

## Labelled Loans, Credit Constraints and Sanitation Investments -- Evidence from an RCT on sanitation loans in rural India

IFS, WB, SIEF

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# Motivation

- **Lack of finance :**
  - acknowledged as major impediment of poor households' ability to improve their wellbeing
  - can affect poor households' decisions ranging from profitable, income-generating investments to choices about migration, family planning and human capital investments (Conning & Udry, 2005).
- **Does lack of finance affect sanitation investments? Can credit help?**
- Some argue yes:
  - **Microfinance** postulated as a **potential, promising, solution** to (help) tackle the sanitation challenge (including WSP, USAID, Water.org)
  - WSP (2015): USD 80 million in financial leading has resulted in more than 315,000 household sanitation loans reaching more than 1.4 million people.

# This paper

- **Can micro-credit for sanitation induce toilet uptake?**
  - To answer this question we need to show that:
    1. Sanitation loans are taken up, and
    2. Additional toilets are being constructed.
  - 1. alone is not sufficient since:
    - households might just shift from other credit sources to this newly offered (cheaper?) credit source.
    - Money is fungible.
- Especially when loan is not linked to any specific type(s) of toilets, and enforcement of loan use is basically non-existent. Different to other settings/evidence:
  - *Sanitation*: BenYishay et al. (2016) shows that credit increases WTP, but linked to specific toilet, material delivery included in price
  - *Health*: Devoto et al (2012) – piped water connections; Tarozzi et al (2014) – bednets
  - *Education*: review by Lochner & Monge-Naranjo, 2012)

# This paper

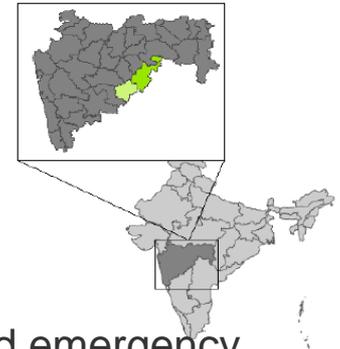
- **Can micro-credit for sanitation induce toilet uptake?**
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    1. Sanitation loans are taken up, and
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# This paper

- **Can micro-credit for sanitation induce toilet uptake?**
  - We find that:
    1. Sanitation loans are taken up, and
    2. Additional toilets are being constructed.
- **Can we conclude that household are credit constrained (for sanitation)?**
  - We analyse whether the sanitation loan uptake increases total household borrowing (direct evidence for credit constraint, Banerjee & Duflo, 2014)
    - We find no change in total amounts borrowed
  - We present a theoretical model outlining how a household can be credit constrained to make a sanitation investment, even though it has access to credit, and a sanitation investment is otherwise optimal.
  - The key drivers in this model are loan attributes, in particular the loan label and the lower interest rate
    - We argue that both play a role in explaining our findings

# Context & intervention

- Rural Maharashtra, India: Latur and Nanded districts
  - Relatively poor and lagging districts, particularly in sanitation
- Implementing Partner: Large **MFI** operating in 6 states in India
  - Provides loans on a joint-liability basis to women
  - Offers income-generating loans, festival loans, education loans and emergency loans
  - Exploit a planned expansion of sanitation loan activities to study areas
  - **Loan conditions:**



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Amount:	Up to Rs 15,000
Interest rate:	22% (later 18%) per annum on a declining balance
Loan maturity:	2 years; payments were to be made on a weekly/bi-weekly basis
Collateral:	None, but joint-liability
Other costs:	Processing fee of 1.1% of loan amount and Rs 306 for life insurance premium

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Typical business loan: up to 45,000 (avg 22,000), 25% interest rate (later 22%), typically 1 year maturity

# Intervention

- **None of the MFI loans is bundled** with the intended investment purpose, and all funds are disbursed directly to the client
  - Sanitation loan not bundled with a specific toilet model or construction material
  - No advice or guidance provided on toilet construction
- Loan use is **not closely monitored**
  - Conducted primarily by asking the client
  - Monitoring loan use is notoriously difficult (Karlan and Zinman, 2011)
  - 26% of clients taking a sanitation loan report using it to construct a new toilet, despite already owning a toilet before intervention began
  - 16-18% report to have used loan for other purpose, even in the MFI's own admin data:

