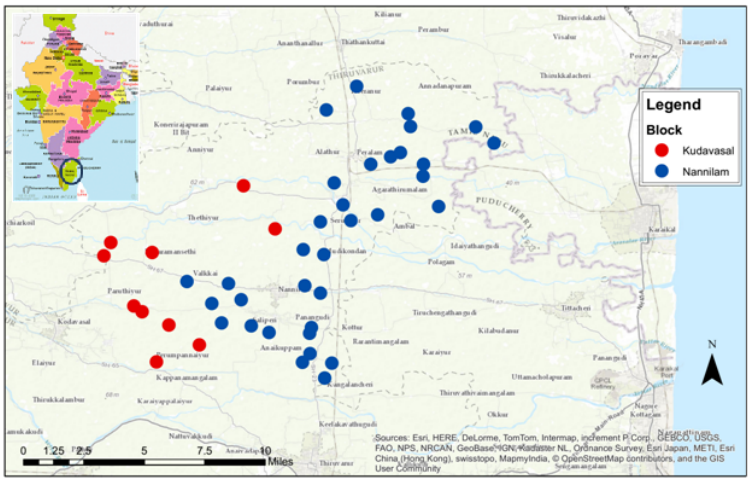
Below we show the area of the two studies. Figure 3 shows Gwalior area (blue dots indicating slums and red dots peripheral villages) and Figure 4 shows the study location in Tamil Nadu (red dots showing gram panchayats in the block of Kudavasal and blue dots gram panchayats in the block of Nannilam.[8]

Figure 3: Study site - Gwalior



[8]This figure has only 46 dots and not 76. The reason for this reduction is described in the next section.

Figure 4: Study site - Tamil Nadu

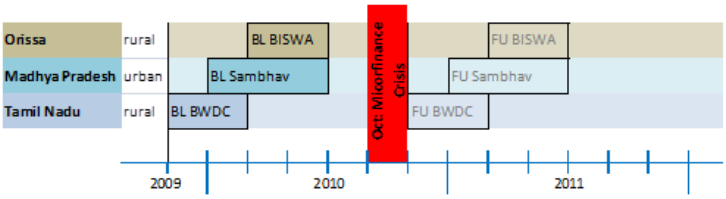


II. Post baseline survey – the two crises and their implications

A. The microfinance and the financial crisis

After the baseline survey, implementing partners started to offer sanitation loans in the selected FINISH areas. However, implementation in the initial months was expectedly slow due to monsoon and summer period. And, when the time came for lending and sanitation construction to pick up, the 2010 microfinance crisis as well as the financial crisis put a spanner in the works. The timing is visualised in Figure 5.

Figure 5: Data collection timeline and the microfinance crisis



The microfinance crisis originated in the state of Andhra Pradesh (AP), where the state government passed an ordinance in October of 2010, prohibited all MFIs within the state to carry out their operations until they registered with the government. The trigger for this ordinance was a series of suicide incidents attributed to the alleged abusive practices of MFIs. These include charging high interest rates, using coercive collection practices and lending aggressively beyond the repayment capacity of the borrowers. Stringent regulations were put in place, which - coupled with actions from local politicians – led to a dramatic fall in repayment rates (from almost 100% to below 20%).

Important for this evaluation study is the fact that this crisis had an impact not only in the state of AP but also throughout India. Many MFIs, including FINISH partners, faced issues of raising funds, expanding operations etc. – all of which for an uncertain period of time, and coinciding also with the financial crisis, which made raising of funds even more difficult. It needs to be understood that MFIs in India are not allowed to take savings from their customers, implying that the only way to get capital for lending is through borrowing themselves.

The impacts were felt by our implementing partners for a long period. As stated in the 2011-12 FINISH Annual Report: "The financial crisis coupled with the micro-finance crisis in Andhra Pradesh continues to rock the MFI sector. Commercial financing of MFIs virtually ceased from the last quarter of 2010 onwards."

No funding for the implementing partners implied no intervention. This had obvious implications for the evaluation studies, not only impacting the timeline of the second data collection round as will be elaborated on in the next section.

B. Implications for the evaluation study

The microfinance crisis and its aftermath had an impact on all our evaluation study partners with important knock-on effects on the evaluation study. We'll describe the study implications for each partner separately.

B..1 Implications for the evaluation with BISWA (rural Odisha)

Without wanting to go into much detail, the crisis revealed some practices of this implementing partner which led to them being asked to resign from the project. FINISH tried to find alternative partners to work in the study areas but, due to the size of BISWA the spread of the study areas was too wide for this to be a feasible solution. The evaluation study was therefore discontinued in Odisha. However, the interested reader is referred to the baseline report for a description of the sanitation situation in rural Odisha in 2010.

B..2 Implications for the evaluation with BWDC (rural Tamil Nadu)

Some months after lending picked up again, towards the late spring/early summer of 2012, we took stock with both BWDC and Sambhav on their activities so far and their capabilities to implement according to the assumptions that were made when designing the study. One of the key assumptions was an increase in sanitation coverage (in study areas) to 50% or above within approximately one year of intervention. Given FINISH's philosophy of aiming for 100% sanitation coverage and the fact that the program has inbuilt incentive to reach this aim, this assumption seemed at that time on the conservative side.

With BWDC, these discussions on achievements to date led to the revelation that they had initially provided loans in both treatment and control areas. This had happened under pressure to lend capital BWDC was holding in that period.[9] Given these activities (that were conducted ignoring the treatment-control allocation), the study sample was revisited.

Two points were considered: (i) identify areas in which BWDC did not expect to work anymore, and (ii) distinguish GPs in which no/some/substantial lending has taken place.

Point (i) was done since BWDC in retrospect revised their selection of communities to work in. In total 30 of the initially identified 76 gram panchayats were dropped due to administrative and operational reasons. Of the 30 GPs, which were equally distributed among treatment and control (15 gram panchayats in each group), three had received sanitation loans from BWDC. In total, 10 loans had been provided. This can be seen in Table 2 below. The data underlying this table is provided in Appendix A.

More importantly - which relates to point (ii), more sanitation loans had been disbursed once lending picked up again after the crisis, in the GPs identified as "good" areas to work in. As is shown in Table 2 (lower panel), 8 GPs (34%) of previously allocated control GPs and 12 (51%) of FINISH GPs had received at least one sanitation loan. In total, 53 sanitation loans had been provided in control areas in the period

[9] Remember that MFIs in India cannot take savings and have to therefore lend themselves to be able to distribute loans to their clients.

Table 2: Sanitation activities conducted by BWDC (as of October 2012)

		No of GPs	Provision of sanitation loans since BL				
			% of GPs received loans	No of GPs	Total no of loans	Month 1st loan	Month ln last loan
Bad	Control	15	13	2	9	Jul-11	Apr-12
	FINISH	15	7	1	1	Dec-11	Dec-11
Good	Control	23	35	8	53	Jul-11	Apr-12
	FINISH	23	52	12	35	Jul-11	Jul-12

July 2011 until April 2012 (when this was picked up and lending stopped) and 35 loans were provided in treatment areas since July 2011. Note that this implies that the first sanitation loan was disbursed about 1.5 years after the baseline survey was conducted.

At the end of October 2012, it was agreed between BWDC, FINISH, WASTE and the research team at IFS, that the study would be continued in the 46 GPs identified by BWDC and where baseline data had been collected. This was based on the understanding that some sanitation activities had already been conducted, implying that the evaluation would identify impacts over and above those achieved by these activities and loans. It was further decided to re-randomize the remaining 46 GPs into treatment and control and the importance of sticking to the new treatment allocation was discussed in details and understood by all parties.

Finally, it was also discussed that, due to the smaller sample size, the evaluation study would be more likely to detect any changes in outcomes with larger changes in the sanitation density. The initial sample was selected based on the assumption that, due to BWDC's FINISH activities, sanitation density would increase (from a base-level of on average 29%) to above 50% within one year of intervention. BWDC put forward that they would, given that they now only had to work in 23 rather than 38 GPs, be able to reach a sanitation density of 60% and above.

The time-frame envisioned for this achievement was about 1-1.5 years, so that the follow-up survey was set to take place around spring 2014.

B..3 Implications for the evaluation with Sambhav (urban Gwalior, Madhya Pradesh)

As with BWDC, we also took more detailed stock of activities with Sambhav around September/October 2012. A list of activities was provided by Sambhav indicating all areas in which sanitation awareness creation activities had taken place and if appropriate, where sanitation loans had been disbursed (see Appendix B for details of this list). The data provided by the implementing partner, showed that sanitation activities had taken place in 2 (out of 28) control communities and 29 (and with that all) treatment ones. Table 3 gives a breakdown of the loans provided.

According to this data, only in one of the two control communities did households receive sanitation loans, 5 in total. In contract, by that time (October 2012), Sambhav had disbursed sanitation loans in 13 (45%) of the treatment communities, totaling 578 loans.

Table 3: Sanitation activities conducted by Sambhav (as of October 2012)

		Provision of sanitation loans since BL		
	No of GPs	% of GPs that received loans	No of GPs	Total no of sanitation loans
Control	2	50	1	5
FINISH	29	45	13	578

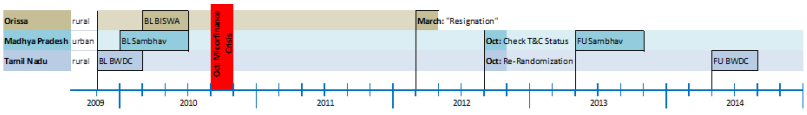
Based on this data and Sambhav's projections for work in the coming months (which included work in those communities where no sanitation loans had been provided since that time), it was decided to plan for the follow-up survey to start around February/March of 2013.

Before we go into more detail on the evaluation framework and findings, we will next provide an overview of the sanitation situation in the two study states at the time of the baseline and the followup survey, i.e. in 2009/2010 and in 2013/2014.

C. Final timeline

The final data collection timeline for the evaluation studies with BWDC in Tamil Nadu and Sambhav in Gwalior, is depicted in Figure 6. The follow-up (endline) survey with Sambhav took place March-December 2013 and the one with BWDC April-September 2014.

Figure 6: Data collection timeline (baseline and followup)



These dates and additional details of the data collection activities are provided in the study summary Figure 7.

Figure 7: Survey summary for both study areas

		BWDC			Sambhav	
State		**Tamil Nadu**			**Madhya Pradesh**	
Study area		Nannilam and Kudavasal block			Gwalior	
						
Unit of randomization		Gram panchayats			Slums and peripheral villages	
Sample size		46			56 (39 slums, 17 villages)	
Survey dates	BL	Nov 2009 – April 2010			Feb – April 2010	
	FU	April– Sept 2014			March– Dec 2013	
Survey instruments		BL		FU	BL	FU
		76GPs	46GPs			
Household (HH)		1,937	1,239	1649	1,989	2016
Main woman		1,747	1096	1325	1,967	1888
Community		168	101	112	45	56
Anthropometric	HH	1,241	724	235	1,673	724
	Indiv.	2,303	1364	514	5,429	1035
Stool test	HH	511	338	68		499
	Indiv.	911	542	68		656
Water test	HH	n.a.		330	n.a.	2015
	Source			133		65
GPs coordinates		n.a.		1649	n.a.	1803
OD areas		n.a.		n.a	n.a.	56
HH attrition		30%			8%	

Note: "HH Attrition" stands for "Household Attrition" and indicates the % of households that could not be re-interviewed.

III. The sanitation situation in the two evaluation study areas

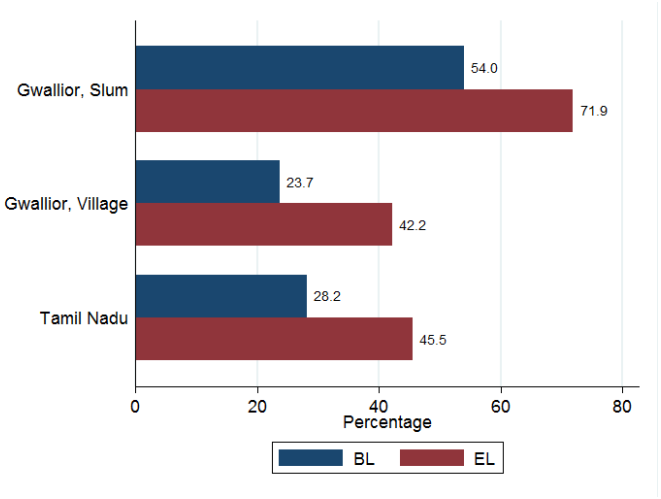
In this section we describe the sanitation situation in our study areas.

A. Toilet ownership

Figure 8 shows the percentage of households owning a toilet, as reported by the main respondent of the household survey. The blue bars are the percentages reported at the time of the baseline and the red bars those from the endline survey. The figure splits the study area into slums in Gwalior (top), peripheral villages of Gwalior (middle) and villages in rural Tamil Nadu (bottom). We will make this distinction throughout this descriptive analysis since different patterns are observed at times by study state (North versus South India) and at times by type of location (urban versus rural).

The figure shows that toilet ownership, independent of the time the information was collected, is much higher in slums. At baseline, 54% of households owned some type of toilet in slums of Gwalior, compared to 24% in peripheral villages and 28% in rural Tamil Nadu. In all three locations, the ownership percentage increased significantly between the baseline and endline survey. Sanitation coverage increased to 72% in slums of Gwalior, 42% in peripheral villages and 46% in rural TN, an average increase of 18% in our study areas.

Figure 8: Toilet ownership



We asked interviewers to observe the toilets. This was primarily done to get a second assessment of the sanitation situation as well as to validate responses given. It was not in all cases possible for interviewers to observe the toilet and this was more the case in urban Gwalior. But, when they did (in approximately 90% of cases or more), there is agreement in toilet ownership. We hardly see respondents claim to have a toilet

and interviewers disagreeing as can be seen in Table 4. This table as well as most remaining ones in this section are structured as follows: The first set of columns shows the percentages for slums of Gwalior (GW: Slum) at baseline (BL) and follow-up (FU), the second set of columns shoes the percentage for peripheral villages of Gwalior (GW: Vill) and the last set study villages in Tamil Nadu (TN). Each row presents one outcome variable of interest.

Table 4: Toilet Characteristics - ownership reporting

	GW: Slum		**GW: Vill**		**TN**	
Characteristic	BL	FU	BL	FU	BL	FU
Interviewer and Respondent agree on sanitation ownership?						
No, interviewer: YES while respondent: NO	4.14%	0.73%	3.58%	0.37%	2.99%	0.00%
No, interviewer: NO while respondent: YES	0.80%	1.02%	1.11%	0.62%	1.86%	1.03%
Yes, both say YES	45.68%	61.35%	22.13%	39.98%	26.39%	38.99%
Yes, both say NO	37.40%	24.60%	68.36%	52.97%	68.77%	50.52%
No interviewer data	11.98%	12.30%	4.82%	6.06%	0.00%	9.46%

Type of toilet

We show in Table 5 characteristics of these toilets at baseline and endline/follow-up. We see that the more urban the location of the household, the more likely it is that the toilet is inside the dwelling. At baseline, 83% of households in slums have their toilet inside the dwelling, compared to just 20% in Tamil Nadu. Interestingly, while this percentage increases to 24% in TN, it drops in Gwalior to 55-65% depending on location. This is an indication that in these (peri-)urban areas, the large percentage of households that constructed toilets, did so outside their dwelling. The structure of the toilets are primarily strong, pucca structures throughout the study areas, with most toilets being pucca in rural TN (91%).

Table 5: Toilet Characteristics - location and structure

	GW: Slum		**GW: Vill**		**TN**	
Characteristic	BL	FU	BL	FU	BL	FU
Where is the toilet?						
Inside the dwelling	82.66%	65.56%	85.11%	55.56%	19.14%	23.89%
Type of the structe around it						
Pucca (strong)		76.35%		86.19%		91.14%
Semi-Pucca		17.34%		9.61%		7.65%
Kutcha (weak)		4.82%		3.30%		0.40%
Don't know/No answer		1.49%		0.90%		0.81%

In rural villages of Tamil Nadu, households were asked at FU why they have the toilet in the chosen location (not shown in the Table). The dominant reasons stated is the fact that it was a convenient location (81%). However, avoiding foul smell was also an important motivator, mentioned by 17% of households as the primary reason for this choice of location for the toilet.

Table 6: Toilets Characteristics

	GW: Slum		GW: Vill		TN	
Characteristic	BL	FU	BL	FU	BL	FU
What type of toilet is it?						
Single pit	33.75%	6.43%	87.23%	4.50%	7.43%	
Twin pit	1.56%	5.97%	3.72%	0.60%	1.71%	
Soaking pit	2.34%	19.40%	1.60%	33.33%	0.57%	
Septic tank	4.38%	26.52%	0.00%	58.26%	88.29%	
Waste pit	0.78%	1.72%	0.00%	0.60%	0.29%	
To the fields	0.16%	0.00%	0.00%	0.00%	0.29%	
Drainage system	13.28%	14.58%	1.60%	1.50%	0.00%	
Other	32.81%	25.03%	4.79%	0.00%	0.00%	
Don't Know / No answer	10.94%	0.34%	1.06%	1.20%	1.43%	
Where does the toilet refuse go?						
Water seal	53.59%	31.00%	31.91%	27.33%	25.43%	
Pourflush	40.78%	27.78%	47.34%	34.83%	64.86%	
Simple pit	2.97%	19.52%	14.89%	36.64%	0.86%	
Other	0.94%	21.01%	0.00%	0.90%	0.00%	
Don't Know / No answer	1.72%	0.69%	5.85%	0.30%	8.86%	
Interviewer and Respondent agree on type of toilet given that they agree on having one						
Yes, they agree	74.88%	65.36%	94.97%	91.33%	93.58%	96.58%
No, they disagree	7.15%	34.52%	2.79%	8.36%	2.14%	3.11%
No Information	17.97%	0.12%	2.23%	0.31%	4.28%	0.31%

In slums of Gwalior, most households own a pour/flush toilet. This information is provided in Table 6. The refuse goes either to a pit or septic tank (40%), to an undefined space ("other", 32%) or to drainage (13%). For those where it is defined, 81% report the refuse to go to a single pit, 10% to a septic tank, 4% to a soaking pit and 3% to a double pit. These percentage change drastically between baseline and endline in Gwalior area. The largest change is in the reporting of owning a septic tank rather than a single pit. This change in reporting is particularly drastic in peripheral villages of Gwalior where at baseline, 93% of households reported to have a single pit and no one a septic tank, whereas at follow-up, 75% stated to own a septic tank. We cannot say whether this is due to actual changes in the type of toilet or (possibly

more likely) erring on the side of the respondent, interviewer or both.[10] We check whether interviewers and respondents disagree on the toilet type (presented in the lower panel of Table 6). It seems that it is easier in rural areas to determine the type (disagreement between interviewers and respondents is 3% at baseline and 8% at followup). Noteworthy is the discrepancy at follow-up in slums of Gwalior where 35% of respondents and interviewer reports do not match.

In Tamil Nadu, the dominant toilet type was a pour/flush or septic tank. 90% of respondents at baseline report to own a septic tank. The questionnaire was slightly changed at follow-up so that the break-up is not available in a comparable manner, but we can say that the percentages are relatively stable over time.

Table 7: Toilets Characteristics (BL) - pit emptying

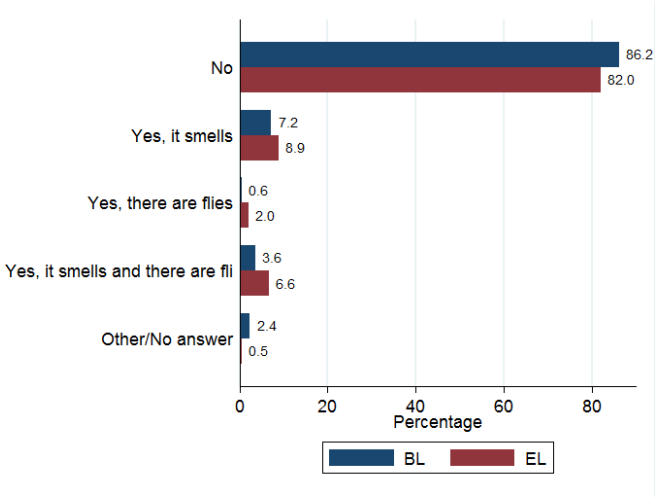
	GW: Slum	**GW: Vill**
Pit-emptying periodicity		
Once a year	9.25%	3.68%
Every 2-3 years	4.10%	2.76%
Every 4-5 years	17.21%	18.71%
Other	69.44%	74.85%
Don't know/No answer	1.99%	2.15%

We also asked households in Gwalior at the time of the follow-up survey how often they empty the pit of their toilet. Table 7 reports that for most households, the pit lasts for more than five years (category "other", around 18% empty it every 4-5 years).[11]

[10] Another possible reason is that different people trained interviewers on types of toilets. Typically, we tried to get someone from FINISH to conduct this session during the interviewer training.

[11] In TN the question is also asked but only few households reported to have experienced that their pit had filled up. Given the negligible number of responses, we do not report it here.

Figure 9: Toilet characteristics - general state



General state of the toilet

Figure 9 reports on the state the toilets were in at the times of the surveys as reported by the household respondent. Throughout the study period and location, more than 80% of respondents report not to have any hygienic problems with their toilets. This is also reflected in Table 8. Hygiene problems include smell and flies, sometimes combined. We see that at followup, a slightly larger percentage (9%) reports their toilet to smell and there to be flies (7%). This is less relevant in Tamil Nadu than in Gwalior.