	Survey sample	Admin sample
Construct a new toilet	67.19	70.19
Upgrade existing toilet	2.22	2.59
Repair existing toilet	2.85	3.02
Other purpose	15.69	17.93
Sanitation investment + other purpose	12.04	6.26

# Intervention

- **Loan use is not enforced**, or incentivised, by MFI
  - MFI management's core focus: minimising default and late repayment
  - Client incentives such as larger loan sizes or lower interest rates for future loans are linked to repayment history only
  - Loan use checks by loan officers not incentivised or sanctioned
  - Approval of new loan applications (done in MFI head office) does not depend on loan use
- 34% of clients who took a sanitation loan and did not have a toilet pre intervention or at endline took another loan from MFI during study period

# Study design

- Cluster Randomised Controlled Trial, with Gram Panchayat (GP, or village) as the cluster
  - GP: Lowest administrative unit in India, charged with delivery of Government of India's flagship sanitation policy, Swacch Bharat Mission
- Study arms:
  1. Sanitation micro-credit (40 GPs)
  2. Control (business as usual) (41 GPs)
- Target Population: Existing clients of partner MFI
- Random allocation stratified by MFI branch and size of GP to increase power
- Sanitation micro-loan program rolled out in February 2015

# Data sources

- **Data sources**

1. End-line household survey (Aug-Sep 2017), 2.5yrs after rollout of intervention
  - 2,841 clients (on average 24 per GP, 74% of all clients with loans outstanding before start of experiment, Nov 2014): 1,253 in T and 1,588 in C group.
  - For 1,134 of them, we have a baseline survey (Dec '14/Jan'15)
2. Administrative data from the implementing MFI
3. Credit bureau data
  - Loans from all MFIs for 88% of endline sample

# Empirical model

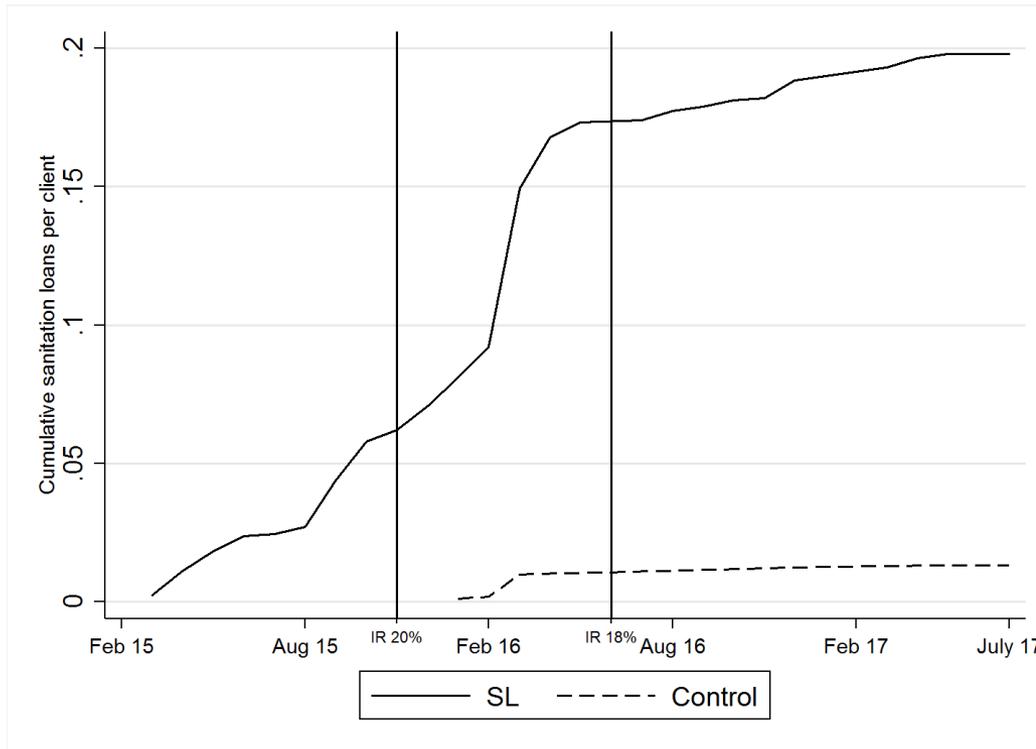
$$Y_{ivs} = \alpha_0 + \alpha_1 Treatment_{vs} + \beta X_{ivs} + \theta_{vs} + \varepsilon_{ivs}$$