Table 8: General State of the toilets

	GW: Slum		**GW: Vill**		**TN**	
Characteristic	BL	FU	BL	FU	BL	FU
Problems with the toilet hygiene						
No	83.91%	82.87%	86.17%	79.81%	90.57%	
Yes, it smells	9.69%	10.53%	8.51%	4.35%	2.00%	
Yes, there are flies	0.47%	1.85%	0.00%	2.48%	1.14%	
Yes, it smells and there are flies	3.75%	4.51%	4.79%	12.11%	2.57%	
Other/No answer	2.19%	0.23%	0.53%	1.24%	3.71%	
Who takes care of the toilets						
Everybody	22.66%	42.59%	21.81%	32.43%	46.57%	
Women	65.94%	49.14%	64.89%	58.86%	42.57%	
Helper	0.47%	1.15%	0.00%	0.90%	2.57%	
Other	8.44%	6.31%	11.70%	5.71%	4.86%	

Continued on next page

Table 8: (Continued)

	GW: Slum		GW: Vill		TN	
Characteristic	BL	FU	BL	FU	BL	FU
No answer	2.50%	0.80%	1.60%	2.10%	3.43%	
How often are the toilets cleaned						
Once or more a week	95.00%	78.53%	96.81%	69.67%	86.00%	
1 to 3 times a month	3.28%	14.58%	1.06%	21.92%	1.14%	
Less than once a month	0.31%	1.03%	0.00%	1.50%	7.14%	
Other	0.78%	4.71%	0.00%	3.60%	0.57%	
No answer	0.63%	1.15%	2.13%	3.30%	5.14%	

Notes: Data source: Baseline and endline household survey. Unit of observation: household. Note that due to changes in the endline questionnaire in TN the variables are not comparable and so we do not report information here on endline data in TN.

Table 8 also reports on the primary caregivers of the toilets. In both study locations, women are the primary caregiver (70-95%) while households in Northern India report women more often to be the exclusive caregivers (70-95%). In all study areas, toilets are typically cleaned once a week or more frequently than that.

Table 9: Construction Details

	GW: Slum		GW: Vill		TN	
Characteristic	BL	FU	BL	FU	BL	FU*
Did you construct or arrange the construction of the toilet?						
Yes, I arranged it myself	71.41%	82.43%	83.51%	78.08%	80.57%	94.09%
Yes, through Nirmal Bharat Abhiyan (TSC)	2.34%	2.64%	1.06%	11.71%	8.57%	1.34%
No, it was here when we moved	24.69%	11.37%	13.30%	4.20%	4.00%	3.09%
Other	0.31%	2.64%	0.00%	4.20%	0.29%	0.00%
Don't Know/No answer	1.25%	0.92%	2.13%	1.80%	6.57%	1.48%

*For this survey, the question was *Who constructed the toilet sub-structure?* It was a multiple response question, therefore for comparability it was recoded as follows: *already there when they moved* if it is mention as an option; *government* if government officials (MG NREGA) or NGO were mention as an option and the toilet was constructed after the HH arrived; and arranged by themselves if no government, house owner if not in the household, or NGO took part of the construction.

Toilet construction and costs

The large majority, between 70-80 percent of study households, arranged the construction of their toilet on their own, as displayed in Table **??**. For most remaining households, the toilet was in the dwelling when they

moved in. This is particularly the case in urban areas and at baseline (25%). In peripheral villages and rural areas, we also see a relatively large percentage of households that had the construction arranged through the Nirmal Bharat Abhiyan scheme at the time of the endline survey (~12%).

Figure 10 provides information on the source of capital for toilet construction. Independent of the study site, own money/savings is the predominant source of financing, with around 90% of toilets at baseline financed through this mean. This is also shown in Table 10.

Figure 10: Toilet characteristics - financing

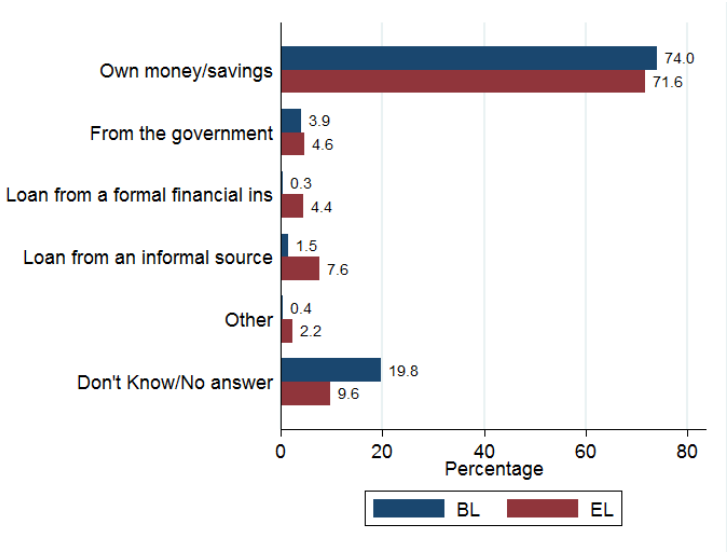


Table 10: Capital for toilet construction

	GW: Slum		GW: Vill		TN	
Characteristic	BL	FU	BL	FU	BL	FU
Where did you get the capital for construction of the toilet?						
Own money/savings	68.75%	74.17%	80.32%	75.38%	80.29%	66.85%
From the government	1.88%	3.56%	3.19%	9.61%	8.00%	3.62%
Loan from a formal financial inst	0.47%	1.26%	0.53%	0.30%	0.00%	9.80%
Loan from an informal source	2.34%	6.20%	0.00%	7.81%	0.86%	9.13%
Other	0.47%	2.53%	0.53%	1.50%	0.29%	2.15%
Don't Know/No answer	26.09%	12.28%	15.43%	5.41%	10.57%	8.46%
Where did you get the capital for construction of the toilet? (New Toilets)						
Own money/savings		73.90%		71.14%		59.20%
From the government		4.82%		14.77%		3.45%

Continued on next page

Table 10: (Continued)

	GW: Slum		GW: Vill		TN	
Characteristic	BL	FU	BL	FU	BL	FU
Loan from a formal financial inst		2.01%		0.00%		14.94%
Loan from an informal source		8.03%		8.05%		11.49%
Other		2.81%		1.34%		2.30%
Don't Know/No answer		8.43%		4.70%		8.62%

Loans from formal or informal sources are very uncommon. Interestingly, this changes between baseline and endline in Tamil Nadu, where almost 11% of households financed their toilets through loans. The lowest panel of the same table confirms that, particularly in Tamil Nadu, we see an increase in the use of loans from formal and informal sources to construct a toilet. The lower panel of the table zooms in on households that constructed a toilet between the two survey rounds. We can see that in rural Tamil Nadu, 15% of new toilets (toilets constructed between baseline and endline) were financed through formal loans and 11% through informal loans. The percentage of new toilets financed through sanitation loans in Gwalior is on the other hand negligible, particularly so in peripheral villages. We however see a large increase in the use of government subsidies: About 5% of toilets in slums and staggering 15% of toilets in peripheral villages were financed through government subsidies.

In Tamil Nadu, at the time of the endline survey, we also collect more detailed information on the costs of the toilet households own. Almost 50% of respondents were not aware of costs, or could not remember, implying that we only have responses from a sub-set of toilet owners. The reported average for the total costs of the toilet is approximately INR 21,600 (with a median figure of INR 20,000). This average estimated cost is presented in Table 11 in the row titled "Total cost, reported elsewhere". We ask households at a different point in time of the interview to give information on the break-up of toilet construction costs and get an additional average cost figure from summing these individual items. The differences in average cost (while not huge) therefore stems from this different questioning style. The largest cost item, contributing about 40% of total costs are the materials, followed by mason labour costs (~20%). Only a small percentage of households report any repair costs they incurred. Those that did had to pay on average INR 2,900, approximately 11% of the reported overall costs of the toilet construction. We note that the cost of the toilet reduces, but not majorly, when looking only at households that do have a toilet but do not have a bathroom (lower panel of Table 11). This confirms findings of other studies (see for example Coffey et al (2014), that Indian households typically strive to get a toilet of high standard, if they do decide to invest into this asset).

Table 11: Toilets construction costs - separate items

Item	Obs	Avg(INR)	% Total
All available information			
Pit digging	81	2796.9	10.5%
Materials	84	10648.8	39.8%
Transport	53	1584.0	5.9%
Mason	78	5297.4	19.8%
Other labour	57	3042.1	11.4%
Other costs	53	3371.7	12.6%
TOTAL		26740.9	100%
Reported Total Cost*	482	21557.8	
Any Repair	18	2905.6	10.9%
No bathroom owners			
Pit digging	19	2405.3	10.4%
Materials	21	9983.3	43.4%
Transport	10	1480.0	6.4%
Mason	19	4039.5	17.5%
Other labour	12	2466.7	10.7%
Other costs	14	2650.0	11.5%
TOTAL		23024.7	100%
Reported Total Cost*	92	19340.8	
Any Repair	4	2525.0	11.0%

*Three outliers were removed (100,000 Rs or above)

Table 12: Subsidized Toilet Construction Costs (TN, FU)

	Received it		Monetary Apx	
Source	Yes	Obs	Prov	Value
Monetary subsidy from				
Government	8.65%	64	90.63%	5293.1
NGO	3.78%	28	92.86%	11307.7
Other	0.41%	3	100.00%	17000.0
None	78.92%	584		
No answer	8.24%	61		
Any unpaid support for construction				
Yes, labour from within the household	2.03%	15		
Yes, labour from outside our household	0.41%	3		
Yes, materials	1.49%	11		
Yes, other	0.41%	3		
No	89.46%	662		
No answer	6.22%	46		

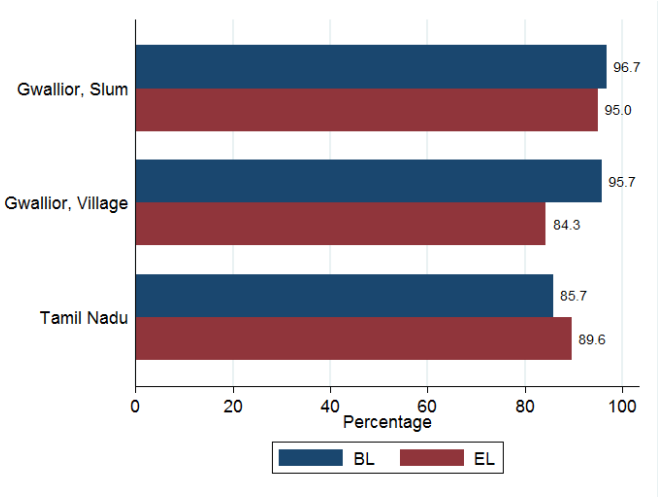
We finally collected information on subsidies received by households in rural Tamil Nadu. As reported before, the large majority has not received any form of subsidies to support their toilet construction. 64 of the study households at the time of the follow-up survey report to have received subsidies from the Government of India, with an average value of INR 5,300. Some households also received subsidy from NGO, the amount being about twice as large at INR 11,000 on average. Since neither FINISH nor BWDC is aware of any NGO providing subsidy for toilet construction in the study area, it is possible that this is in fact government subsidy, facilitated through an NGO as discussed above. These numbers are shown in Table 12. The Table also shows that it is quite uncommon for households to receive non-monetary support for the construction of their toilet. Less than 5% respond in the positive when we ask them about the same.

Usage of toilets

Having looked in detail at types of toilets owned and financing of the toilets, we now turn to their usage. We can see from Figure 11 that usage of private toilets is high among our study households – especially in Gwalior where about 96% of households report to use their toilet. This percentage is lower in TN but still the great majority with 85%. Interestingly, while the percentage remains stable over time in slums, it drops by 10% in peripheral villages. A slight increase is observed in rural Tamil Nadu.

Table 13 provides a breakdown of these usage figures. Households were asked whom in the households uses the toilet. Except for during the endline survey in Tamil Nadu, the response options were categories: All

Figure 11: Percentage of toilets in use



household members, women, girls, men, boys, grandparents/elderly. Concentrating first on slums in Gwalior, we can see that usage is very consistent across these groups. When looking at peripheral villages, we can see a tendency for women to be more likely to use the toilet than men, youngsters and elders in the household. This finding is more pronounced at the time of the endline survey. Similarly, we find women to be the main users in villages of Tamil Nadu, where 95% of households report at baseline that women use the toilet they own. This compares to 87% of men, 86% of children and 86% of elders. During the follow-up survey, we moved away from the response categories and asked about sanitation behaviour at the individual level. We aggregate this data in this table (lower panel) for comparison purpose. While less stark, we still find that women are the main users of the toilets.

We give a more detailed break-down of usage in villages in Tamil Nadu in Table 14. The first two columns, titled "Individual" aggregate the individual level information, showing us that amongst women, older women (60+) are less likely to use toilets than younger women and the same pattern is found for men. The next columns (HH:One and HH:All) give an indication of variation in toilet usage within households: "HH:One" are percentages of households where at least one member in the indicated category (such as Women 6-15) uses the toilet. The last column ("HH:All") conditions that every household member that falls into the indicated category uses the toilet. Taking the example of all men in the study households (see the row "Men" in Table 14): 87.55% of individuals in this category are reported to use their toilet at home; 92.26% of household have at least one male household member using the toilet and finally, 83.1% of households have all their men use the toilet. Note that depending on the household composition, it is possible that a lower percentage of women reports to use the toilet than we would have households with at least one woman using the toilet as can be seen in the first row called "Women". The table shows that within household toilet usage

is very consistent for household member (men and women) age 6-15 years (~91-92%) as well as members of both gender older than 60 years (~89% for women and 86% for men), Variation is introduced through household members in the age group 16-59 years, meaning that if one male in the household in that age group uses the toilet, the same does not necessarily hold for another male household member in that age group. This variation is however not very large and not statistically significantly different across different age groups. While we believe that asking about individual sanitation behaviour provides more information than lumping information in specific categories, we note that the behaviour is in most cases still not self-reported (i.e. one respondent gives information on sanitation behaviour for other household members individually).

Table 13: Toilets Usage

	GW: Slum		**GW: Vill**		**TN***	
Characteristic	BL	FU	BL	FU	BL	FU
Who uses the toilet?						
Everybody	96.72%	94.03%	95.74%	82.28%	85.71%	89.64%
Women	98.28%	97.36%	98.94%	92.79%	95.43%	91.71%
Girls	96.88%	94.60%	95.74%	85.59%	86.00%	92.26%
Men	96.72%	94.37%	95.74%	85.29%	87.14%	87.55%
Boys	96.72%	94.49%	96.28%	84.08%	86.00%	90.97%
Grandparents	96.72%	94.03%	95.74%	82.88%	86.29%	87.25%
Nobody	0.16%	0.92%	0.00%	1.80%	1.14%	3.76%
NA	0.00%	0.34%	0.00%	1.20%	2.29%	4.11%

*TN FU based on individual data rather than household data. *Girls* and *Boys* are female and male between age 6 and 12, and *Grandparents* are those aged 60 and over. For this sample, *Nobody* is the proportion of individuals living in HH for which ALL of their members report not to be using sanitation facilities of their dwelling.

Table 14: Toilet Usage Individual Level (TN, FU)

	Individual		**HH: ONE**		**HH: ALL**	
Category	Ind	%	HHs	%	HHs	%
Women	1387	91.71%	644	95.34%	644	87.89%
Women 6-15	168	92.26%	133	91.73%	133	91.73%
Women 16-25	247	95.14%	203	95.07%	203	95.07%
Women 26-35	186	93.55%	175	93.71%	175	93.14%
Women 36-59	450	95.56%	442	95.48%	442	95.48%
Women 60+	183	88.52%	179	88.83%	179	88.83%
Men	1357	87.55%	633	92.26%	633	83.10%
Men 6-15	144	90.97%	117	91.45%	117	91.45%
Men 16-25	235	91.49%	180	92.22%	180	92.22%

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Figure 12: Toilet usage 2

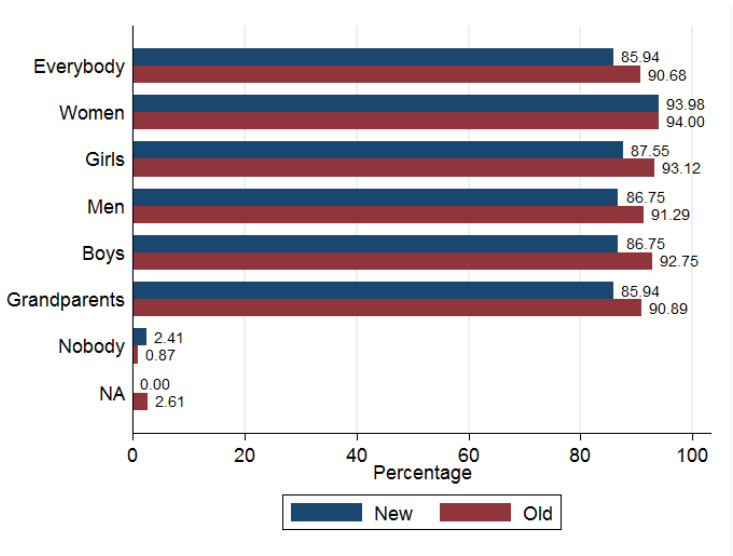


Table 14: (Continued)

	Individual		HH: ONE		HH: ALL	
Category	Ind	%	HHs	%	HHs	%
Men 26-35	220	90.91%	182	91.76%	182	91.76%
Men 36-59	399	91.23%	385	91.43%	385	91.43%
Men 60+	214	85.98%	209	85.65%	209	85.65%

ONE: at least one member. ALL: all members

We finally point to the interesting observation that the reported usage of toilets that were constructed between baseline and endline (as compared to those constructed previous to the baseline survey) is lower in all study locations. Usage across household member groups is roughly four percentage points higher in households that owned their toilets already at the time of the baseline survey. This can be seen in Figure 12.

B. Households without toilets

We focus in this section on households that do not own a toilet. Figure 13 shows the opposite to Figure 8, namely the percentage of people without a toilet in our study areas at the two different points in time when we conducted interviews. One can see the reduction in number of households openly defecating over time as well as the variation across locations, with slum areas having a lower percentage of people openly defecating.

Figure 13: Non-toilet owners

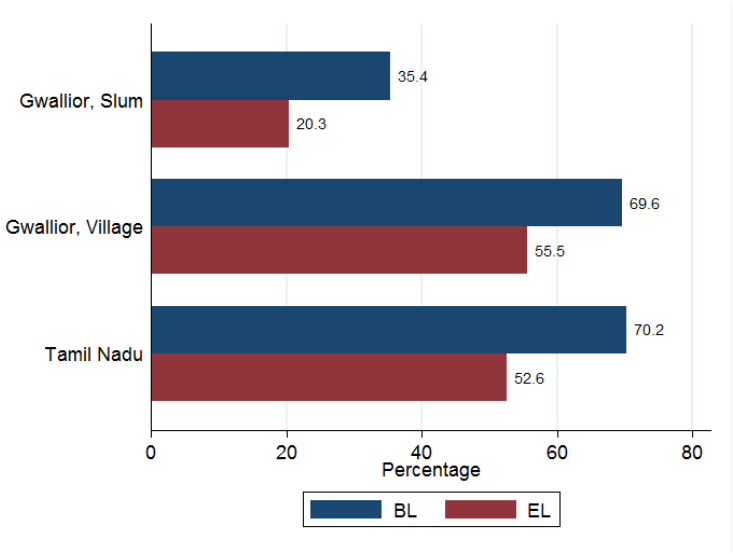


Table 15: Sanitation behaviour if there is no toilet at home

	GW: Slum		GW: Vill		TN	
Defecation place	BL	FU	BL	FU	BL	FU*
Open fields	80.29%	43.18%	96.10%	80.32%	77.42%	77.53%
Outside, near the dwelling	11.21%	24.23%	12.23%	10.63%	23.26%	19.62%
Public toilet	10.85%	11.70%	0.00%	1.13%	0.80%	0.94%
Neighbour's toilet	1.63%	4.46%	0.35%	1.81%	0.34%	1.48%
Other	0.00%	17.55%	0.00%	6.79%	0.00%	0.40%

*TN FU based on individual data, with a specific question for both items. In all the orther samples, these items are part of a multiple-response box.

Table 15 shows information on where these households go to when they need to relieve themselves. The great majority goes to open fields or other open spaces, possibly near to the house. Public toilets are very uncommon in rural areas with less than 1% of households using them. In slums of Gwalior on the other hand,

about 11% of households use public toilets. The percentage is mostly stable over time. Another interesting observation is that the use of the neighbor's toilet increases over time in all the study areas. However, even at follow-up it is not very common to do so (between 1.5-4,5%).

Open defecation

We start by discussing the sanitation behaviour of households that report to go for open defecation. The next section will concentrate on households using public toilets. Table 16 provides all the details we will discuss next. As with some other question, there is slight variation in the wording across survey rounds and locations. We for example asked at baseline at what time household members typically go for open defecation and split this up by gender at the time of the endline survey.

We can see that households going for open defecation do so primarily early in the morning, while almost half of household respondents also report to go any time they need to go. It is not obvious from the data whether their choice is due to preference or habit (i.e. members preferring to go in the morning than at night) or due to being constrained to go at other times of the day (due to for example fear of being seen). We believe however that it is rather due to preferences, which is partly based on the finding that only very few households believe that the place they go to for open defecation is unsafe. We discuss safety issues in more detail below when looking at motivations to construct a toilet.

In terms of perceptions about the OD place and problems encountered[12], a couple of interesting observations are worth pointing out:

Overall, the perception of OD areas is rather negative: Close to 80% of those open defecating perceive the place to be smelly, they report that it is uncomfortable (50-70%) and one third to one half finds it inconvenient. While percentages on positive judgments are not very high, we observe that households perception of open defecation improves over time: We find an increase of about ten percentage points in households reporting the OD place they frequent to be convenient[13], clean and healthy. This is however somewhat at odds with a small increase in households reporting that the areas are smelly.

The lowest panel of Table 16 shows additional problems encountered by households when they go for open defecation. Most households report that it is uncomfortable and inconvenient[14].

[12] Note that households can report more than one perception, which is why percentages do not add up to 100.

[13] Note that households reporting the place of defecation to be inconvenient is not a mirror of them reporting it to be convenient. This could be an indication that many households do not strongly lean towards one of the two but rather think it is neither convenient nor inconvenient.

[14] Note that the percentage of households reporting open defecation to be inconvenient is not the mirror to those reporting it as convenient. This indicates that a set of households is indifferent in terms of convenience.

Table 16: Open Defecation

Characteristic	GW: Slum		GW: Vill		TN	
	BL	FU	BL	FU	BL	FU
At what time do members of your household usually go to answer the nature's call?						
Any time they need to go	49.90%		56.13%		37.47%	
In the early morning	50.72%		51.33%		50.34%	
In the late evening	8.21%		11.37%		0.80%	
At night	5.13%		6.39%		1.72%	
During the day	0.00%		2.84%		9.77%	
At what time do FEMALE members of your household usually go to answer the nature's call?						
Any time they need to go		38.93%		44.77%		
In the early morning		67.86%		74.39%		
In the late evening		16.43%		18.71%		
At night		4.64%		2.23%		
During the day		0.36%		0.67%		
At what time do MALE members of your household usually go to answer the nature's call?						
Any time they need to go		44.29%		55.46%		
In the early morning		63.21%		67.04%		
In the late evening		10.36%		14.03%		
At night		3.21%		0.89%		
During the day		0.00%		0.22%		
Do you feel that this place is: Yes						
Convenient	3.25%	10.71%	2.11%	19.15%	12.50%	
Safe	3.25%	11.07%	2.11%	14.25%	6.73%	
Clean	3.25%	13.21%	1.05%	16.93%	6.73%	
Healthy	4.07%	10.00%	2.11%	18.04%	7.21%	
Smelly	71.54%	86.07%	77.89%	76.39%	73.56%	
In line with you religious/cultural belief	22.76%	14.29%	26.32%	17.15%	22.12%	
No answer to any of them	74.74%	0.00%	83.13%	0.00%	76.09%	
Problems encountered when defecating in the open: Yes						
It is uncomfortable*	68.64%	57.39%	71.93%	48.55%	62.83%	19.88%
It is inconvenient	33.08%	54.89%	26.61%	50.62%	2.05%	
It is not healthy	5.16%	22.31%	0.00%	26.24%	0.91%	
It takes a lot of time	5.16%	11.78%	0.55%	12.40%	0.68%	
None of the above	0.57%	6.27%	0.00%	2.48%	0.00%	
No answer to any of them	5.42%	2.92%	3.37%	2.81%	0.00%	

We also ask households how long it takes them to reach the open defecation place (shown in Table 17). In Gwalior, the baseline figure is an average walking time of 24 minutes. This reported time reduces significantly

during the endline survey to 16 minutes for females and 18 minutes for males. The time is similar in peripheral villages. Some of the difference will surely be down to measurement error. However, the decrease might at the same time link to the increase in the perception of convenience reported above.

OD areas in villages in Tamil Nadu seem to be closer with an average reported walking time of ten minutes.

Table 17: Open Defecation - time to walk

	GW: Slum		GW: Vill		TN	
Characteristic	BL	FU	BL	FU	BL	FU
Walking time to OD-areas (time in minutes)						
Total	*24.37*		*20.23*		*10.85*	
Females		*15.99*		*16.58*		
Males		*17.66*		*17.61*		

During the endline survey in Gwalior, we had an interviewer map the open defecation areas. Figure 14 gives an example of open defecation areas and households location towards those. Having GPS coordinates on the OD areas as well as the households, we can calculate air-line distances between households and the OD areas. These are presented in Table 18, separately for households that own a toilet, households that go for open defecation, and households that use public toilets. We can see that in slums, households using the public toilet live furthest away from open defecation areas (on average 137m), households with a toilet live on average 110m from the closest OD area and those households that actually go for open defecation live closest with on average 43 air-line meters to cover.

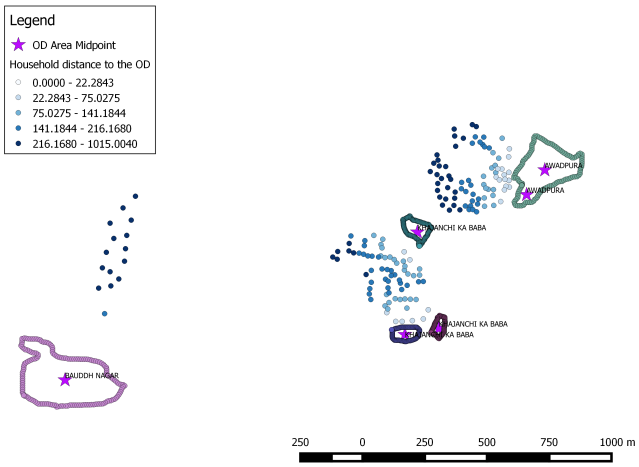
Table 18: Distance to OD Areas and Water Sources

	GW: Slum			GW: Vill		
Characteristic	Toi	OD	Pub	Toi	OD	Pub
Distance to the border of the closest OD area (meters)						
Average	*109.18*	*43.27*	*137.45*	*191.62*	*351.55*	*147.30*
Minimum	*0.00*	*0.79*	*0.00*	*0.00*	*1.27*	*0.00*
Maximum	*679.96*	*278.37*	*582.87*	*1015.00*	*933.84*	*1000.92*

Organized according to place of defecation if not toilet owners. **Toi:** toilet owners; **OD:** open defecation; **Pub:** public defecations

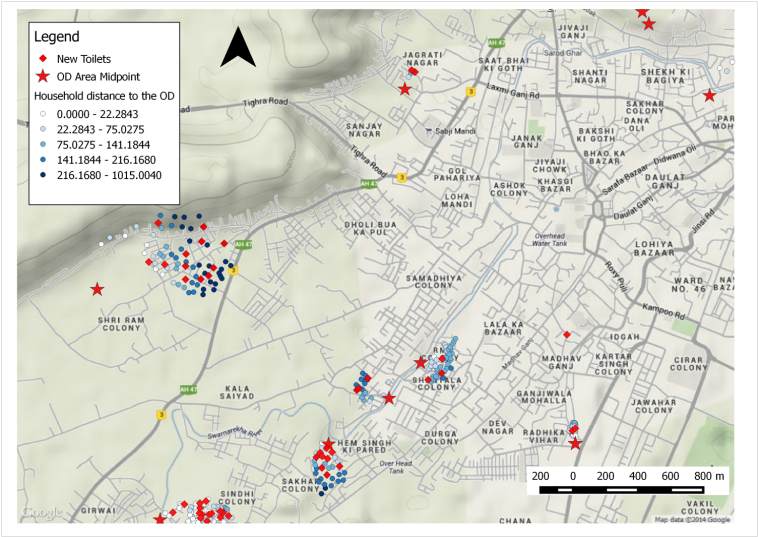
Interestingly, the picture looks slightly different for households in peripheral villages. Here, households that go for open defecation live furthest away from OD area. They have to cover on average 350m, compared to 190m for households that own a toilet and 147m for households that use a public toilet.Overlapping this

Figure 14: Non-toilet owners - distance to OD areas



information with maps - as done in Figure 15 - it can be seen that the OD areas (marked with a star) are typically either outside residential areas or along rivers.

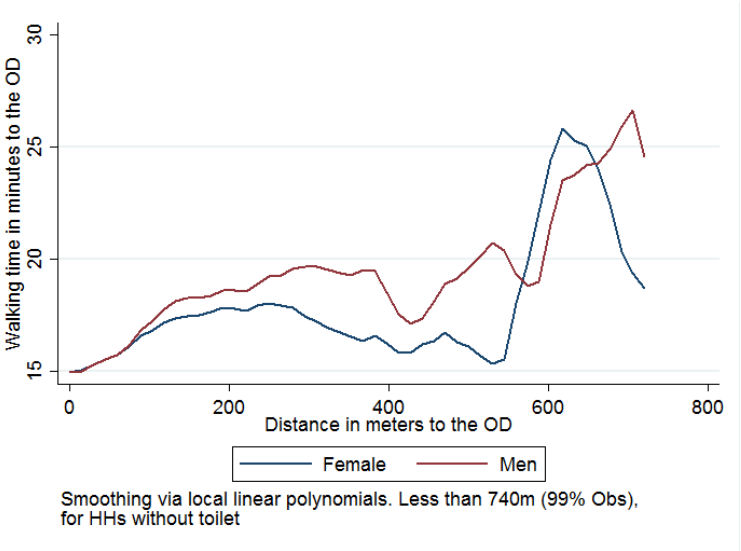
Figure 15: Non-toilet owners - OD areas



We can use this information to validate the walking time reported in minutes. Figure 16 plots the distance measured through GPS against the minutes reported by households that go for open defecation (separately for

women and men). It can be seen that, while not perfectly, the reported minutes increase with the measured distance. This check it just rough since it does not take real distance (just flying distance) into account, but the graphs gives confidence in the reported data.

Figure 16: Walking time versus distance for households frequenting OD areas



Public toilets

We now turn to discuss information provided by households that use public toilets. Table 19 provides information on public toilets. We focus on slums of Gwalior, given the negligible percentage of households using these facilities in rural areas and peripheral villages.

Table 19: Public Toilets

	GW: Slum	
Characteristic	BL	FU
At what time do members of your household usually go to answer the nature's call?		
Any time they need to go	71.01%	
In the early morning	49.28%	
In the late evening	11.59%	
At night	2.90%	
During the day	2.90%	
At what time do FEMALE members of your household usually go to answer the nature's call?		
Any time they need to go		59.02%
In the early morning		50.82%
In the late evening		4.92%
At night		3.28%
During the day		0.00%
At what time do MALE members of your household usually go to answer the nature's call?		
Any time they need to go		55.74%
In the early morning		49.18%
In the late evening		6.56%
At night		3.28%
During the day		0.00%
Do you feel that his place is: Yes		
Convenient	26.56%	50.00%
Safe	25.00%	60.00%
Clean	9.38%	41.67%
Healthy	14.06%	40.00%
Smelly	75.00%	56.67%
In line with you religious/cultural belief	17.19%	35.00%
No answer to any of them	7.25%	1.64%

As with visiting of open defecation areas, there also does not seem to be much restriction in terms of the time the public toilets are used. At baseline, we ask for all household members in general, and learn that

51% of households report to use the public toilets in the early morning, and around 53% go any time they need to go. During the endline survey, we ask separately for male and female household members. Early in the morning is again the most common time to go (58% for males and 62% for females), followed by any time necessary (49% for males and 44% for females).

We ask households that use public facilities whether they feel safe doing so. Only a quarter of those households frequenting public toilets at the time of the baseline survey believe that they are safe. This percentage increases dramatically to 60% at the time of the endline survey. In terms of their hygiene status, 75% of users characterize the place as smelly at baseline. There seems to be an improvement over time, with only 57% stating that the public toilets are smelly at the time of the endline survey. In line with this observation, a larger percentage of households also report the public toilets to be clean and healthy (both around 40% at endline compared to 10-14% at baseline). We recall that, despite these improvements, we do no see more households using public toilets over time. It is further worth noting that overall, public toilets (except for the smelliness) are rated much more positively by households using them than open defecation places are rated by their users (see Table 16 for a comparison).

Table 20: Public Toilets - costs and user numbers

	GW: Slum	
Characteristic	BL	FU
Do you have to pay for using the public facility?		
No	30.43%	78.69%
Yes	21.74%	19.67%
Average per month (Rs)	*38.00*	.
No answer	47.83%	1.64%
How many families use this facility?		
One	0.00%	3.28%
Two or more	65.22%	91.80%
How many	*45.91*	*34.46*
No answer	34.78%	4.92%

Both at baseline and endline, about 20% of households using public toilets report that they have to pay to do so. This is displayed in Table 20. At the time of the baseline survey, the cost amounted to about Rs 38 per month (we do not have this information at endline). The number of families using the toilets are estimated to be around 45 at baseline and 34 at endline per facility.

We also asked users of public toilets how long it takes them to walk to the facility they use (shown in Table 21. As before, the reported time cuts almost in half between the baseline and endline survey from 18 minutes to 8-9 minutes. No significant difference between male and female household members is observed,

which is in line with most public toilets offering facilities for both genders.

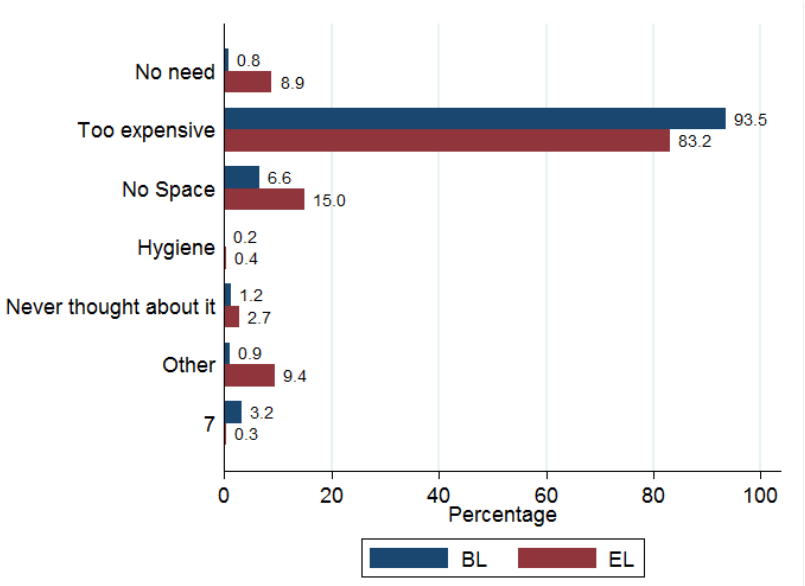
Table 21: Public Toilets - walking time

	GW: Slum		GW: Vill		TN	
Characteristic	BL	FU	BL	FU	BL	FU
Walking time to public-sanitation (time in minutes)						
Total	*18.29*				*19.73*	
Females		*8.47*		*9.50*		
Males		*8.45*		*9.00*		

Reasons for not having a toilet and future plans

We asked households the main reasons why they do not have their own toilets. As can be seen in Figure 17 and Table 22, the cost of a toilet is the main deterrent. Independent of the study location, households state that toilets are "too expensive". We see a slight reduction over time from 93% to 83%. The largest drop is observed in Tamil Nadu, where at baseline 95% report that toilets are too expensive, compared to 80% at endline.

Figure 17: Non-toilet owners - reason for not having a toilet



Limited space is the second most often reason stated for not having a toilet. Not surprisingly, the

percentage is highest in slums, where 9% at baseline and 20% at endline report this as an important constraint.

Table 22: Reasons for not having a toilet

	GW: Slum		GW: Vill		TN	
Characteristic	BL	FU	BL	FU	BL	FU
Why don't you have your own toilet?						
No need	0.35%	2.51%	0.69%	2.93%	1.13%	14.43%
Too expensive	92.11%	85.79%	92.25%	87.81%	95.14%	79.82%
No Space	8.60%	20.06%	6.02%	11.06%	5.66%	14.99%
Toilet should not be close to house	0.00%	0.28%	0.34%	0.45%	0.34%	0.34%
Never thought about it	0.53%	1.11%	1.20%	1.13%	1.58%	4.17%
Other	1.75%	10.03%	0.86%	10.61%	0.45%	8.46%

We analyse whether these reasons for not having a toilet vary with characteristics of the households. We report here only the variation in responses by the income quintile of the household. Table 23 shows that there is very little variation in stated reasons for not having a toilet across quintiles. Richer households are as likely to report that toilets are too expensive as poorer households do. We found similar results when looking for example at the type of dwelling the household lives in.

Table 23: Motivations for No Sanitation Investment and Income

Characteristic	Q1	Q2	Q3	Q4
	BL: Base line			
No need	1.18%	0.84%	0.20%	0.85%
Too expensive	93.57%	94.26%	93.28%	92.35%
No Space	7.78%	6.93%	4.07%	7.08%
Toilet should not be close to house	0.17%	0.17%	0.20%	0.57%
Never thought about it	0.85%	0.51%	1.43%	2.55%
Other	1.18%	0.34%	0.81%	1.70%
	EL: Endline			
No need	7.58%	5.74%	5.92%	4.76%
Too expensive	86.36%	87.73%	85.71%	75.24%
No Space	18.69%	12.79%	16.38%	11.90%
Toilet should not be close to house	0.25%	0.26%	1.05%	0.00%
Never thought about it	2.02%	1.83%	1.74%	1.90%
Other	8.08%	8.62%	6.27%	19.05%

When asked whether households would prefer to have their own toilet, the overwhelming majority of surveyed households responds in the positive (shown in Table 24). Only a negligible percentage (less than 3% in both study locations and at both study times) say either no or are not sure about it. The only exception is rural Tamil Nadu, where almost 5% of households are not keen to have their own toilet. At the time of the follow-up survey we ask more details on whether households would be willing to take a loan for a toilet and find that, especially in Gwalior, there is a high willingness: 74% of households without a toilet in slums and 78% in peripheral villages would resolve to taking a loan.

Table 24: Sanitation plans and knowledge

	GW: Slum		**GW: Vill**		**TN**	
Characteristic	BL	FU	BL	FU	BL	FU
Would you prefer to have your own toilet?						
Yes	97.73%	97.77%	97.08%	98.65%	93.36%	
No	0.17%	0.84%	0.00%	1.13%	4.72%	
Don't know/Not answer	2.10%	1.39%	2.92%	0.23%	1.91%	
Would you be willing to take a loan for a toilet? (given preference for toilet and not enough own funds)						
Yes		74.37%		77.88%		57.75%
No		23.68%		20.54%		38.88%
Don't know		1.11%		1.58%		1.12%
No answer		0.84%		0.00%		2.25%

Households in Tamil Nadu were probed on their intentions a bit further. Table 25 shows that of those households without a toilet, 52In terms of financing this planned toilet, 4% state that they can finance the toilet completely from their current amount of savings, 19% say they would be able to save enough. The remaining 75% of households would not be able to cover the cost of construction from their own funds.

Table 25: Sanitation plans (TN)

	TN
Characteristic	FU
Are you planning to construct a toilet?	
No	51.91%
Yes, we have already taken some steps	10.67%
Yes, but we have not yet taken any step	36.97%
No answer	0.45%
What type of toilet do you plan to construct?	

Continued on next page

Table 25: (Continued)

Characteristic	TN FU
Flush/pour flush to - septic tank	69.72%
Flush/pour flush to - pit latrine	14.79%
Ventilated improved pit latrine	0.94%
Pit latrine with slab	4.46%
Composting toilet	8.45%
Urine diversion dehydration toilet	0.23%
I don't know	1.41%
Enough savings/ability to save for toilet construction?	
No	75.06%
Yes, we have enough savings	4.16%
Yes, we would be able to save enough	19.33%
Don't know/No answer	1.46%

To close this section, we then asked households in rural Tamil Nadu whether they would be able to access different sources of funding for the construction of a toilet: Loans from a formal source, informal source, subsidy, or transfers from family/friends. The latter source, transfer from family/friends seems the least feasible option: 60% of households are certain that they would not be able to get funds for a toilet from this source, 7% are not sure. The most secured option seems to be loans from a formal provider: 36% of households are sure they could receive funding for a toilet from this source, this is followed by subsidies, where 30% of households believe that they can access this funding source for sure. This is shown in Table 26.

Table 26: Potential Sources of Funding (TN, FU)

Would you be able to get money from any of the following sources if you planned to construct a toilet? Source	Surely	Maybe	Don't know	No	NA
Loan from formal source	35.84%	16.74%	6.07%	38.20%	3.15%
Loan from informal source	18.31%	24.83%	4.72%	49.21%	2.92%
Subsidy	29.78%	22.81%	10.00%	34.27%	3.15%
Transfers from friends and family	12.92%	17.42%	6.63%	59.55%	3.48%

C. Hygiene

We also asked households a set of of questions on their hygiene habits. There is not very much variation between those that use a toilet and those that do not so that we show a pooled table for the whole sample (see Table 27).

Table 27: Sanitation and Hygiene

	GW: Slum		GW: Vill		TN*	
Characteristic	BL	FU	BL	FU	BL	FU
Do HH members wear footwear when they go to toilet?						
Yes, always	85.40%	87.87%	90.48%	93.45%	65.38%	76.75%
Sometimes	0.73%	0.87%	1.36%	1.85%	12.11%	6.54%
No, never	0.00%	0.07%	0.12%	0.00%	3.39%	9.90%
Don't know/Not answer	13.87%	11.18%	8.03%	4.70%	19.13%	6.81%
How do HH members usually clean themselves after toilet?						
Wash with water	85.04%	88.60%	90.98%	95.55%	80.55%	
Clean with soil	0.07%	0.22%	0.12%	0.00%	0.16%	
Wash with water and soil	0.07%	0.00%	0.00%	0.00%	0.00%	
Don't know/Not answer	14.81%	11.18%	8.90%	4.45%	19.29%	
Do you normally wash your hands after going to the toilet?						
Yes, always	86.27%	88.60%	92.34%	95.55%	73.12%	85.12%
Sometimes	0.22%	0.07%	0.12%	0.00%	5.97%	3.36%
No, never	0.00%	0.15%	0.00%	0.00%	1.05%	3.33%
Don't know/Not answer	13.51%	11.18%	7.54%	4.45%	19.85%	8.19%
How do you clean your hands after toilet?						
With water and soap	83.55%	82.28%	88.05%	70.83%	19.35%	
With water only	0.38%	1.82%	0.31%	4.45%	60.48%	
With soil	0.00%	4.36%	0.00%	18.54%	0.40%	
I don't clean my hands	0.00%	0.15%	0.00%	0.00%	0.08%	
Other	0.08%	0.29%	0.16%	1.73%	0.08%	
Don't know/Not answer	15.99%	11.11%	11.48%	4.45%	19.60%	

*TN FU based on individual data, with a specific question for both items. In all the orther samples, these items are part of a multiple-response box directed to the respondent alone.

The first observation to make is that Gwalior locations seem to have a higher status of hygiene practices than villages in Tamil Nadu: Households are on average more likely to wear footwear when they go to the toilet/for open defecation, they are more likely to always wash their hands after they went and they are also more likely to wash their hand with water and soap. While around 70-80% of households in Gwalior wash their hands with water and soap, only 19% do so in villages in Tamil Nadu. Here, the majority (60%) washes their hands with water only. In villages in Gwalior we see a negative change over time in that almost 20%

of households report at endline to use soil rather than water and soap. We however also see improvements in hygiene practices over time: We see increases in all areas in percentage of household members reporting to always wear footwear when going to the toilet, as well as higher percentages at the time of the endline survey for households reporting to always wash their hands after going to the toilet.

D. Motivations to construct a toilet

The remaining part of this document will concentrate on establishing correlations and possibly any causal links between (i) the FINISH intervention and outcomes and (ii) owning a toilet (independent of whether induced to be constructed through FINISH or not) and a number of outcomes. Before we go into details, we discuss some of the benefits that households themselves report. These are shown in Table 28.

In terms of reasons or main motivating factors to construct a toilet, we can see that there were two dominant ones: 'Female household members' and 'more convenience'. More than half of the sampled households, both in Gwalior and TN, report that females played an important role in the decision to construct a toilet. Interestingly, the importance decreases over time in Gwalior by roughly 20 percentage points, while the opposite holds true for rural Tamil Nadu. 'More convenience' is stated by 55-61% of households in Gwalior and 51% of households in Tamil Nadu at the time of the baseline survey and increases on average 15 percentage points over time.

The third most often stated motivation is hygiene. In slums of Gwalior about 30% of households report greater hygiene as a motivating factor at the time of the baseline survey, This percentage decreases somewhat over time to around 23-24%. Hygiene seems to play an even more important role in rural areas of Tamil Nadu, where around half of all households state hygiene as an important motivating factor.

Further mentioned by at least a quarter of all households in study locations (37% in Tamil Nadu) is 'greater safety'. Interestingly, this percentage decreases everywhere by a minimum of ten percentage points over time.

Table 28: Sanitation related perceptions

	GW: Slum		**GW: Vill**		**TN**	
Characteristic	BL	FU	BL	FU	BL	FU
Motivation						
More convenience	61.02%	74.80%	55.35%	72.24%	50.64%	62.55%
FemaleHH members wanted one	68.86%	45.61%	74.84%	55.33%	67.63%	83.02%
Status in the village	15.04%	12.55%	20.75%	7.69%	14.74%	7.11%
Better hygiene	30.51%	23.08%	28.93%	24.41%	46.79%	51.61%
Greater safety	25.42%	11.61%	24.53%	12.04%	36.54%	19.97%
Financial support from the Government	1.91%	2.16%	6.29%	7.69%	6.73%	2.42%
Other	1.27%	1.08%	1.26%	1.00%	0.64%	33.07%

Continued on next page

Table 28: (Continued)

	GW: Slum		GW: Vill		TN	
Characteristic	BL	FU	BL	FU	BL	FU
Don't know/No Answer	2.12%	0.54%	0.63%	1.00%	1.60%	1.21%
Improved Social Status due to the toilet						
Yes	97.50%	74.22%	96.28%	82.94%	54.00%	
No	0.63%	2.29%	0.00%	0.33%	40.57%	
Don't Know	0.00%	21.05%	0.00%	13.71%	0.00%	
No answer	1.88%	2.43%	3.72%	3.01%	5.43%	
Do you think that you save time by having a toilet at home?						
Yes	95.31%	90.47%	93.09%	93.39%	87.43%	
No	0.63%	1.84%	1.06%	4.50%	6.57%	
Don't Know	4.06%	7.69%	5.85%	2.10%	6.00%	
If you didn't have access to a toilet, would you construct one?						
Yes	87.19%	90.82%	90.43%	88.89%	69.43%	
No	0.31%	6.31%	0.00%	6.31%	1.43%	
Don't Know/ No answer	12.50%	2.87%	9.57%	4.80%	29.14%	
Do you miss out open defecation time?						
Yes		22.16%		22.52%		
No		75.89%		75.08%		
Don't Know/ No answer		1.95%		2.40%		

We then ask a number of other questions about potential benefits of having a toilet. These were not asked the same way at endline in Tamil Nadu, which is why that column is empty for these variables. We did however ask another set of variables in this state, which we will discuss shortly.

To start with, we asked about the link between having a toilet and the status in the village. Interestingly, the large majority of households in Gwalior believes that their status in the village increased due to their toilet (above 90% at baseline and 75-83% at endline). In rural Tamil Nadu, it is still the majority of households who hold this perception (54%), but considerably less than in Gwalior. Note though that although most households believe that their status increased due to the toilet, only about 10-20% of households state this as a motivating factor to built the toilet.

Another benefit of having a toilet, perceived by the vast majority of households is that they save time due to having the toilet at home.

However, when we look at Table 29, where we report questions only asked in Tamil Nadu at endline, we learn that while households save time by not having to walk to open defecation areas, about 10% of households in rural Tamil Nadu report that they now spend more time on collecting water, 6% state they

spent considerably more time. About 30% that report to spend more time consider this as a burden.

Table 29: Sanitation related perceptions

	TN
Characteristic	FU
Extra time collecting water due to the toilet?	
Yes, considerably more	6.04%
Yes, somewhat more	4.83%
No	84.97%
No answer	4.16%
Is this extra water collection time a burden?	
Yes, very much	6.17%
Yes, somewhat	27.16%
No	66.67%
Motivation: social links	
Neighbours/important villagers had one	1.21%
Usage of toilets elsewhere	0.67%
Imposed by someone in the village	0.40%
Motivation: others	
Physical problems with OD	17.32%
Difficulties in finding alternatives	16.38%

We also ask about social links as a motivating factor to construct toilets in rural Tamil Nadu. From Table 29 we can see that the social links asked about are not important motivating factors for the construction of the toilet in this area: Only 1.2% state that they built a toilet because their neighbor or an important village member had one. Further, hardly any household (less than 1%) states that the toilet was imposed by someone else in the community.

Finally, about 17% of households state that they had some physical challenges with open defecation and this motivated the construction of a toilet and 16% state that alternatives seemed too difficult to find.

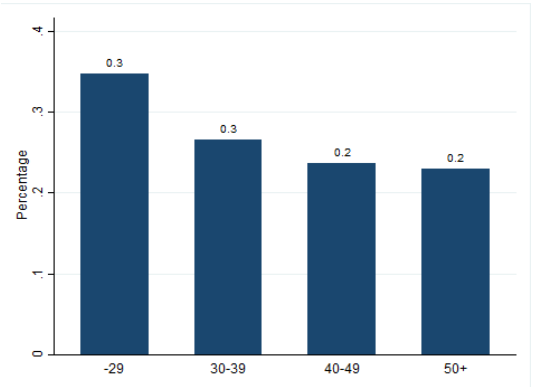
We also analyse whether motivations reported vary with the income of the household. The results are reported in Table 30. As with constraints to building sanitation facilities, also motivating factors do not vary extensively with the income level of the household. One does see however an increase in percentage of households mentioning factors like convenience, status and better hygiene with increasing income of the households.

Table 30: Motivations for Sanitation Investment and Income

Characteristic	Q1	Q2	Q3	Q4
	BL: Base line			
More convenience	47.37%	47.67%	50.82%	63.22%
Female members in the household wanted one	57.89%	68.02%	73.36%	67.25%
Status in the village	9.21%	11.63%	19.26%	16.88%
Better hygiene	21.82%	29.57%	32.69%	31.05%
Greater safety	24.34%	25.58%	29.51%	30.98%
Financial support from the Government	3.95%	5.81%	3.69%	3.78%
Other	1.29%	0.58%	1.61%	0.75%
	EL: Evaluation line			
More convenience	77.64%	73.82%	78.63%	83.09%
Female members in the household wanted one	50.00%	58.48%	65.53%	64.71%
Status in the village	11.68%	12.55%	13.49%	15.11%
Better hygiene	27.90%	25.68%	42.15%	42.82%
Greater safety	15.14%	16.73%	18.30%	19.20%
Financial support from the Government	8.96%	4.51%	5.19%	2.80%
Other	7.56%	13.85%	11.86%	12.15%

Finally, the main woman in the household was asked whether the ability of a prospective husband to provide sanitation facilities played an important role in their marriage decision. On average, just under 30% of women state that toilets were an important decision factor. Figure 18 breaks this down by the age of the main woman. It becomes obvious that the important of sanitation increased in recent years: Younger women are more likely to say that sanitation facilities played a role in their marriage decision than older women are.

Figure 18: Relevance of sanitation in choice of husband



IV. Adherence to treatment, implementation progress and its study implications

The natural next step in the analysis is to check whether, and if so, how much, of the changes that we see over time and the benefits reported by toilet owners, are induced by the FINISH intervention. However, we can only attribute impacts to the intervention under a number of conditions. These include that:

1. The allocation of communities to treatment (FINISH) and control (no FINISH intervention) was random, implying that characteristics of communities and households within the communities are balanced (i.e. - statistically speaking - the same in the two groups).

2. The intervention is implemented.

3. The intervention is implemented in communities allocated to treatment only.

4. The implemented intervention had significant impact and this impact is in line with what was seen as a minimum or realistic impact when designing the evaluation study.

5. Attrition is unrelated to the treatment allocation (i.e. households if households cannot be found at endline or refuse to respond, then this is unrelated to the FINISH intervention).

We discuss the first point (balancedness) in the respective baseline reports in detail and show there that this was indeed the case in our study locations.

The second point is extensively discussed in the beginning of this document, explaining - among other - why one of the three implementing partners taking part in the evaluation study had to be dropped as well as discussing challenges the other two implementing partners faced.

These challenges had important impacts on the evaluation which relate to the third and fourth point listed above. We will discuss these two points in more detail in the following section.

The third point is discussed in the context of the evaluation study in Gwalior with Sambhav as our evaluation there is substantially influenced by our findings related to this point. We discuss checks undertaken which shed light on whether respondents reported to have heard of and/or attended sanitation activities, and more importantly whether these were reported in treatment and control areas.

The fourth point, the intensity of the implemented intervention, is discussed in the context of Tamil Nadu, with BWDC, given its impact on the evaluation study there. We discuss whether the expected increase in sanitation coverage was achieved and the corresponding implications.

A. Sanitation activities conducted by Sambhav

At the time of the endline survey, we asked our respondents to the household survey (typically the household head) as well as the main women in the household whether they were aware or participated in any sanitation events (and which ones) over the last years. Some of these are conducted under FINISH (such as street plays), some exclusively so (such as film showings). We can see from Table 31 that household heads in slums of Gwalior, who are typically male, are rarely aware of any sanitation activities that took place in their community (column (1)). In contrast, about 18% of the main women in our study households reported to have been aware and attended sanitation activities (column (2a)). In the lower panel we can see that film showing is the predominant activity driving the percentage reported. It is therefore very likely that these activities are conducted as part of the FINISH intervention.

Table 31: Sanitation activities as reported by respondents at FU

		% of HH main respondent aware/attended	% of main woman aware/attended		
		Overall (1)	Overall (2a)	FINISH (2b)	Control (2c)
Sanitation Awarness activities		5%	18%	18%	18%
Streetplay	aware	3%	2%	1%	4%
	attended	2%	2%	1%	3%
Film-showing	aware	0%	16%	15%	17%
	attended	0%	17%	17%	17%

This in itself is a positive observation in view of the FINISH evaluation study, however, when considering columns (2b) and (2c), which split the percentages by treatment status of the communities, we see that there is no differences - on average, the same amount of people attended these sanitation activities in both types of communities. This was unexpected, especially for the film-showings, which were quite specific to the FINISH intervention. This raised alarm bells and we had further discussions with the implementing partner, Sambhav. It turned out that due to the slowness of activities and lending during the microfinance crisis, they were eager for any funds and support and conducted a number of sanitation activities for the government as well as UNICEF. Unfortunately, when doing so, they did not taking into account the treatment allocation for the FINISH evaluation study. Most unfortunate was that this had not been reflected in the data provided to us in October 2012 or shared with us prior to the fielding of the follow-up survey.

Based on the findings from the data and information received retrospectively from Sambhav, our identification strategy to measure the impacts was sacrificed. The fact that the intervention took place in control communities implies that we are not able to compare communities in which FINISH was implemented, with

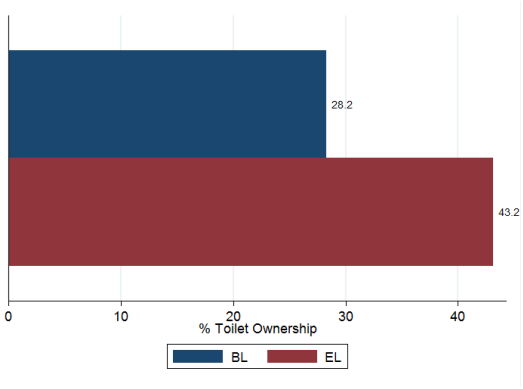
comparable ones where it was not implemented (which would have been the control communities). We hence do not conduct an impact analysis of the FINISH intervention.

While this is extremely unfortunate, we are still able to use the collected data to learn more about sanitation in general. We describe in the final section of this report the strategy we follow to learn more about sanitation, some or a lot of which would have been built due to the FINISH program. Before doing so, we discuss data collected in Tamil Nadu.

B. Achievements by BWDC

While information provided makes us confident that BWDC did adhere to the allocation of treatment and control communities, we face here another important issue that makes attributing impacts a big challenge. Specifically, we face the issue of much lower uptake of sanitation in the treatment communities than anticipated. To re-capture, when the study was designed, BWDC had said they could increase sanitation coverage through their intervention to over 50% in half of the 76 initially selected study communities. After the re-randomization in 2012, this target was increased to a minimum coverage of 60% in the 23 treatment communities. Looking again at the figure of sanitation uptake (see Figure 19), we can see that the achievement is quite far from this target: Toilet ownership went from just under 30% to just over 40%, an average increase of 13%.

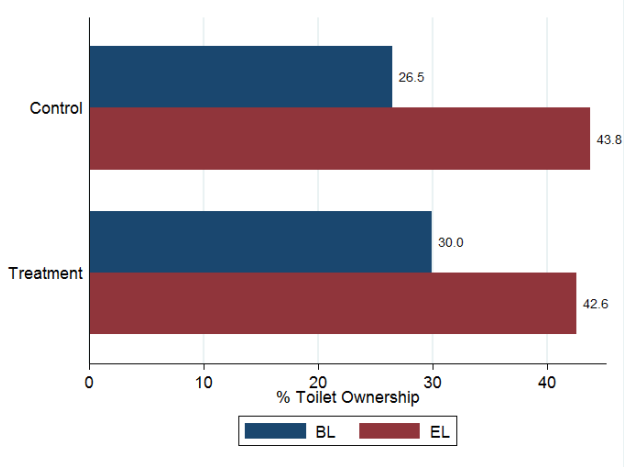
Figure 19: Sanitation coverage in Tamil Nadu (BL and EL)



More importantly though, this average increase it relatively evenly spread over treatment and control communities, as can be seen in Figure 20. In fact, just from eyeballing the figure we can see that the increase over time is even larger in control communities. Knowing the change in outcomes (such as toilet ownership) in the control communities, we can redo the power analysis and calculate the changes that FINISH should have achieved for us to be able to detect them with our data. Sticking to the primary outcome of private ownership of sanitation, the power analysis (based on standard assumptions) tells us that FINISH needed to

achieve an increase of at least 9-10 percentage points *over and above* the increase that happened naturally over time for us to detect achievements by FINISH in our data. Based on initial discussions with program implementers, this was a reasonable change to expect, but did not happen.

Figure 20: Sanitation coverage in Tamil Nadu by treatment status (BL and EL)



V. Impact analysis of the FINISH intervention in Tamil Nadu

The figure shown above anticipates the impact FINISH actually had on sanitation ownership in Tamil Nadu. Independent of the specification we choose, the estimated impact is very small and insignificant. This can be seen in Table 32. This Table, as well as those to follow, entails the following information: The first column names the outcomes variables we consider, each row is one variable. So, in this Table, we look at whether the household owns a toilet, whether the household uses own toilet for defecation, uses other than own toilet for defection (primarily public toilets), or goes for open defecation. We then present two different specifications.[15] The columns numbered (1), (2), and (3) take the whole sample into account, whereas columns numbered (4), (5), and (6) only analyse households that were interviewed both at baseline and at endline. Given the reduction in number of study villages, we decided to increase the number of households to be interviewed, which naturally implies that not all households interviewed at endline would have been interviewed at baseline.[16] For each of the two specifications, we present the average of the outcomes variable under consideration for the control group at the time of the endline survey (columns (1) and (4)), the number of observations (households) used in each regression (columns (2) and (5)) and finally the estimated impact of the intervention on the outcome variable (columns (3) and (6)). The estimated impact is the coefficient δ from the regression:[17]

$$Y_{i,j,t=EL} = \delta FINISH_{i,j,t=EL} + \beta X_{i,j,t=EL} + u_{i,j,t=EL}$$

The interpretation is as follows[18]: The estimated impact of the FINISH intervention on household toilet ownership is 2.64 (as reported in column (3) of Table 32) when considering the whole follow-up sample. This means, that due to the FINISH intervention, 2.64% more households have a toilet. However, this findings is insignificant, indicated by the fact that we present no stars next to this estimate. In other words, the impact on this outcome variable is zero, statistically speaking. This is confirmed when considering only the panel sample, where the estimated coefficient is -2.01 (column (6)) and also highly insignificant. The findings on usage of the toilets are very similar. No significant impacts of the intervention on usage of toilets are found.

[15] Other specifications were run for robustness checks. Results are consistent across specifications.

[16] Note that we also replaced households that attrited between the two survey rounds, either because they moved away, could not be found, refused to answer, etc. The attrition rate is 24%. Importantly, attrition is unrelated to treatment status. We see that Muslim households are more likely to have attrited and hindu householdsless likely. Households where the head had no education are more likely not to be interviewed again at endline and houseolds with debt are more likely to be observed.

[17] Please note that in the first Table, on toilet ownership, we do not include covariates in the regression. We do so to increase power in this crucial outcome since we lose roughly 200 observations due to missing information in covariates. Other tables do include covariates but we confirm that results are consistent with or without them included. Note also, that we use covariates collected at the endline rather than baseline as more commonly done. This is since we would otherwise not be able to use information on households added to the sample.

[18] Subscripts are defined as follows: i stands for household, j for the community the household lives in and t is a subscript for time. In our case $t = 2010$ for baseline and $t = 2013$ for endline. More details on notation is provided in section VI.

Table 32: Treatment Impact

Cross-section τ : $Y_{j,t=EL} = \delta T_{j,t=EL} + u_{j,t=FU}$						
	FULL SAMPLE			PANEL		
Outcome Variables Y	(1) $\bar{Y}^{T=0}_{t=EL}$	(2) Obs	(3) Impact	(4) $\bar{Y}^{T=0}_{t=EL}$	(5) Obs	(6) Impact
Ownership (household leve)l						
F1. Does your household have a toilet?	*45.6%*	1635	2.64	*43.2%*	869	−2.01
			(3.65)			(4.51)
Usage (individual level)						
Own Toilet used for defecation	*41.5%*	5985	1.81	*40.2%*	3073	−2.42
			(3.82)			(5.15)
Use a toilet that does not belong to the HH	*1.4%*	5985	−0.55	*1.4%*	3073	−0.77
			(0.54)			(0.77)
Open Defecation	*56.9%*	5985	−1.43	*58.2%*	3073	3.06
			(3.79)			(5.21)

GP-level clustered SE on parenthesis (46 clusters). Significance: * 10%, ** 5%, *** 1%.

Given that we do not find an impact of FINISH on uptake and/or usage, it is not very likely that we find impacts on other outcomes. The argument for health-impacts was already discussed above: It is believed that for health impacts to kick-in, it is important for a large percentage (if not 100%) of households to own and use sanitation since even one open defecator can still contaminate the water other households consume. If health impacts are not realized, productivity of households is also less likely to increase (it could of course still increase through other channels such as time savings).

We will give a very brief discussion on the findings on a subset of for four set of outcome variables[19]: health outcomes, productivity and time use, wealth and finances and outcomes at the level of the main woman in the household. To pre-empt results, we find hardly any significant impacts on any outcomes considered. A few variables show significant impacts of the intervention, but we note that these are typically not consistent across specifications. Such non-robustness of results typically casts doubt on their validity. This links to the fact that it is known that, when testing a large number of hypothesis (outcome variables), about 5% will by chance statistically significant.

Table 33 shows outcomes related to health. We report results of FINISH impacts on whether any household member visited a doctor or other healer in the last four weeks, whether any household member was visited by a health professional, whether a household member was hospitalized and average costs incurred over all visits; and finally, whether any children in the household (under the age of 6 years) had diarrhea in the last seven days. None of the estimated impacts are significant, all are estimated to be zero. The coefficient on whether any household member visited a hospital in the last year shows significance at the ten percent level (indicating an increase in hospitalization due to the intervention). This is however not robust across

[19]We concentrate on a sub-set of variables we actually looked at for briefness. Other outcomes considered do not throw any additional light on the impacts of the intervention in Tamil Nadu.

specification and only marginally significant.

Table 33: Treatment Impact on Health: Household Level

Cross-section τ : $Y_{j,t=EL} = \delta T_{j,t=EL} + \beta X_{j,t=FU} + u_{j,t=FU}$						
	FULL SAMPLE			PANEL		
Outcome Variables Y	(1) $\bar{Y}^{T=0}_{t=EL}$	(2) Obs	(3) Impact	(4) $\bar{Y}^{T=0}_{t=EL}$	(5) Obs	(6) Impact
=1 if any HH member visited a doctor without hospitalization (last 4 weeks)	*59.2%*	1379	0.07	*61.7%*	702	−3.72
			(2.88)			(4.07)
=1 if any HH member was visited by doctor (last 4 weeks)	*2.7%*	1352	−0.96	*2.5%*	685	0.81
			(1.10)			(1.43)
=1 if any hh member hospitalized in last 12 months	*22.7%*	1383	3.00*	*22.0%*	704	4.14
			(1.51)			(2.63)
Average total costs over all visits	*1455.5*	653	−252.26	*1520.5*	348	68.03
			(0.65)			(1.02)
=1 if any children had diarrhoea last 7 days	*1.7%*	1402	0.34	*2.2%*	718	0.11
			(273.18)			(431.39)

X_j includes socio-demographic controls of the main woman, HH head, HH demographics and socio-economic status. Robust/Village-level clustered SE in parenthesis. Significance: * 10%, ** 5%, *** 1%.

Table 33 looks at outcomes related to productivity and time use in the form of working hours and pay. There is some indication that labour supply increases due to the intervention a finding that is again not robust across specification though. In addition, we do not see any of these possible impacts to be accompanied by a change in earnings of the household. Variables related to wealth and finance are displayed in the Table 34.

Table 34: Treatment Impact on Productivity and Time: Household Level

Cross-section τ : $Y_{j,t=EL} = \delta T_{j,t=EL} + \beta X_{j,t=FU} + u_{j,t=FU}$						
	FULL SAMPLE			PANEL		
Outcome Variables Y	(1) $\bar{Y}^{T=0}_{t=EL}$	(2) Obs	(3) Impact	(4) $\bar{Y}^{T=0}_{t=EL}$	(5) Obs	(6) Impact
Total male workers in the HH	*1.0*	1403	0.05	*1.0*	719	0.04
			(0.04)			(0.05)
Total female workers in the HH	*0.4*	1403	0.07**	*0.4*	719	0.06
			(0.03)			(0.05)
Total male paid working hours of the household	*37.0*	1403	3.23	*35.0*	719	7.28*
			(3.25)			(4.19)
Total female paid working hours of the household	*12.7*	1403	3.60**	*12.8*	719	2.53
			(1.45)			(1.96)
Total students in the HH	*0.8*	1403	−0.00	*0.8*	719	0.04
			(0.05)			(0.07)

X_j includes socio-demographic controls of the main woman, HH head, HH demographics and socio-economic status. Robust/Village-level clustered SE in parenthesis. Significance: * 10%, ** 5%, *** 1%.

We again see that basically all estimated coefficients are insignificant. The only stars that show up are for the ratio of savings to household income, indicating a lower savings ration for treatment areas. The same caveats as above however hold. Other variables shown relate to dwelling value, income from wages and business as well as information on debt levels of the study households.

Table 35: Treatment Impact on Wealth and Finances: Household Level

Cross-section τ : $Y_{j,t=EL} = \delta T_{j,t=EL} + \beta X_{j,t=FU} + u_{j,t=FU}$						
	FULL SAMPLE			PANEL		
Outcome Variables Y	(1) $\bar{Y}^{T=0}_{t=EL}$	(2) Obs	(3) Impact	(4) $\bar{Y}^{T=0}_{t=EL}$	(5) Obs	(6) Impact
Value of the Dwelling (if reported) in 1000s Rs	*360.1*	1265	−44.44	*332.6*	661	−35.38
			(30.82)			(40.17)
Income from wages (if any) in 1000s Rs	*66.7*	1161	−4.18	*60.1*	596	−8.11
			(5.36)			(7.07)
Income from business (if any) in 1000s Rs	*66.3*	427	19.14	*55.6*	226	4.06
			(19.15)			(12.14)
=a if household has debt outstanding	*69.3%*	1340	4.82	*74.5%*	683	3.34
			(3.44)			(3.89)
Amount of total debt during the last 4 years (if any) in 1000s Rs	*112.7*	1224	−1.41	*115.2*	643	−3.82
			(6.97)			(11.16)
=1 if hh has any type of savings	*70.9%*	1397	−0.80	*73.9%*	714	−4.51
			(3.88)			(3.47)
Savings (if any) as a proportion of income	*10.8%*	913	−5.74**	*10.9%*	490	−4.80
			(2.49)			(2.94)

X_j includes socio-demographic controls of the main woman, HH head, HH demographics and socio-economic status. Robust/Village-level clustered SE on parenthesis. Significance: * 10%, ** 5%, *** 1%.

The last set of outcomes we present relate to the main woman in the household. Our survey teams interviewed the household head (or other knowledgeable household member) as well as, separately, the main woman of the household. Some of the indicators presented in Table 36 come from this survey instrument. The first outcome is self-reported health, followed by summary indicators of how well the respondent answered to knowledge questions related to sanitation, health and hygiene. The intervention had no significant impacts on any of these outcomes.

Table 36: Treatment Impact on Main Woman: Household Level

Cross-section τ : $Y_{j,t=EL} = \delta T_{j,t=EL} + \beta X_{j,t=FU} + u_{j,t=FU}$						
	FULL SAMPLE			PANEL		
Outcome Variables Y	(1) $\bar{Y}^{T=0}_{t=EL}$	(2) Obs	(3) Impact	(4) $\bar{Y}^{T=0}_{t=EL}$	(5) Obs	(6) Impact
SR Health: 1 extremely poor, 10 perfect	*7.2*	1072	0.05	*7.2*	542	0.12
			(0.13)			(0.20)

Continued on next page

Table 36: (Continued)

	FULL SAMPLE			PANEL		
	(1)	(2)	(3)	(4)	(5)	(6)
Outcome Variables Y	$\bar{Y}^{T=0}_{t=EL}$	Obs	Impact	$\bar{Y}^{T=0}_{t=EL}$	Obs	Impact
Hygiene knwoledge correct answers	*7.0*	1070	0.22	*7.0*	541	0.16
			(0.14)			(0.17)
Hygiene knwoledge incorrect answers	*14.9*	1070	−0.22	*15.0*	541	−0.15
			(0.14)			(0.17)

X_j includes socio-demographic controls of the main woman, HH head, HH demographics and socio-economic status. Robust/Village-level clustered SE in parenthesis. Significance: * 10%, ** 5%, *** 1%.

VI. Learning about Sanitation dynamics: toilet acquisition and its economic and social implications

Because of reasons outlined in the above discussion, we are not able to evaluate the impact of the FINISH intervention in Gwalior and find no significant impacts in Tamil Nadu (possibly due to low achievements and hence not sufficient sample to detect these small changes). The structure of the data and the fact that a considerable percentage of households between the two survey rounds made the transition to become toilet owners, however, allows us to analyze determinants of toilet ownership in the two survey rounds as well as determinants of acquisition between them. We pool our data from Tamil Nadu and Gwalior to have a larger sample and hence be able to conduct a more precise analysis. We are further able to analyze potential impacts of toilet ownership on outcomes by exploring the panel structure of the data, controlling for a large set of covariates, household fixed effects and common-time shocks. We conduct a number of robustness checks on our findings, which show consistency of our results. However, we raise caution that the lack of clear exogenous variation in toilet ownership makes it difficult to attribute observed impacts undoubtedly to toilet ownership.

Any of the findings we present can furthermore not be attributed to the FINISH intervention, due to the reasons discussed in the previous section. However, we note that during the two data collection rounds sanitation activities under the FINISH program took place and credit was provided. Therefore, while we cannot make any clear statement about the FINISH intervention, we might expect that some of the increase in coverage would be at least partially driven by program activities. Findings like the ones on importance of loan access (as outlined in the earlier section describing the sanitation situation in the study areas and recalled in this section) support this hypothesis.

A. Descriptive Information on the study households

We start by providing information about our study households (a representative sample of our study area at the time of the first survey round in 2010) that help to get a better understanding of the setting and their socio-economic background. Summary statistics are pooled for both Gwaliorand Thiruvarur, but we point to interesting differences between the two areas in our description.

Table 37 provides descriptive statistics of our sample households, which are a representative sample of our study area at the time of the first survey round in 2010.

Table 37: Descriptive Statistics

	R1			R2		
	N Obs	Mean	SD	N Obs	Mean	SD
Social background and HH demographic composition						
Religion: Muslim	3401	16.6%	37.2	3808	14.7%	35.4
Forward caste	3374	17.9%	38.3	3766	16.2%	36.8
Backward caste	3374	42.7%	49.5	3766	41.4%	49.3
Scheduled caste	3374	26.3%	44.0	3766	27.9%	44.8
Scheduled tribe	3374	2.0%	14.2	3766	1.9%	13.5
Most backward caste	3374	11.1%	31.5	3766	12.7%	33.3
Nr of household (HH) members	3216	5.1	2.0	3527	5.3	3.4
Nr of male HH members	3216	2.7	1.3	3527	2.7	1.4
=1 if HH has at least one child under 6yrs	3421	36.2%	48.1	3701	35.3%	47.8
=1 if there is an unmarried boy 17-24	3146	33.2%	47.1	3505	32.6%	46.9
=1 if there is an unmarried girl 13-20	3146	32.3%	46.8	3505	30.9%	46.2
Main woman Age	2981	37.3	11.5	3099	38.1	11.6
=1 if main woman is married	2984	91.1%	28.5	3091	90.7%	29.0
=1 if main woman has no education	3002	46.8%	49.9	2874	43.6%	49.6
=1 if main woman has more than primary school	3002	29.2%	45.5	2874	37.1%	48.3
=1 if main woman lives with her in-laws	3002	11.3%	31.7	3831	21.1%	40.8
=1 if sanitation was taken into account for marriage	2851	36.2%	48.1	3025	18.0%	38.4
HH Income						
Self-Reported yearly income, 1000Rs of 2013	3196	76.8	87.9	3597	74.4	94.4
=1 if any bad shock during the last year	3421	13.4%	34.1	3790	19.5%	39.6
Dwelling Characteristics						
=1 if dwelling is owned, 0 otherwise	3217	89.5%	30.6	3802	87.9%	32.6
Pucca (Strong)	3203	30.6%	46.1	3646	56.4%	49.6
Semi-Pucca (Semi-strong)	3203	41.7%	49.3	3646	21.7%	41.2
Value of the Dwelling (1000 Rs of 2013)	2544	162.1	214.0	2937	286.4	371.4
Sanitation and Hygiene						
=1 if main source drinking water is hh service connection	3421	21.0%	40.7	3810	28.8%	45.3
=1 if HH has a toilet?	3217	36.6%	48.2	3637	53.5%	49.9
=1 if HH has a bathroom	3421	47.6%	49.9	3816	65.7%	47.5
Distance to the border of the closest OD area (100m)				1590	1.2	1.5
Distance from HH to nearest water source (100m)				1657	7.6	6.9

Continued on next page

Table 37: (Continued)

	R1			R2		
	N HHs	Mean	SD	N HHs	Mean	SD
Community Level						
Proportion of HHs with connected water service	102	14.1	22.9	102	12.8	19.3
Total number of HHs surveyed	102	33.6	29.4	102	37.6	30.4
Proportion of HHs with toilet	101	23.3	30.2	97	26.6	29.8
In Gwalior area	102	54.9%	50.0	102	54.9%	50.0
Slum	102	37.3%	48.6	102	37.3%	48.6

† Rupees of 2013: R1 values where adjusted by a factor of 1.32. It was calculated based on national level figures for 2011, 2012 and 2013.

Around 16% of the HHs reported to be Muslim and almost all the remaining Hindu (less than 10% were from other religious background - not shown). In terms of caste, 18% of HHs report to belong to forward castes (FC), 43% to backward castes (BC), 26% to scheduled castes (SC), 2% to scheduled tribes (ST), 11 % to most backward castes (MBC). In terms of household composition, our sample HHs comprise of on average 5 members, 3 of which are male. Around 36% of the HHs have at least one child under the age of 6 years. At the baseline, the main woman in the household is on average 37 years of age and the large majority (91%) is married. 46% have no formal education, and 29% completed more than grade 5.

Average HH income per capita was around 16,600 Rs per year at the time of the first survey round, while it was 15,800 Rs at the second round approximately three years later. As India's inflation rates are 8.9%, 9.3% and 10.9% for 2011, 2012, 2013 (WDI, World Bank), the general increase on national consumer prices between the two survey rounds was around 32%. This fact, jointly with an increase in the average household size, implies that households experienced a real decrease in their average yearly income per capita of approximately 4% between the two survey rounds.[20] At these income levels, households are way below the commonly used international poverty line of 1.25 USD per person per day. Taking the 2010 first quarter exchange rate of about 1 USD to 46.5 INR, our households earned on average 0.97 USD per day at the time of the first survey round.

At the same time though, close to 90% of the HHs were owners of their dwelling, and they estimate their houses to be valued at 162,100 Rs at the first survey round (2013 prices) and 286,400 Rs at the second survey round. 21% of them had access to water through piped-water, a figure that increases to 28.8% by the second round. A bit more than one third of the sample has a toilet and almost half have a bathroom. For those HHs for which there is information on distance to Open Defecation (OD) areas (73% of Gwalior sample), the average distance is 120m. For the case of the distance to the nearest water source (available for 76%

[20]Such decrease are mainly driven by Thiruvarur data.

of Gwalior approximately), it is 760m. We will discuss our sample household's sanitation situation in more detail in the next section.

As describe before, we have information on a wide set of characteristics of the HHs. The average of such variables are available in Tables 42, 43, 44,45, and 46, which also include our results. We will discuss these tables in detail when describing the results from our empirical strategies.

Key features of the sanitation situation

We provided a detailed description of the sanitation situation in section III. Here, we point to some key features in the data that will be of interest in the subsequent analysis.

Table 38: Reported Toilet Ownership

Community	**Round 1 (%)**	**Round 2 (%)**
Thiruvarur	28.25	45.57
Gwallior Village	23.68	42.22
Gwallior Slum	53.98	71.89
Total	36.56	53.51

As shown in Table 37, we learn from this module that about 36% of the HHs at the time of round 1 data collection reported to have a toilet of their own. This figure varies considerably by the location of the community as we show in Table 38: in Gwalior peripheral villages about 24% of households had a toilet and in urban slums it was 54%; in rural Thiruvarur the figure is 28%. By the time of the second survey round, a bit than three years later, sanitation coverage was close to 53% in our study communities: 72% in urban slums and 44% in peripheral villages of Gwalior, and 46% in Thiruvarur.[21] Almost all the households in the study areas report to own a pour flush toilet, i.e. a toilet where water for flushing is poured in by the user. The water is typically (~63%) flushed into a pit or a septic tank. Only very few households have a toilet linked to a drainage system (on average 6-7%) and those that do are primarily situated in the notified slums of Gwalior. At the time of the first survey round, only about 4% of households had a simple pit latrine[22], the typically cheapest and most basic form of improved sanitation. These statistics are presented in Table 39. Over time, we see primarily an increase in this type of simple pit toilet. When zooming in on the 33% of households that did not have a toilet at baseline, but made the transition to become a toilet owner, we see that among these, the percentage of simple pit owners is higher than amongst previous toilet owners: About 20% of toilets constructed between the two survey rounds are simple pit models.

[21] One might be concerned that household misreport their sanitation ownership status, possibly due to embarrassment, about not having sanitation facilities. In order to deal with that, the interviewer verified if there was or not a toilet in the house (such information is not available for 6% of the sample). In 95%-98% of the cases the interviewer agrees with the respondent on ownership status.

[22] A simple pit latrine typically consists of a pit dug into the ground, covered by slab or floor, with a hole through which excreta fall into the pit.

Table 39: Reported types of toilets owned

Grouped Type	Round 1 (%)	Round 2 (%)	Restricted Round 2 (%)
Pour/Flush to Pit, septic tank, etc.	63.38	64.40	63.83
Pour/Flush to Drainage	7.39	6.14	5.04
Pour/Flush to Other	18.44	14.07	10.43
Simple pit	4.25	14.99	20.00
Don't know/No answer	6.54	0.41	0.70

Restricted: HHs that did not report having a toilet at Round 1

Figure 21

(a) (b)

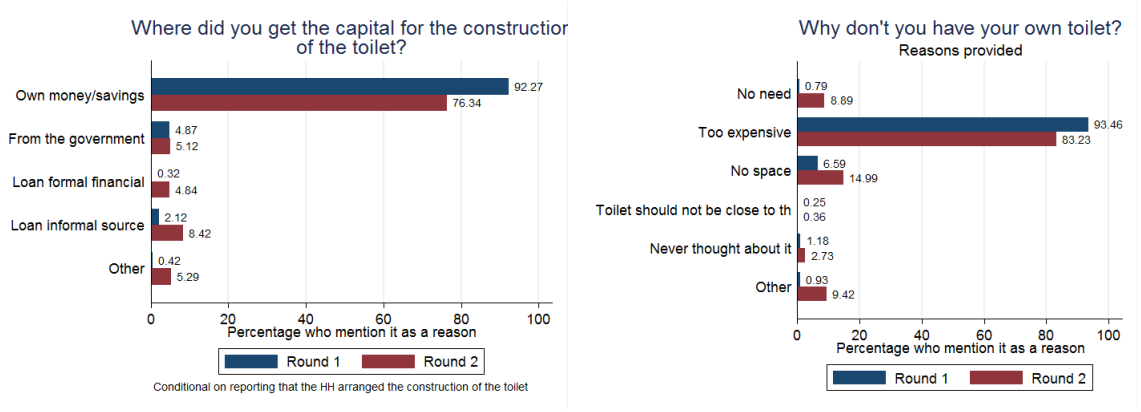
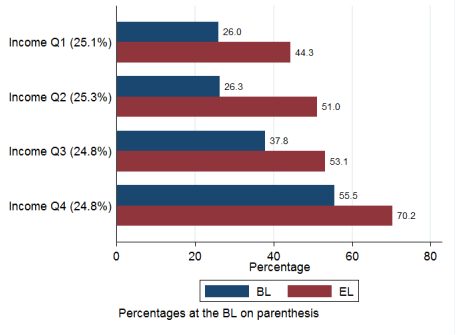


Figure 21a provides information on financing of toilets. In both survey rounds the predominant financing source was own savings: 94% reported in 2010 to have financed their toilet with savings and 83% in 2013. Most of the remaining 6% of households in round 1 mentioned otherwise subsidies from the government and informal loans as sources for capital for the construction of their toilet. These two sources gained in importance between the two survey rounds with 13% of households reporting them.

Given the low average yearly income of our sample households which implies that a sanitation investment can be as large as 20% of the average yearly income[23], and the fact that funding for toilets are primarily savings, it then comes at no surprise that the cost of a toilet is the main constraint to toilet acquisition reported (as shown in Figure 21b). It is noteworthy though that the percentage of households citing high costs as the main constraint drops from 93% in 2010 to 83% in 2013. This comes with a dramatic increase in access to credit market between the two waves: loans as a proportion of income increase from around 10%

[23]The implementing partner of the sanitation intervention this data was originally collected for, estimates that a usable and safe toilet could be constructed with Rs 10,000, including the pit, seat and platform, and a superstructure with roof and gate. Households themselves report to spend a much larger amount on a toilet, with on average over Rs 20,000.

Figure 22: Toilet ownership and income



to 20% of the HH income, and having taken a loan during the last year changed from 26% to 48%. Is this greater financial inclusion related to toilet acquisition? We will analyze that with more detail later.

B. Methods and results

Our analysis has two main objectives: (1) Assessing determinants of toilet ownership and acquisition and (2) understanding the benefits of toilet ownership on a number of outcomes. The latter analysis tries to tease out causality attached to observed correlates.

Take the example of household income. Our data confirms the common observation that income is a major driver of toilet-ownership: HHs with higher income are more likely to own a toilet. This is depicted in Figure 22, where we plot the percentage of HHs owning a toilet against the income quartile they fall into. We observe a strong gradient in the first survey round (darker bars), which declines in the second round (lighter bars) but still shows that richer households are more likely to have a toilet. In this example, our analysis on determinants of toilet ownership looks at whether such correlations remain even when accounting for other household characteristics. The second part of our analysis tries to understand whether owning a toilet affects the amount of income a household receives.

A well executed experimental evaluation design, coupled with a well implemented intervention, would allow to clearly attribute any role that toilet ownership plays in an observed change in household income. In our setting however, where no such clear exogenous variation is introduced, stronger assumptions need to be made. For some outcomes - such as income - the task becomes particularly difficult as the direction of causality is not easily defined: more income implies further access to sanitation but improved health can yield higher income. We describe below the approach we use and assumptions we need to make.

Before doing so, we however dive into the analysis of determinants of toilet ownership and acquisition, discussing in more detail the methodology used and presenting our findings.

B..1 Determinants of toilet ownership and acquisition

In this section we explore what household characteristics are associated with sanitation uptake. The features of our data allow us to analyze two types of variation: cross-sectional and longitudinal. Exploring the cross-sectional variation informs us about characteristics that are correlated with toilet ownership at a specific point in time, even if these characteristics vary little over time, such as religion or caste. We can compare findings for the two survey rounds and learn which covariates are important determinants consistently in both years. The longitudinal feature of our data enables the analysis of the role of variables that show variation over time. It further allows us to analyze determinants of toilet acquisition. By zooming in on households that had no toilet at the time the first round of data was collected, we can correlate household characteristics with toilet acquisition.

Methodology

For the cross-sectional analysis we use a linear probability model. It establishes the correlation between a set of covariates X and toilet ownership status T at data collection wave τ as shown in Equation 1. Variables vary at the level of the HH i, the community j and time t. The vector of estimated parameters $\hat{\beta}_1$ gives us an idea of the correlation between each variable on the right hand side and toilet ownership, assuming that it is linear relationship. We cluster the error term at the community level. This parameter $\hat{\beta}_1$ would provide the causal effect only if any omitted variable, that is unobserved but is related with T, is uncorrelated with the variable of interest x. Further, the direction of causality would have to be clearly determined - as discussed previously taking income as an example. An example of a variable where the direction would be more easily established is caste: a household's caste might influence toilet acquisition but the reverse is unlikely to hold: acquisition of a toilet would not change the caste of a household.

$$T_{i,j,t=\tau} = g(X'_{i,j,t=\tau}\beta_1 + u_{i,j,t=\tau}) \tag{1}$$

To analyze determinants of toilet acquisition we constrain our sample to households that had no toilet in 2010. We again estimate a linear probability model, but make now use of the longitudinal feature of our data: the left-hand side is the status of toilet-ownership in 2013, while the right-hand side are covariates measured at the time of the first survey round in 2010. This is shown in Equation 2. The same caveats on identification of causal effects apply. In terms of policy implications, this analysis provides an interesting framework though: we can learn whether some particular characteristics actually determine the decision of a HH to invest in sanitation.

$$T_{i,j,t=2} = g(X'_{i,j,t=1}\beta_2 + u_{i,j,t=2}) \quad | \quad T_{i,j,t=1} = 0 \tag{2}$$

Results

Table 40 presents the results of the analysis of determinants of toilet ownership and acquisition. We concentrate on the same set of covariates as used to describe our sample households in section 2.1. We repeat the sample averages for each covariate in columns 1 and 2 for easiness of comparison of the point estimates. Since sample sizes change slightly with each specification, the averages might differ somewhat in each column and in comparison to those presented in Table 37. Columns 3, 4, and 5 present the estimated coefficient β for the covariates under the different specifications discussed above (equations 1 and 2). [24]

We will start by discussing findings about which household characteristics are correlated with toilet ownership, presented in column 3 for 2010, and in column 4 for 2013. Thereafter, we will turn to the discussion of determinants of toilet ownership, estimates of which are presented in column 5.

Determinants of toilet ownership

The top panel of Table 40 focuses on household income. As income itself might be an outcome, due to the potential improvement of health and productivity, the variable is aggregated by quartiles for this cross-sectional analysis. In both survey rounds (estimates in columns 3 and 4) we find confirmed that households of higher income are significantly more likely to have a toilet. This is a finding our descriptive analysis already suggested. It is worth stressing though that reverse causality is likely to play an important role: part of that positive correlation might be because HHs with improved sanitation facilities and hygiene behaviour might be more productive. This issue is not solved in this analysis.

We find a very similar pattern to that of household income for the social background of the households. Even when we take into account household income (as done throughout in the analysis), forward caste households are more likely than backward caste ones to own a toilet whereas schedule castes and tribes are less likely to have one in comparison to backward caste households. There are slight differences over time, but the general picture is consistent in both years as shown in the descriptive analysis.

The data does not reveal any significant difference in toilet ownership patterns by the religion of the household (results not shown).

However, we further look at the correlation of demographic composition of the household with toilet ownership. While one might expect larger households to be more likely to own a toilet due to higher demand, we do not see this reflected in the context of our data. Also other household composition information does not seem to correlate with toilet ownership in our two survey rounds.

Consistently over the years though is a positive and significant correlation between toilet ownership and the education level of the main woman in the household. Notice that sanitation might be relevant for the marriage market as ownership seems clearly related to have taken it into account on the matching.

[24] As indicated in the footer of the table, three stars present high significance at 1% or less, two stars 5% significance and one star represents a significance level of 10%.

The final set of variables we look at is the type and location of the household's dwelling. We find that owning, or living in a dwelling of strong or semi-strong structure is a significant correlate with toilet ownership. Further, at the time of the first survey round, living in a slum is associated with a significantly higher probability of having a toilet, but in general the expansion is slower in Gwalior as it started from a higher point. notice, however, that there seems to be a positive relationship between average sanitation and the likelihood to own a toilet, meaning that network effects might play an important role.

Distance to OD areas and community water sources are not reported in this table as it only includes data for Gwalior at Round 2. No significant relationship was found in that case.

Table 40: Toilet ownership Determinants: cross-section logits

Eq4. Logit : $Y_{i,j,t=\tau} = g(X_{i,j,t=\tau}\beta_1 + u_{i,j,t=\tau}$
Eq5. Logit (R): $Y_{i,j,t=2} = g(X_{i,t,t=2}\beta_2 + u_{i,j,t=2}) | T_{i,j,t=1} = 0$

	Descriptive		Marginal Effects		
	R1	R2	R1	R2	R2 New
	(1)	(2)	(3)	(4)	(5)
Independent Variables X	$\bar{X}_{t=1}$	$\bar{X}_{t=2}$	Eq4	Eq4	Eq5
HH Income					
Income quartile 2 or above	*75.8%*	*75.3%*	−0.92	2.30	3.32
			(2.63)	(2.57)	(2.51)
Income quartile 3 or above	*50.7%*	*48.5%*	6.52***	2.60	7.12**
			(2.33)	(2.38)	(2.91)
Income quartile 4 or above	*25.0%*	*25.7%*	8.12***	11.57***	−1.96
			(2.06)	(2.16)	(3.76)
Social background					
Forward caste	*18.5%*	*18.2%*	−0.51	1.04	−0.60
			(3.37)	(2.57)	(5.55)
Most backward caste	*11.0%*	*11.0%*	−1.45	−0.13	5.93
			(2.86)	(2.75)	(4.04)
Scheduled caste	*26.6%*	*27.0%*	−13.47***	−20.08***	−15.76***
			(2.44)	(2.28)	(3.84)
HH Demographic Composition					
Nr of household (HH) members	*5.2*	*5.5*	0.37	0.51	1.21
			(0.68)	(0.73)	(1.23)
Nr of male HH members	*2.7*	*2.8*	−1.31	−0.82	−4.26**
			(0.98)	(0.98)	(1.67)
=1 if HH has at least one child under 6yrs	*33.4%*	*34.7%*	−1.13	−0.59	−1.59
			(1.91)	(2.43)	(2.81)
=1 if there is an unmarried boy 17-24	*33.4%*	*33.6%*	−0.43	−2.56	9.59***
			(1.88)	(1.65)	(2.59)
=1 if there is an unmarried girl 13-20	*32.2%*	*31.8%*	−0.21	−2.05	−4.65
			(1.72)	(2.04)	(3.55)
=1 if main woman completed grade IX or above	*12.8%*	*18.4%*	11.17***	12.28***	3.98
			(2.19)	(2.28)	(4.77)

Continued on next page

Table 40: (Continued)

	Descriptive		Cross-section		
	R1	R2	R1	R2	R2 New
	(1)	(2)	(3)	(4)	(5)
Independent Variables X	$\bar{X}_{t=1}$	$\bar{X}_{t=2}$	Eq1b	Eq1b	Eq2b
=1 if sanitation was taken into account for marriage	*36.6%*	*17.5%*	5.54***	5.79***	4.25
			(2.13)	(2.03)	(2.70)
Dwelling and Community Characteristics					
Pucca (Strong)	*30.3%*	*59.4%*	26.54***	22.95***	5.57
			(2.37)	(2.31)	(3.54)
Semi-Pucca (Semi-strong)	*42.8%*	*21.8%*	14.85***	8.98***	7.26**
			(2.37)	(2.82)	(2.85)
Proportion of HHs with connected water service in the village/slum	*15.3*	*15.3*	0.01	−0.07	−0.22*
			(0.05)	(0.06)	(0.13)
Proportion of HHs with toilet in the village/slum	*26.6*	*34.0*	0.61***	0.75***	0.52***
			(0.05)	(0.07)	(0.12)
In Gwalior area	*66.0%*	*63.9%*	−24.42***	−34.37***	−15.92**
			(3.32)	(3.73)	(6.49)
Slum	*39.4%*	*38.0%*	6.85***	10.70***	18.21***
			(2.38)	(2.83)	(3.78)
Total N Observations			2726	2661	1509

† Rupees of 2013: R1 values where adjusted by a factor of 1.32. It was calculated based on national level figures for 2011, 2012 and 2013.
X_i includes socio-demographic controls of the main woman, HH head and the HH demographics and socio-economic status. Robust SE on parenthesis. Significance: * 10%, ** 5%, *** 1%.

Determinants of toilet acquisition

Results on our estimations on correlations with toilet acquisition are presented in column 5 of the same Table, Table 40. The estimates presented here help us gain a deeper understanding of which characteristics at the baseline might forecast sanitation adoption.

The results from estimating equation 2 show that the expansion was more likely to be at the third quartile, also it seems clear that once income is taken into account, schedule caste and tribe are less likely to improve their sanitation access in comparison with backward caste. This tell us that disparities on access to sanitation might be growing.

Of further importance seems to be changes in the household composition: The arrival of a new female HH member increases the likelihood of constructing a toilet significantly. We also find that this increase is *not* due to the birth of a household member. It might therefore be that this new adult member brings additional resources that allow making the investment in a toilet. Notice also that it is more likely that a household invest in sanitation if one male household member is close to the legal marriage age. This relationship on the other hand does not hold for female household members of marriage age. Two possible mechanisms come

to mind to explain these findings: the first one is that households invest into sanitation in preparation for marriage, either to make their groom candidate a more desirable candidate or since potential brides may have made their commitment decision conditional on the construction of a toilet. This latter explanation is not unlikely considering campaigns of the Indian Government using slogans such as "no loo no bride". The second mechanism is that households with boys of marriageable age anticipate an income shock through bride dowry, which facilitates the investment into sanitation. While some households have reported income from dowry in the section on household income, and hence this would already be accounted for in our analysis, it is likely that dowry income is considerably under reported in our data. This is since dowries are illegal in India and we would therefore expect households to be hesitant to report them. We nevertheless do not think that the dowry mechanisms is the dominant one but rather the investment into a toilet in preparation of a marriage. Findings we present in the next section where we analyze the link between toilet ownership and outcomes support this hypothesis.

Toilet acquisition can come from construction but it is also possible that households moved from a dwelling without a toilet to one with. Households that migrated within a community were tracked at the followup survey to the extent possible. Such a change in dwelling is however not found to be relevant. We again look also at the location of the household's dwelling in relation to OD areas and water sources. We do so only for our sample in Gwalior as this type of data is not available for Thiruvarur. Results are presented in Table 41. Note that distances for round 1 have to be inferred since GPS coordinates were only collected during the second survey round. An intuitive hypothesis would be that HHs that are located far from OD areas are more willing to invest in sanitation, which is precisely what we see in our findings: being further away from the OD area increases the likelihood of constructing a toilet between the two survey rounds. Estimates on distance to water sources provide a similar picture, showing that living further away from a water source increases the likelihood of constructing a toilet. This could be seen as less intuitive since the need for water increases with owning a toilet.

C. Toilet ownership and outcomes

We now turn to understanding links between toilet ownership and a number of outcomes. Ideally, we would like to answer the question of what the impact of owning a toilet is on variables capturing for example health and productivity of household members. However, as discussed before, the lack of a clear exogenous variation on toilet ownership makes it harder to address this question. We proceed in line with our analysis above to move away from correlations and get closer to causality. We further present robustness checks on our findings.

Table 41: Sanitation uptake and distance to OD areas and water sources

Eq5. Logit: $Y_{i,j,t=2} = g(X_{i,t,t=2}\beta_2 + u_{i,j,t=2}) \vert T_{i,j,t=1} = 0$		
	(1)	(2)
Independent Variables X	$\bar{X}_{t=2}$	Eq5
Distance to the border of the closest OD area (100m)	*1.4%*	1.95*
		(1.13)
Distance from HH to nearest water source (100m)	*1.4%*	1.08***
		(0.21)
Total N Observations		761

X_i includes socio-demographic controls of the main woman, HH head and the HH demographics and socio-economic status. Robust SE on parenthesis. Significance: * 10%, ** 5%, *** 1%.

Methodology

We can gauge the direction and size of potential impacts by analyzing how outcomes Y_i are related to toilet ownership T_i, conditional on the determinants X_i. Here, the dependent variable is the relevant outcome and we add toilet ownership as the main covariate of interest. Equation 3 presents the cross-section analysis using ordinary least squares, and equation 4 an individual linear fix-effects model.

$$Y_{i,j,t=\tau} = \delta T_{i,j,t=\tau} + X'_{i,j,t=\tau}\omega_1 + u_{i,j,t=\tau} \tag{3}$$

$$Y_{i,j,t} = \delta T_{i,j,t} + X'_{i,j,t}\omega_2 + \alpha_i + \gamma_t + u_{i,j,t} \tag{4}$$

Robustness checks

We performed several alternative specifications in order to analyze the sensitivity of the findings presented. The first one is to test the sensitivity of estimates to the inclusion of different set of covariates, X. The second one is to use linear models instead of logits for the determinants of toilet ownership and for the dichotomous outcomes. These checks are supportive of our findings presented here.

The third robustness check we conduct is to estimate Equation 2 on a sample of households matched based on the probability that they will construct a toilet in the future (propensity score) in order to get a closer approach to causal estimates[25]. While some of the variables remain unbalanced (this holds for the Thiruvarur data and partlicularly for income quartiles and caste), Figure 25 in the appendix provides the relevant evidence that through the matching procedure we ensure to run regressions on a comparable sample

[25]See **??** for further discussion. The procedure was implemented using kernel matching on the propensity score, psmatch2 **?** in Stata 13

at Round 1. We furtehr include controls in our matching estimates to reduce potential bias. Doing so, our findings are for the large part confirmed. We will mention the relevant results in our discussion below and present a summary Table with key findings from the matching in Appendix Table 47. We note that the matching discards of observations that are unsuitable for matching, which reduces our sample size and hence power to detect impacts. However, this does not greatly affect the findings.

Results

As in the impact analysis presented in section V of this report, where we look at impacts of FINISH on households in rural Tamil Nadu, we will also here present our findings clustered around different areas: health, productivity and time use, household's wealth and finances and a set of variables focusing on the main woman in the household. The first set of results (those related to health outcomes is presented in Table 42). This Table, as all others in this section, is structured as follows: As in all other tables, each row represents one outcomes (Y) considered. The first nine columns (under the heading "Cross-section analysis") show our findings from the analysis of correlations between toilet ownership and outcomes at the time of the baseline survey (columns (1)-(3)), at the endline survey (columns (4)-(6)) and for households that acquired a toilet between these two data collection waves (columns (7)-(9)). Each set of results presents three types of information: The number of observations (households or individuals, i.e. household members) (columns (1), (4), and (7)), the average of the respective outcomes variable at the time of the baseline survey (columns (2), (5), and (8)) and finally the estimated coefficients (columns (3), (6) and (9)). The last two columns of the table show the results of the panel analysis. For brevity we show here only the number of observations as well as the estimated coefficient associated with toilet ownership.

Results - Health & Environment

One of the main objectives of improving sanitation coverage is an improvement in the health situation. Sanitation in its broad sense is the maintenance of hygienic conditions. Toilets in this context act to prevent human contact with faeces. To gauge whether the construction of toilets improved the health of our study population, we distinguish between two sets of health outcomes: subjective and objective measures.

The upper panel of Table 42 presents findings on reported health outcomes: reported illnesses and health seeking behavior. We find little evidence for impacts of toilet ownership on any of these. There is a positive association between demand of health care and sanitation ownership (columns 3 and 6). However, this seems to be a fixed effect related to preferences for health-care as the panel estimator is not different from zero, showing that the construction of a toilet does not seem to increase or reduce demand for health care. Matching results confirm this. Also, notice that hospitalization is unrelated to sanitation ownership, which might be related to acute illnesses derived from poor sanitation.

We do not find any evidence of reduced incidence of diarrhea, which might be driven by the fact that

only six to ten percent of children were affected at the time of the survey rounds. This is likely to limit our ability to detect any changes with the sample size at hand.

Our subjective health indicators are respondent's perceptions of his/her own health and that of his/her family. Respondents were asked to rate their own and their family's health on a scale from 1 to 10 (with one presenting very poor health). They were also asked to rate their health in comparison to other community members of similar age and gender. Regression estimates on these outcomes are reported in the second panel of Table 42. While the coefficients on toilet ownership are all estimated to be positive, none is significant at the conventional level of 5% in our cross-sectional analysis. However, in our panel specification (column 11) we find an interesting pattern: While having a toilet is not correlated with rating ones own and ones family's health higher, the main respondent is 9.44 percentage points more likely to perceive him/herself as healthier than peers in the community and 7.6% more likely to perceive his/her family as healthier than other families in the community, after a toilet is constructed.[26] This shows the household's own perception that their toilet makes them better off compared to others.

In terms of more objective health measures we have information on stool sample analysis for children under the age of 6 and also show estimates on water quality test results.

Stool sample examination results are only available for the second survey round, hence constraining us in the methods we can apply. Overall we do not find significant correlations and patterns. There is some indication that households that constructed a toilet might be more likely to experience a small degree of malabsorption (based on higher likelihood of mucus and fat in the stool), also it might be an increase on the likelihood to present bacteria. However, the correlation for indicators of parasite infections for households with and without a toilet (based on OVA and cysts in the stool as well as acid reaction) is negative. An important issue here is sample selection: the stool sample comes from more educated households, with higher income. This implies that estimated effects are likely to be biased downwards, given that one would expect higher incidences of illnesses in poorer and lower educated households. Another issue might be statistical power due to lack of variation. Although sanitation coverage is around 60% in this sample, a bigger sample might be required to find variation in this type of outcomes.

We finally present results on water samples that were taken at the household level and tested for colony counts and other water quality indicators. Again, we do not find any difference in the quality that could be related to toilet ownership. The coefficient on the colony count is positive but not significant, providing therefore no reason to believe that toilets were badly constructed and could therefore lead to the contamination of drinking water sources. This could also be due to a high chlorine coverage of about 50% in the water. For both household types (with and without toilets) the PH is with a level of 7.2 within the commonly accepted range of 6.5-8.5.

[26] Matching estimates also show positive coefficients but the significance decreases, particularly in the panel specification. Perceptions on better health of one's own family becomes however significant at the ten percent level in the cross-section specifications.

Table 42: Health Variables

Eq6. Cross-section τ : $Y_{i,j,t=\tau} = \delta Toilet_{i,j,t=\tau} + X_{i,j,t=\tau}\omega_1 + u_{i,j,t=\tau}$
Eq7. Panel: $Y_{i,j,t} = \delta Toilet_{i,j,t} + X_{i,j,t}\omega_2 + \alpha_i + \gamma_t + u_{i,j,t}$
Sample: All available data in each survey at HH level. **Restricted (R):** HHs that did not report having a toilet at the R1.

	Cross-section analysis									Panel	
	Round 1			Round 2			Restricted Round 2			Linear Panel	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Outcome Variables Y	N Ind	$\bar{Y}_{t=1}$	Eq6	N Ind	$\bar{Y}_{t=2}$	Eq6	N Ind	$\bar{Y}_{t=2}$	Eq6	N Ind	Eq7
Health Outcomes											
=1 if visited a doctor without hospitalization (last 4 weeks)	3023	*35.1%*	5.00**	3331	*49.8%*	4.23**	1586	*49.6%*	0.91	2488	2.50
			(2.07)			(1.88)			(2.98)		(2.87)
=1 if any hh member hospitalized in last 12 months	3071	*11.2%*	−0.68	3336	*18.0%*	2.41	1585	*15.9%*	1.29	2489	0.58
			(1.53)			(1.61)			(2.40)		(1.99)
=1 if any children had diarrhoea last 7 days	2350	*10.0%*	0.18	1991	*6.7%*	−0.01	1037	*6.9%*	0.76	1732	1.44
			(1.60)			(1.04)			(1.59)		(2.10)
Subjective Health (Gwalior)											
Rate your own health from 1-10, where 1 is very poor health	1906	*7.0*	0.10	1927	*8.6*	0.06	1039	*8.6*	0.11	1744	0.07
			(0.07)			(0.07)			(0.10)		(0.09)
Perceive himself as healthier than others	1897	*32.1%*	1.19	1889	*29.3%*	1.88	1016	*29.8%*	4.44	1709	9.18***
			(3.08)			(2.41)			(2.77)		(3.34)
Rate your family's health from 1-10, where 1 is very poor health	1899	*6.9*	0.05	1924	*8.8*	0.10	1037	*8.7*	0.14	1740	0.11
			(0.07)			(0.06)			(0.09)		(0.08)
Perceive family as healthier than others	1894	*29.6%*	0.20	1881	*28.6%*	2.89	1012	*27.9%*	4.87	1701	7.13**
			(2.65)			(2.59)			(3.45)		(3.34)
Stool Sample (Gwalior)											
At least 1 child presents mucus in the stool				466	*53.4%*	7.15	263	*53.6%*	10.35		
						(7.26)			(7.64)		
At least 1 child presents stool acid reaction				466	*65.2%*	−4.26	263	*70.0%*	2.56		
						(5.43)			(5.50)		
At least 1 child presents OVA in the stool				466	*24.9%*	−4.09	263	*23.2%*	−3.87		
						(3.96)			(5.05)		
At least 1 child presents Cyst in the stool				466	*5.8%*	−1.40	263	*5.7%*	−3.30		
						(1.75)			(2.95)		
At least 1 child presents fat in the stool				466	*53.2%*	0.56	263	*56.7%*	2.29		
						(5.00)			(7.15)		
At least 1 child presents starch in the stool				466	*56.0%*	−2.82	263	*56.3%*	1.10		
						(4.45)			(7.62)		

Continued on next page

Table 42: (Continued)

	Cross-section analysis									Panel	
	Round 1			Round 2			R. Round 2			Linear Panel	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Outcome Variables Y	N Ind	$\bar{Y}_{t=1}$	Eq4	N Ind	$\bar{Y}_{t=2}$	Eq4	N Ind	$\bar{Y}_{t=2}$	Eq4	N Ind	Eq5
At least 1 child presents bacteria in the stool				466	*9.4%*	−2.22	263	*7.2%*	4.49*		
						(2.19)			(2.58)		
Water Quality (Gwalior)											
=1 if water is clear				1701	*73.7%*	4.38	931	*72.1%*	2.66		
						(3.19)			(4.24)		
=1 if deposit present				1701	*73.7%*	4.33	931	*72.1%*	2.30		
						(3.19)			(4.22)		
=1 if chlorine present				1701	*46.5%*	−0.73	931	*54.8%*	−0.71		
						(2.73)			(3.41)		
PH				1701	*7.2*	−0.00	931	*7.2*	0.01		
						(0.02)			(0.02)		
Coloby count (1000s organisms)				597	*104.5*	1.60	330	*102.9*	−0.22		
						(2.61)			(2.91)		

† Rupees of 2013: R1 values where adjusted by a factor of 1.32. It was calculated based on national level figures for 2011, 2012 and 2013.
X_i includes socio-demographic controls of the main woman, HH head and the HH demographics and socio-economic status. Robust SE on parenthesis. Significance: * 10%, ** 5%, *** 1%.

Productivity and children's time allocation

One of the possible results of improved sanitation coverage is an increase in productivity due to improved health. That might be reflected in wages and in participation on the labor market, but - as we showed in our theoretical framework - it is not straightforward how. For instance, improved productivity might increase potential wages which may drive more people into the labor market; as a result, wages might not increase and even could decrease. Results just presented raise doubts of the importance of this channel. However, the picture found in the data is richer than this.

Cross-sectional analysis from both of the two survey rounds reveals that there is a positive correlation between the total number of hours supplied by the HH and sanitation ownership (results not shown). However, when we include controls, such links fade out. The interesting pattern that emerges is when we look at labor supply by gender (presented in Table 43, first two outcomes variables): We find that while male labor supply is the same for households with and without a toilet[27], female labor supply is reduced for households with sanitation. These findings are confirmed in our panel specification, column 11 as well as through the matching exercise.[28] One possible explanation for this finding is that male wages might increase faster than those of females, so that one would expect households to re-allocate labour hours to male household members in response. However, there is no significant evidence of differential wage growth by genders[29].

As before, our identification strategy requires us to make strong assumptions to claim for results to be causal. However there is a strong correlation between female labor participation conditional on HH income level and demographics. We have seen that HHs that construct toilets also have women who work less. One possible theory is that both sanitation and non-female labour participation are related to social status, and some HHs are willing to invest their resources to achieve it.

We do not have information on time allocation of the women beyond working hours, but results we present next might suggest that women take over tasks that were previously undertaken by children, including certain home chores and collection of water. The lower panel of Table 43 shows estimates of the relationship between toilet ownership and the time allocation of children age 3-15 years in the HH (information available for our Gwalior sample only). We conduct the analysis using an indicator for a positive amount of time reported in a specific activity by at least one child within the considered age rage. As a robustness check (not reported in the table), we also estimated the relationship with reported average hours of all the children in the household, a variable we expect to suffer from a significant degree of truncation. The findings are in line. Consistently across all specifications we find evidence that children living in households with a toilet spend less time on domestic housework. We also find evidence in some of the specifications that these children spend significantly less time carrying water. Our findings suggest that some of these hours are spent on education.

[27] An exception is the coefficient in the baseline cross-sectional specification, which is negative and significant.

[28] When breaking it down by age of the women (not shown) we find that it is mainly women above the age of 25 years that work less. Results are not shown but available from the authors on request. Note that while coefficients are consistent in the matching exercise, the findings loose their significance in this specification, likely due to the significantly reduced sample size.

[29] If anything, the panel coefficient of the matching exercise suggests a reduction in male wage.

Table 43: Time Allocation and Labour Market

Eq6. Cross-section τ **:** $Y_{i,j,t=\tau} = \delta Toilet_{i,j,t=\tau} + X_{i,j,t=\tau}\omega_1 + u_{i,j,t=\tau}$
Eq7. Panel: $Y_{i,j,t} = \delta Toilet_{i,j,t} + X_{i,j,t}\omega_2 + \alpha_i + \gamma_t + u_{i,j,t}$
Sample: All available data in each survey at HH level. **Restricted (R):** HHs that did not report having a toilet at the R1.

	Cross-section analysis									Panel	
	Round 1			Round 2			Restricted Round 2			Linear Panel	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Outcome Variables Y	N Ind	$\bar{Y}_{t=1}$	Eq6	N Ind	$\bar{Y}_{t=2}$	Eq6	N Ind	$\bar{Y}_{t=2}$	Eq6	N Ind	Eq7
Labour market											
Total male paid working hours of the HH	3071	*12.7*	-1.74^{***}	3355	*10.1*	0.46	1597	*10.2*	0.69	2505	0.69
			(0.44)			(0.38)			(0.52)		(0.48)
Total female paid working hours of the HH	3071	*3.1*	-1.19^{***}	3355	*3.0*	-1.01^{***}	1597	*3.1*	-1.05^{***}	2505	-0.98^{***}
			(0.36)			(0.21)			(0.30)		(0.34)
(LOG) Typical wage/hour males (Rs†) per hhm	2016	*21.6*	$7.22\%^{*}$	2238	*40.8*	1.06%	1058	*34.5*	5.06%	1681	1.96%
			(3.85)			(3.35)			(3.66)		(5.33)
(LOG) Typical wage/hour female (Rs†) per hhm	598	*12.5*	7.78%	875	*21.4*	$13.93\%^{*}$	454	*19.3*	15.07%	660	2.82%
			(8.47)			(7.28)			(9.21)		(20.06)
Children 3-5 Time Allocation (Gwalior)											
Children 3-15: =1 if doing domestic housework	1542	*44.8%*	-6.57^{**}	1409	*46.8%*	−3.50	781	*49.8%*	−1.62	1266	-11.84^{***}
			(2.71)			(2.40)			(2.99)		(3.75)
Children 3-15: =1 if carrying water	1542	*41.5%*	-8.23^{**}	1402	*37.9%*	-9.05^{***}	777	*45.6%*	-9.06^{**}	1259	-15.18^{***}
			(3.27)			(2.78)			(3.51)		(4.33)
Children 3-15: =1 if working HH business	1542	*2.3%*	-2.56^{**}	1401	*14.7%*	−1.45	776	*18.8%*	−1.49	1258	−1.28
			(1.10)			(1.66)			(2.10)		(2.38)
Children 3-15: =1 if playing	1542	*82.2%*	2.75	1403	*88.9%*	−1.67	778	*90.4%*	0.71	1260	2.04
			(2.39)			(2.04)			(2.40)		(2.99)
Children 3-15: =1 if taking care of elders or sick HH members	1542	*42.5%*	−0.20	1404	*30.8%*	2.93	779	*32.0%*	3.33	1261	−1.82
			(3.22)			(2.81)			(3.42)		(4.36)
Children 3-15: =1 if extra education	1542	*21.0%*	7.57^{***}	1409	*32.2%*	4.86^{*}	781	*28.4%*	3.95	1266	2.81
			(2.55)			(2.84)			(4.45)		(3.75)

† Rupees of 2013: R1 values where adjusted by a factor of 1.32. It was calculated based on national level figures for 2011, 2012 and 2013. Wages are for individuals aged 25 to 60.
X_i includes socio-demographic controls of the main woman, HH head and the HH demographics and socio-economic status. Robust SE on parenthesis. Significance: * 10%, ** 5%, *** 1%.

Consumption, Wealth and Finances

Sanitation can affect the wealth of households in a number of ways. We discussed in our theoretical framework that through improved health households might become more productive and hence work more or earn higher wages. Given that we are controlling for annual income per capita of the household, a downward bias might be introduced in all estimates that are directly related to it. However, we find large, positive and significant correlation between sanitation ownership and uptake and household consumption. Table 44 shows estimates for a number of consumption expenditure variables. Total expenditure is, consistently across specifications, positively correlated with sanitation ownership as well as acquisition. In line, estimates on non-durable consumption expenditures, which includes expenditures on items such as transport, utilities, fuel, salary, education, health, cosmetics, follow the same pattern. No clear relationship is found on expenditures on alcohol and tobacco, food consumption expenditures on the other hand also show positive and significant correlations with toilet ownership. However, for food consumption expenditures, this relationship only in the cross-sectional specifications. Once the panel estimator is considered, the point estimate is not different from zero.[30] Overall, the evidence suggests that, while there might be extra operational costs due to the toilet, there seems to be a general increase in consumption expenditures for household that decided to invest in a toilet.

A change one would expect due to investment in sanitation is an increase in the dwelling value. And we see this to be indeed the case. Table 45 shows that owning a toilet increases the value of the dwelling significantly - a finding that is consistent across all our specifications and in the robustness analysis. And the increase in value is much above the investment needed to construct the toilet. As mentioned before, the typical toilet owned in our sample (a single pit toilet) can be built with 10,000 Rs and households that provided estimates on construction costs of their toilet reported these to have been around Rs 20,000. The reported increase in value of the dwelling due to the toilet is on the other hand significantly higher at 50,000 Rs. This is for houses that are on average worth 170,000 Rs in 2013. It is worth stressing though that these values are self-reported and it is conceivable that respondents have a biased view on the value of an investment as large as 20% of average household annual income. However, having said that, typically toilets also provide households with private bathing space and we indeed find that households with a toilet are about 30% more likely to also own a bathroom.

Interestingly, we also find significant relationships between sanitation and other assets the households own. Specifically, the value of other *household* asset is significantly higher if household have a toilet and there is some indication that also transportation assets (bicycle, scooter, motorbike and fourwheeler) increases with sanitation ownership. These results tell us more about the idea of social status: despite having similar income, HHs with sanitation might also have better quality of life in general.

[30] Results of the matching are confirming these results on consumption expenditures, showing positive and highly significant increases in total consumption of around 16-17 percentage points, primarily driven by expenditures on non-durable consumption. The results on food consumption are again less clear and differ by specification.

We finally consider savings and credit of our study households, shown in the lower panel of Table 45. Results on savings suggest that households with toilets are slightly more likely to have savings in 2010, but not in 2013 (matching panel results even suggest a decrease in savings). This supports once again that toilet-ownership is spreading towards household with less means. We already saw that households of lower income and lower castes caught up in terms of toilet ownership between the two waves.

Results on credit outcomes suggest that the investment in toilets was facilitated by greater credit access. We see that households which own a toilet have larger loans (as a proportion of their income), especially at the time of the second survey round in 2013. The result holds in the cross-sectional as well as longitudinal specification. Also matching estimates show this pattern. This is a very interesting result with respect to the descriptive analysis: most of the HHs claimed that they used their own resources to build a toilet, however it seems that access to credit is essential for allowing HHs to make such investments.

Table 44: Household Consumption

Eq6. Cross-section τ **:** $Y_{i,j,t=\tau} = \delta Toilet_{i,j,t=\tau} + X_{i,j,t=\tau}\omega_1 + u_{i,j,t=\tau}$
Eq7. Panel: $Y_{i,j,t} = \delta Toilet_{i,j,t} + X_{i,j,t}\omega_2 + \alpha_i + \gamma_t + u_{i,j,t}$
Sample: All available data in each survey at HH level. **Restricted (R):** HHs that did not report having a toilet at the R1.

	Cross-section analysis									Panel	
	Round 1			Round 2			Restricted Round 2			Linear Panel	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Outcome Variables Y	N Ind	$\bar{Y}_{t=1}$	Eq6	N Ind	$\bar{Y}_{t=2}$	Eq6	N Ind	$\bar{Y}_{t=2}$	Eq6	N Ind	Eq7
Consumption last year per hhm											
(LOG) Total consumption (1000 Rs†)	3065	*23.8*	13.65%***	3354	*23.0*	17.74%***	1597	*20.7*	13.85%***	2505	14.49%***
			(2.57)			(2.77)			(3.72)		(3.57)
(LOG) Total food consumption excl. tobacco and alcohol (1000 Rs†)	3033	*15.5*	8.25%***	2997	*9.7*	10.13%***	1457	*8.6*	8.23%**	2304	4.88%
			(2.77)			(2.47)			(3.80)		(3.79)
(LOG) Non-durable I consumption (1000 Rs†)	3043	*6.2*	28.45%***	3339	*10.6*	28.10%***	1591	*8.8*	17.44%***	2494	24.10%***
			(4.11)			(3.29)			(5.04)		(4.71)
(LOG) Expenditure on Alcohol and tobacco yearly (1000 Rs†)	617	*0.9*	12.56%	718	*1.8*	−2.48%	376	*2.0*	−1.23%	590	−7.03%*
			(14.43)			(13.18)			(17.59)		(4.11)

† Rupees of 2013: R1 values where adjusted by a factor of 1.32. It was calculated based on national level figures for 2011, 2012 and 2013.
X_i includes socio-demographic controls of the main woman, HH head and the HH demographics and socio-economic status. Robust SE on parenthesis. Significance:
* 10%, ** 5%, *** 1%.

Table 45: Assets and finances

Eq6. Cross-section τ : $Y_{i,j,t=\tau} = \delta Toilet_{i,j,t=\tau} + X_{i,j,t=\tau}\omega_1 + u_{i,j,t=\tau}$
Eq7. Panel: $Y_{i,j,t} = \delta Toilet_{i,j,t} + X_{i,j,t}\omega_2 + \alpha_i + \gamma_t + u_{i,j,t}$
Sample: All available data in each survey at HH level. **Restricted (R):** HHs that did not report having a toilet at the R1.

	Cross-section analysis									Panel	
	Round 1			Round 2			Restricted Round 2			Linear Panel	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Outcome Variables Y	N Ind	$\bar{Y}_{t=1}$	Eq6	N Ind	$\bar{Y}_{t=2}$	Eq6	N Ind	$\bar{Y}_{t=2}$	Eq6	N Ind	Eq7
Water and Dwelling Characteristics											
=1 if main source drinking water is HH service connection	3071	*22.2%*	15.82***	3352	*30.0%*	8.72***	1596	*23.7%*	6.65***	2504	12.58***
			(2.61)			(1.94)			(2.23)		(2.24)
=1 if HH has a bathroom	3071	*50.6%*	38.61***	3353	*68.2%*	27.14***	1596	*60.5%*	28.75***	2504	29.97***
			(2.44)			(1.89)			(2.61)		(2.56)
(LOG) Value of the dwelling (1000 Rs.†)?	2442	*160.9*	41.22%***	2700	*274.6*	46.97%***	1340	*201.5*	37.78%***	1980	38.09%***
			(5.56)			(5.92)			(8.94)		(8.65)
Other assets											
(LOG) Transport (1000 Rs†)	2237	*11.2*	29.78%***	2506	*26.2*	50.54%***	1153	*15.2*	40.36%***	1861	30.43%***
			(7.56)			(7.64)			(10.19)		(9.93)
(LOG) House elements (1000 Rs†)	2977	*68.0*	15.81%***	3220	*367.7*	30.38%***	1537	*272.9*	28.26%***	2434	31.73%***
			(4.94)			(5.97)			(8.47)		(7.98)
(LOG) Farm (1000 Rs†)	1163	*50.5*	−3.06%	1385	*97.9*	22.98%**	749	*97.2*	1.62%	1001	26.70%*
			(14.83)			(11.12)			(14.09)		(15.74)
Savings and loans											
=1 if hh has any type of savings	3071	*36.2%*	3.10	3343	*46.7%*	3.59**	1591	*44.1%*	1.50	2495	1.93
			(2.15)			(1.72)			(2.44)		(2.54)
(LOG) Amount of savings per hhm (1000 Rs†)	1073	*3.2*	9.14%	1483	*2.2*	43.85%***	673	*1.9*	29.42%**	1017	29.81%
			(10.82)			(8.68)			(12.46)		(19.36)
=1 if household has debt outstanding	2916	*38.5%*	−4.76**	2745	*56.4%*	−0.19	1288	*58.6%*	3.66	1972	−0.45
			(2.29)			(2.62)			(3.57)		(3.16)
(LOG) Amount of debt outstanding (calculated) per hhm (1000 Rs†)	1091	*10.0*	20.98%***	1741	*23.6*	38.64%***	802	*18.6*	61.65%***	1149	57.66%***
			(7.69)			(10.43)			(12.42)		(17.07)

† Rupees of 2013: R1 values where adjusted by a factor of 1.32. It was calculated based on national level figures for 2011, 2012 and 2013.
X_i includes socio-demographic controls of the main woman, HH head and the HH demographics and socio-economic status. Robust SE on parenthesis. Significance:
* 10%, ** 5%, *** 1%.

Main woman of the household

Our final set of outcomes focuses on the main woman in the household. We consider three types of variables: Financial information of the woman (savings), her knowledge about hygiene and sanitation practices and indicators of empowerment. The latter are often considered a determinant of uptake with more empowered women having higher bargaining power to push for the asset. We check here whether a relationship exists the other way round and the direction of this possible relationship. One could consider that a toilet provides the women of the household with less influence since they now have less reason to leave the dwelling and hence less possibilities for interaction with others in the community. On the other hand, one could think of situations where a toilet offers time savings which lead to more interaction and say within the household.

The upper panel of Table 46 shows results on empowerment indicators. We find little consistent correlation between sanitation and empowerment of the main woman in the household. The freedom of mobility indicator captures whether or not the women were allowed to go unaccompanied to a local market, to the health center or doctor, to visit neighbours, to visit friends/family within village, to visit relatives outside the village, to visit religious facilities, to collect water. The index runs from 0 to 7 as it is the sum of positive answers to those questions. Control over money index, from 0 to 6, follows a similar pattern. It takes into account if women control the money needed for buying fruits or vegetables, other food items, clothes for herself, medicine for herself, toiletries for herself, and clothes and medicine for her kids. Participation in household choices is a sum of dichotomous questions related to her participation on a set of decisions: to work, to buy a durable good, how to allocate the typical budget, and what to do with extra resources. The unconditional correlations are negative for control over money[31] and mobility indexes, while positive for the participation one. These results might suggest that both women empowerment and sanitation are outcomes of the marriage market (as discussed in the determinants section), and sanitation per se does not seem to be related to variations on such power once the couple is established. However, given that we do not have exogenous variation on women power in the household, we cannot test such hypothesis formally. Similarly, we do not find that savings of the main woman seem to change with toilet ownership or acquisition.

The last two variables presented in the Table capture hygiene knowledge of the main woman. The variables are derived from a set of 21 items that ask if water can cause diseases, for causes of diarrhea, and possibilities to prevent it. While the correlation is positive with the total correct answers, and negative with the incorrect ones (it was possible to omit questions), such relation is weak and seems unrelated to the decision to invest or not in sanitation. However, matching results show stronger evidence in the panel specification that knowledge increases over time with a positive and significant coefficient on number of correct answers and the opposite for number of incorrect answers.

[31] Matching results suggest a significant negative relationship between sanitation ownership and control over money.

Table 46: Main women hygiene-related outcomes

Eq6. Cross-section τ **:** $Y_{i,j,t=\tau} = \delta Toilet_{i,j,t=\tau} + X_{i,j,t=\tau}\omega_1 + u_{i,j,t=\tau}$

Eq7. Panel: $Y_{i,j,t} = \delta Toilet_{i,j,t} + X_{i,j,t}\omega_2 + \alpha_i + \gamma_t + u_{i,j,t}$

Sample: All available data in each survey at HH level. **Restricted (R):** HHs that did not report having a toilet at the R1.

	Cross-section analysis									Panel	
	Round 1			Round 2			Restricted Round 2			Linear Panel	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Outcome Variables Y	N Ind	$\bar{Y}_{t=1}$	Eq4	N Ind	$\bar{Y}_{t=2}$	Eq4	N Ind	$\bar{Y}_{t=2}$	Eq4	N Ind	Eq5
Main women hygiene-related outcomes											
Freedom of mobility index	3071	*5.1*	−0.33*	3355	*4.9*	−0.14	1597	*5.0*	−0.29	2505	0.01
			(0.20)			(0.13)			(0.20)		(0.17)
Participation in household choices index	3071	*3.2*	−0.30**	3355	*3.7*	0.05	1597	*3.7*	0.05	2505	0.03
			(0.15)			(0.09)			(0.12)		(0.12)
Control over money index	3071	*4.3*	−0.25	3355	*2.8*	−0.17	1597	*2.9*	−0.33*	2505	−0.08
			(0.18)			(0.12)			(0.17)		(0.16)
Report to have savings on her own				2842	*33.8%*	−0.17	1378	*32.2%*	0.89		
						(1.95)			(2.52)		
Savings amount (if any)				2843	*706.0*	−82.36	1379	*519.5*	−149.88		
						(147.33)			(126.02)		
Hygiene Knowledge test index: correct answers	2840	*16.3*	0.03	2847	*14.2*	0.12*	1382	*15.0*	0.07	2184	0.08
			(0.19)			(0.07)			(0.12)		(0.33)
Hygiene Knowledge test index: incorrect answers	2781	*4.4*	0.08	2847	*7.5*	−0.12*	1382	*6.7*	−0.09	2184	0.07
			(0.17)			(0.07)			(0.11)		(0.32)

† Rupees of 2013: R1 values where adjusted by a factor of 1.32. It was calculated based on national level figures for 2011, 2012 and 2013.
X_i includes socio-demographic controls of the main woman, HH head and the HH demographics and socio-economic status. Robust SE on parenthesis. Significance: * 10%, ** 5%, *** 1%.

D. Discussion and Conclusions

Given complications that arose during the evaluation of the FINISH intervention, we turn to an analysis of toilet ownership and acquisition rather than FINISH impacts. The data collected as part of the FINISH evaluation provides us with the opportunity to study important determinants of toilet ownership and acquisition of slum-dwellers and households in peripheral villages of Gwalior city in Madhya Pradesh, India as well as rural villages in Tamil Nadu.

This is an important question to consider for two main reasons: India's slum population is growing rapidly while at the same time having no or only inadequate access to safe sanitation and at the same time we observe resistance to uptake of sanitation in rural areas. High population density coupled with improper means of disposing faeces provides a breeding ground for preventable disease epidemics.

At the same time – contrary to common perception - willingness to pay exists in these markets and households are aware of benefits they can reap from having access to safe sanitation (Sinroja, 2013).

Our findings suggest that an important motivator for toilet construction is status and living standards. Households not only report their status to have increased due to acquisition of a private toilet, they also report the value of their dwelling to be significantly higher and we find other changes that could be related to improved status such as a reduction in labor of the main woman in the household. This reduced labor shows sign of increasing investment in education of the children in the household.

Contrary to studies that suggest that health considerations play only a minor role in the decision to acquire sanitation, we find that households perceive to be healthier than their neighbors because of the constructed toilet. While we cannot draw a clear conclusion from the data whether households are actually healthier, our evidence strongly suggests that they personally feel that the toilet made them better off compared to other households.

We also provide evidence that financial constraints are particularly binding for households in the lower end of the income distribution and that access to finance facilitates uptake. This could be through finance for the specific purpose of building sanitation, but also by freeing other resources that can now be invested to construct a toilet.

These findings suggest that messaging around status and moving up in society might resonate well with this type of population. Our findings also suggest that campaigns such as the 'no loo, no bride' campaign launched by the government of Haryana in 2005 might work particularly well in a more urban setting. A paper by Stopnitzky (2011) shows in line with this that increasing proportions of females with strong sanitation preferences drive male investment in toilets.

Overall, our findings suggest that despite being an investment of considerable size for poor households, they value the decision and perceive to have gained along a number of margins.

References

Cameron, Shah and Olivia. Impact Evaluation of a Large-Scale Rural Sanitation Project in Indonesia. World Bank Impact Evaluation Series No. 83. February 2013.

Manisha Cameron, Lisa; Shah. Scaling up rural sanitation: Findings from the impact evaluation baseline survey in indonesia. Technical report, World Bank, 2010[32]. License: CC BY 3.0 IGO.

Spears, Dean ; Hammer, Jeffrey. Village sanitation and children's human capital : Evidence from a randomized experiment by the maharashtra government. Technical report, World Bank, 2013[33]. License: CC BY 3.0 Unported.

Humphrey, Jean H . Child undernutrition, tropical enteropathy, toilets, and handwashing. The Lancet, 374(9694):1032_1035, 2009.

NSSO. Some characteristics of urban sslum 2008-09. Report 534, National Sample Survey Office, National Statistical Organization, Ministry of Statistics and Programme Implementation, Government of India, May 2010.

Pattanayak,Subhrendu K, Katherine L Dickinson, Jui-Chen Yang, Sumeet R Patil, Purujit Praharaj, and Christine Poulos. Promoting latrine use: Midline findings from a randomized evaluation of a community mobilization campaign in bhadrak, orissa. Working Paper 2, Research Triangle Institute, 2007.

Pattanayak, Subhrendu K, Jui-Chen Yang, Katherine L Dickinson, Christine Poulos, Sumeet R Patil, Ranjan K Mallick, Jonathan L Blitsteinb, and Purujit Praharajf. Shame or subsidy revisited: social mobilization for sanitation in orissa, india. Bulletin of the World Health Organization, 87: 580_587, 2009.

Sinroja, Ratna. Slum sanitation in india - is there a case for private toilet provision? Blog, March 2013. URL http://businessinnovationfacility.org/profiles/blogs/slum-sanitation-in-india-is-there-a-case-for-private-toilet. Last accessed 10th of September 2014.

Spears, Dean. Effects of rural sanitation on infant mortality and human capital: Evidence from india's total sanitation campaign, 2012. Princeton.

Spears, Dean and Sneha Lamba. E_ects of early-life exposure to rural sanitation on childhood cognitive skills: Evidence from india's total sanitation campaign, 2011. Princeton. WaterAid-India. India country strategy 2011-2016, Dec 2011.

WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (2012). Progress on Drinking Water and Sanitation: 2012 Update. Geneva, New York: WHO/UNICEF.

[32]URL https://openknowledge.worldbank.org/handle/10986/17271
[33]URL https://openknowledge.worldbank.org/handle/10986/16014.

Appendix

Appendix A – Data provided by BWDC for re-randomization

Figure 23: Toilet Ownership

FINISH=1 Control=1	Sno	GP	First Loan dis Date	Last loan Dis Date	No of Loans	No of Beneficiary	Loan Expected closing last date	Good GP	Estimated_toilets New	Estimated_toilets Rehabi
1	1	Nadagudi	-					no		
1	2	Paruthiyur	-					no		
1	3	Kaliyagudi	8-Dec-11	8-Dec-11	1	2	12-Mar-13	no		
1	4	Thaliyur	7-Jul-11	7-Jul-11	2	10	14-Oct-12	yes	20	26
1	5	Thuthugudi	-	-	-	-	-	yes	20	20
1	6	Thirukottaram	11-Apr-12	11-Apr-12	2	10	16-Jul-13	yes	19	19
1	7	Moolangudi	-	-	-	-	-	no		
1	8	Kollapuram	11-Apr-12	24-Jul-12	2	9	12-Nov-13	yes	25	25
1	9	Senganur	-	-	-	-	-	yes	20	20
1	10	Annathanapuram	-	-	-	-	-	no		
1	11	Seruvalur	-	-	-	-	-	yes	21	21
1	12	Kottur	24-Sep-11	8-Dec-11	5	30	18-Mar-13	yes	19	19
1	13	Thirukandeeswaram	-	-	-	-	-	yes	20	20
1	14	Srivanjiyam	-	-	-	-	-	yes	25	25
1	15	Keelgudi	-	-	-	-	-	yes	23	20
1	16	Veethividangan	19-Sep-11	12-Dec-11	2	12	16-Mar-13	yes	24	20
1	17	Polagudi						no		
1	18	Pillur	7-Nov-11	7-Nov-11	1	5	10-Feb-13	yes	25	20
1	19	Saliperri	22-Sep-11	22-Sep-11	3	14	14-Dec-12	yes	15	16
1	20	Achuthamangalam						yes	25	25
1	21	Rettakkudi						no		
1	22	Mahilancherry	27-Apr-12	19-Aug-12	2	10		yes	19	25
1	23	Kothavasal	11-Apr-12	11-Apr-12	4	20	16-Jul-13	yes	20	24
1	24	Ubayavedandapuram	22-Oct-11	24-Jul-12	3	13	20-Aug-13	yes	20	21
1	25	Keeranur						yes	25	25
1	26	Kadakagudi						no		
1	27	Kandaramanickam	7-Jul-11	7-Jul-11	2	3	15-Oct-12	yes	15	19
1	28	Vaduvakudi						no		
1	29	Neikuppai						yes	15	20
1	30	Sarhuneshwaram						no		
1	31	Thethiyur						no		
1	32	Seethakkamangalam	7-Jul-11	17-Aug-12	7	28	10-Nov-13	yes	25	25
1	33	Manavalanallur						no		
1	34	Vayalur						no		
1	35	Nemmeli						yes	20	16
1	36	Neduncherry						yes	20	20
1	37	Kadalangudi						no		
1	38	Alathur						no		
0	1	Moongilkudi						yes	15	10
0	2	Alangudi						yes	30	20
0	3	Menangudi						yes	25	10
0	4	Mudikondan	22-Sep-11	5-Apr-12	7	27	14-May-13	yes	30	20
0	5	Sembiyanallur						no		
0	6	Agarathirumalam	22-Sep-11	22-Sep-11	5	12	14-Dec-12	yes	25	15
0	7	Anaikuppam						yes	20	10
0	8	Kaduvangudi	27-Apr-12	27-Apr-12	3	15	16-Aug-13	no		0
0	9	Visalur						yes	10	10
0	10	Koilthirumalam						yes	20	20
0	11	Panandaravadai						yes	20	20
0	12	Thirumeichur						no		
0	13	Serupuliyur						no		
0	14	Maharajapuram						yes	20	10
0	15	Sorakkudi						yes	10	10
0	16	Panangudi	7-Jul-11	24-Sep-11	3	12	12-Jan-13	yes	15	15
0	17	Kurungulam	15-Jul-11	11-Apr-12	12	44	18-Jul-13	yes	10	20
0	18	Thattathimoolai						no		
0	19	Velangudi	7-Jul-11	8-Dec-11	5	21	12-Mar-13	yes	25	20
0	20	Pavattakudi						yes	20	20
0	21	Vadakudi	24-Sep-11	9-Apr-12	11	36	16-Apr-13	yes	15	10
0	22	Kuvalaikkal						yes	10	10
0	23	Kadagam	15-Jul-11	11-Apr-12	6	17	16-Jul-13	no		
0	24	Valkai	7-Jul-11	12-Dec-11	9	29	10-Mar-13	yes	25	20
0	25	Thirupambaram						no		
0	26	Vikkarapandiyam						no		
0	27	Naranamangalam	12-Oct-11	12-Oct-11	1	3	5-Feb-13	yes	25	20
0	28	Perumbanaiyur						yes	30	25
0	29	Sarabojirajapuram						yes	20	20
0	30	Thiruvizhimizhalai						no		
0	31	Suraikkayur						no		
0	32	Thiruvidacherry						yes	20	25
0	33	Prathabaramapuram						yes	10	10
0	34	Anniyur						no		
0	35	Paravakarai						no		
0	36	Vishnupuram						no		
0	37	Vilagam						no		
0	38	Serugudi						no		

APPENDIX B – Sambhav Data as of October 2012

Figure 24: Toilet Ownership

	Treatment SLUMS/VILLAGES													CONTROL SLUMS/VILLAGES						
						Before Survey		Present Status						Where Sambhav Has provided sanitation loan or conducted awamess creation activities						
	Name	Ward	Households	Population	With Toilet	Without Toilet	HH With Toilet	No. of Toilet Constructed	Total Household with Toilet	Number of Loan Given	Name	Ward No.	Household	Population	Total No.of Toilets	No. of Toilets Constructed	Loan Given
1	Shanikarpur	1	580	2900	73	507	220	147	220	0	Payaja	54	423	2115	266	26	0
2	Motpheel	1	250	1300	130	120	250	120	250	77	Awadpura	60	1505	9400	641	21	5
3	Maida Mohalla	10	100	582	30	70	70	40	70	0							
4	Ramta Pura	13	600	3100	402	198	410	8	410	0							
5	Peetal Karkhana	27	65	825	5	60	14	9	4	0							
6	Ram Nagar	28	147	900	42	105	280	238	280	5							
7	Mahal Gaon	29	400	2700	225	175	340	115	340	0							
8	Har Kheda	29	60	335	4	56	57	53	57	0							
9	Satya Narayan Ki Tl	3	735	3575	280	455	560	280	560	96							
10	Ghosipura	3	400	2000	128	272	320	192	320	10							
11	Nimma Ji Ki Kheh	45	500	3300	200	300	450	250	450	142							
12	Shivnagar	48	197	600	98	99	160	62	160	21							
13	Raja Gas Godam	48	300	1500	150	150	240	90	240	6							
14	Lhar Khana	52	93	485	10	83	80	70	80	0							
15	Bodhi Nagar	54	250	1300	130	120	274	144	274	27							
16	Masmo Ka Mohalla	56	103	515	40	63	45	5	45	0							
17	Rangyana Mohalla	9	400	2250	210	190	340	130	340	85							
18	Raja Ki Mandi	9	1200	6000	653	547	740	87	740	0							
19	Naya Gaon	village	300	1500	10	290	82	72	82	0							
20	Veerpur	village	1070	5992	525	545	761	236	761	26							
21	Sunarpura	village	450	2250	25	425	110	85	110	0							
22	Gunkha	village	243	1215	20	223	80	60	80	0							
23	Hamarm Ka Pura	village	222	940	70	152	90	20	90	0							
24	Ajaypur	village	600	3360	360	240	437	77	437	5							
25	Raipur Khurd	village	98	588	19	79	80	61	80	0							
26	Sirol Colony	29	400	2200	40	360	390	350	390	63							
27	Dongar Pur	29	195	975	82	113	160	78	160	15							
28	Raipur Kala	village	135	1000	20	115	91	71	91	0							
29	Lakkad Khana	55	330	1800	223	107	280	57	280	0							
			10423	55987	4204	6219	7411	3207	7401	578							

APPENDIX C - Theoretical Framework

Toilet acquisition

Households get utility from their consumption C, leisure L and health H. For simplicity of notation, we will assume that sanitation investment enter into the utility via health capital, via assets or directly into utility according to a function $h(T_t)$ which captures motives as comfort or other motivations that do not interact with economic activity. Also, let's assume that U is quasi-concave, twice continuously differentiable and that $U_x > 0, U_{xx} \leq 0, x \in \{C, L, H\}$.

$$U_t = U(C_t, L_t, H_t) + h(T_t) \tag{5}$$

The household chooses non-durable consumption C_t, its total labour supply, $\bar{L} - L_t$ ($\bar{L}$ is the total number of hours available for leisure and labour), their borrow/savings level, B_t ($B_t < 0$ is equivalent to savings), and also whether to get a toilet, $T_t = 1$, or not, $T_t = 0$. Toilets are indivisible, so this is a discrete choice. If the decision to get a toilet is made in period t, it will only be available in period $t + 1$. A toilet investment costs k ($k \geq 0$).

The health production function $f(\cdot)$ translates H_t into H_{t+1}, but it also depends on toilet ownership, T, and the level of toilet density in the community household i lives in ($\overline{T}_t$).

$$H_{t+1} = f(H_t, T_t, \bar{T}_t) \tag{6}$$

For simplicity we might assume that $\overline{T}_t$ is exogenous. That is, individuals consider that their choice T_t is not relevant enough to modify $\overline{T}_t$.

Apart from labour, which is paid at a rate $w(H_t)$, the household has an income stream Y_t in each period which is unrelated to sanitation or health (which is assumed to be known with certainty). Access to capital markets is subject to a ceiling $\bar{B}$ ($B_t \leq \bar{B}$) and both savings and borrowing returns are subject to a fix and known interest rate $1 - r$.

$$C_t + w(H_t)L_t = A_t + w(H_t)\bar{L} + Y_t + B_t - kT_t \tag{7}$$

The investment into sanitation increases the household's dwelling value, which is reflected in an increase in their assets, A_t (all of them considered to be liquid). The gross return on the sanitation investment is ρ_t, which is a function of the average level of sanitation $\overline{T}_t$ (an increase of the value of the dwelling). Then, the evolution of assets is governed by the returns of borrowing/savings and of the sanitation investment.

$$A_{t+1} = -rB_t + \rho_t T \tag{8}$$

Two period model

For ease of exposition, let's assume that there are only two periods. Also, $H_2 = f(H_1, T, \overline{T}_1)$ is assumed to be know with certainty as there is no uncertainty and H_1, A and$\bar{T}_1$ are known. Hence, a HH would decide to construct a toilet if $V^{T=1} > V^{T=0}$, where $V^T(H_1, A_1, \bar{T}_1; \theta)$ (as defined in Equation 9) and θ is the set of parameters of the model.

$$V^T = max_{c_1,c_2,L_1,L_2,B} U(C_1, H_1, L_1) + \beta U(C_2, H_2(T), L_2) + \beta h(T) \tag{9}$$

$$st. \begin{cases} C_1 + w(H_1)L_1 = A_1 + w(H_1)\bar{L} + Y + B - kT \\ C_2 + w(H_2)L_2 = -rB + \rho T + w(H_2)\bar{L} + Y \\ B \leq \bar{B} \end{cases} \tag{10}$$

The first order conditions of the problem present the classic two elements of the inter-temporal consumer model. First, there is a normal trade-off between consumption and labour: $U_C(C_t, H_t, L_t) = U_L(C_t, H_t, L_t)\frac{1}{w(H_t)}$. Second, the Euler equation governs the relation between consumption (and labour) in both periods: $U_C(C_1, H_1, L_1) = \beta r U_C(C_2, H_2, L_2)$ as long as the credit constrain is not binding. Also, under such scenario, we can link both budget restrictions via borrowing:

$$C_1 + w(H_1)L_1 + \frac{1}{r}(C_2 + w(H_2(T))L_2) = [A_1 + Y + \frac{1}{r}Y] + [w(H_1)\bar{L} + \frac{1}{r}w(H_2(T))\bar{L}] + (\frac{\rho}{r} - k)T \tag{11}$$

Hence, sanitation choice is determined by the following considerations.

First, when individuals are not restricted by a credit constrain, sanitation investment moves resources from period 1 into period 2. Hence the individual has to compare the gains from current forgone investment on the benchmark asset (borrowing and savings with a rate r) with the returns from the sanitation investment: the direct utility from improved health outcomes, direct financial returns (dwelling valuation) and productivity. Notice that even if total life-cycle income is decreased due to the investment (productivity and asset valuation gains due no compensate the price of the toilet k) and there is no direct utility from sanitation (so $h(T) = 0$), it might be still desirable for the household to invest on it if the direct utility from H_2compensate the reduction on life-time consumption and leisure.

Second, sanitation investment might change the balance between consumption and labour. This could be in two ways: first, if health affect productivity, it might increase wages in the future. Second, it affects marginal utility of labour and consumption due to the direct impact on health (which might be cancel out under specific utility functions). Hence the impact of sanitation on labour supply is then unclear and depends on the underlying assumptions of the utility function. If we consider female and male labour separately, the

picture is more complicated as the productivity gains might be different as well as leisure.

Third, if individuals are limited by the borrowing constrain, as in the classical setup, households might be unable to invest in sanitation even if they were willing to do so. The borrowing constrain is specially important as T is indivisible, which means that the investment would not be enough unless the resources are enough to make the investment and compensate current consumption loss (due to the inability to smooth completely consumption).

A final remark is the dependence of the returns on parameters. First, the average level of sanitation $\bar{T}$ is central on the decision: if the adoption is too low the potential gains on health might be very small as public water sources might not improve at all (health production $f(\cdot)$ depend on both own and community sanitation). However, this is not necessary monotonic as a large $\bar{T}$ might mean that households can free-ride on the health benefits derived from others investment. A similar analysis can be done in the case of financial returns, for instance, a low rate of adoption might increase the value of the dwelling notoriously as it becomes a luxury in the area (boosting ρ). Consequently, expectations on the rate of adoption of sanitationγ, which are unobserved and potentially heterogeneous across households. Notice that if the community is small enough, individuals might decide strategically their investment in order to shape $\bar{T}_2$. Hence, any prediction requires further assumptions on these functions which go beyond the scope of this paper.

APPENDIX D – Robustness check - Propensity score matching

Figure 25: Propensity Score Matching

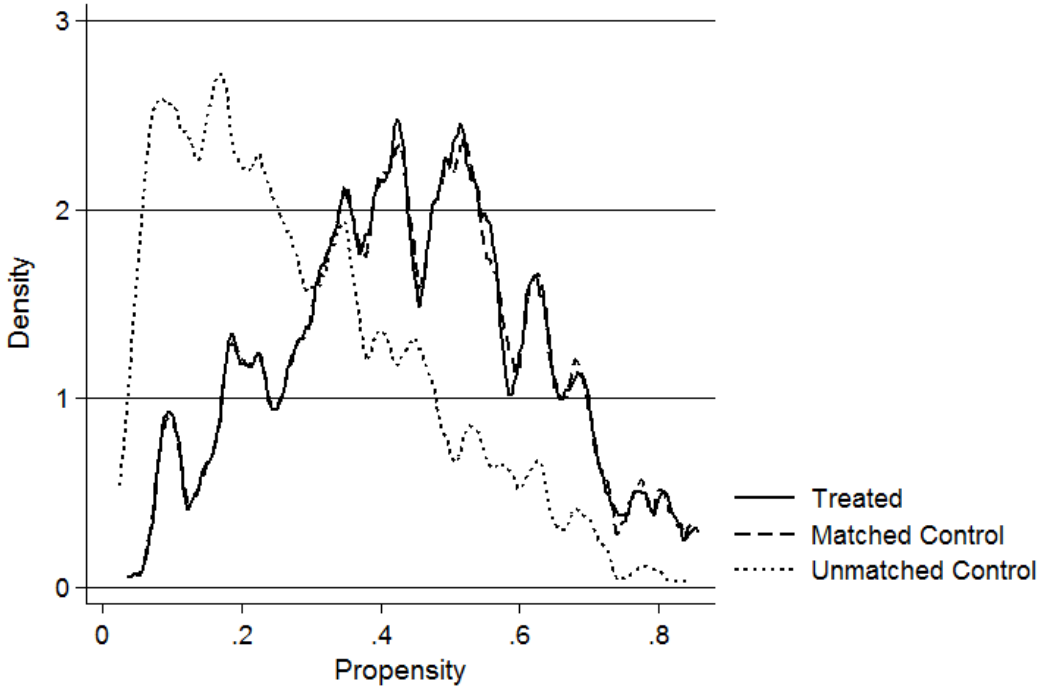


Table 47: Estimates under the matched sample on Round 1 covariates

Eq6. Cross-section τ **:** $Y_{i,j,t=\tau} = \delta Toilet_{i,j,t=\tau} + X_{i,j,t=\tau}\omega_1 + u_{i,j,t=\tau}$
Eq7. Panel: $Y_{i,j,t} = \delta Toilet_{i,j,t} + X_{i,j,t}\omega_2 + \alpha_i + \gamma_t + u_{i,j,t}$
Sample: All available data in each survey at HH level. **Restricted (R):** HHs that did not report having a toilet at the R1.

	Cross-section analysis			Panel	
	Restricted Round 2			DID on R.	
	(1)	(2)	(3)	(4)	(5)
Outcome Variables Y	N Ind	$\bar{Y}_{t=2}$	Eq6	N Ind	Eq7
Health Outcomes					
=1 if visited a doctor without hospitalization (last 4 weeks)	1497	*50.0%*	3.85	1692	−2.75
			(3.87)		(4.35)
Labour market					
Total male paid working hours of the HH	1508	*10.2*	0.33	1709	0.70
			(0.96)		(0.87)
Total female paid working hours of the HH	1508	*3.2*	−1.49***	1709	−1.11*
			(0.39)		(0.63)
Children 3-5 Time Allocation (Gwalior)					
Children 3-15: =1 if doing domestic housework	712	*49.6%*	−2.17	712	−9.35
			(3.19)		(6.13)
Children 3-15: =1 if carrying water	708	*44.2%*	−12.64***	708	−11.28
			(3.93)		(6.97)
Children 3-15: =1 if extra education	712	*28.9%*	2.69	712	0.70
			(4.84)		(5.27)
Consumption					
(LOG) Total consumption (1000 Rs†)	1220	*21.1*	12.44%***	1709	17.31%***
			(4.70)		(6.60)
(LOG) Total food consumption excl. tobacco and alcohol (1000 Rs†)	1213	*8.6*	7.83%*	1516	−11.45%*
			(4.18)		(6.64)
Water, Dwelling Characteristics, and Other Assets					
=1 if HH has a bathroom	1507	*59.7%*	28.13***	1708	27.08***
			(3.42)		(3.98)
(LOG) Value of the dwelling (1000 Rs.†)	1267	*201.8*	47.00%***	1449	48.36%***
			(9.25)		(9.71)
(LOG) Transport (1000 Rs†)	1081	*15.2*	48.58%***	1248	40.60%***
			(13.82)		(15.59)

† Rupees of 2013: R1 values where adjusted by a factor of 1.32. It was calculated based on national level figures for 2011, 2012 and 2013.
X_i includes socio-demographic controls of the main woman, HH head and the HH demographics and socio-economic status. Robust SE on parenthesis. Significance: * 10%, ** 5%, *** 1%.