- $Y_{ivs}$  is outcome for household  $i$  in GP  $v$  in strata  $s$ 
  - Consider sanitation loan uptake, sanitation investments, overall household borrowing
- $Treatment_{vs} = 1$  if in treatment GP in 2014
- Controls,  $X_{iv}$ :
  - Toilet ownership at BL (explains most variation in toilet ownership in control households at endline)
  - Presence of child aged 3-4 in HH (related to sample stratification)
  - The ratio of number of clients to village size
  - interviewer FEs
- $\theta_s$  is a strata dummy
- Inference: Standard errors clustered at the GP level

# Roadmap

1. Is sanitation credit taken up?
2. Are sanitation investments made?
  1. Does the total amount borrowed increase? Do households switch to other sources of credit?
  2. Channels driving investment behaviour.

# Is sanitation credit taken up?



	Sanitation Loan
SL	0.180*** (0.0356)
Cluster-robust p-value	[0.0000]
Romano-Wolf p-value	
Strata FE	Yes
Interviewer FE	Yes
Household covariates	Yes
Ratio sample clients/GP size	Yes
Control Mean	0.0132
N	2841

*Notes:* SL refers to sanitation loan treatment arm. Robust standard errors clustered at the village level are shown in round parentheses. \*, \*\*, \*\*\* indicates significance at the 10, 5 and 1 percent level. In this case Romano-Wolf p-value is not displayed as it is the same as the cluster robust p-value. Covariates: Toilet ownership at baseline, indicator for presence of a child aged 0 - 2 at baseline, ratio of number of sampled clients to village size. Strata and interviewer fixed effects included. Data source: household survey.

- Very few loans given in control areas
- Overall impact of 18.2 percentage points

# Roadmap

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# Are sanitation investments made?

- Two key types of sanitation investments:
  - New toilet (most popular)
  - Toilet repair and upgrade
    - Few loans reported to be used for repair (1%) or upgrade (3%) (7% reported loan use for ‘sanitation and other’)
    - Assess whether toilet quality improved
    - Use polychoric PCA to combine interviewer observations on various dimensions of overground and underground quality into aggregate measures

# Are sanitation investments made?

	(1)	(2)	(3)	(4)
	Own toilet	Own toilet	Functioning toilet	Functioning toilet
	HH report	Interviewer observation	HH report	Interviewer Observed Toilet
SL	0.0869** (0.0262)	0.0911*** (0.0249)	0.0919*** (0.0236)	0.0958*** (0.0235)
Cluster-robust p-value	[0.0009]	[0.0003]	[0.0001]	[0.0000]
Romano-Wolf p-value	[0.0020]	[0.0000]	[0.0000]	[0.0000]
Strata FE	Yes	Yes	Yes	Yes
Interviewer FE	Yes	Yes	Yes	Yes
Household covariates	Yes	Yes	Yes	Yes
Ratio sample clients/GP size	Yes	Yes	Yes	Yes
Control Mean	0.452	0.412	0.398	0.372
N	2841	2841	2841	2841

- We find: 9ppt increase in toilet ownership and usage (self-reported and observed)

*Notes:* SL refers to sanitation loan treatment arm. Robust standard errors clustered at the village level are shown in round parentheses. \*, \*\*, \*\*\* indicates significance at the 10, 5 and 1 percent level, referring to Romano-Wolf p-values obtained performing 1000 bootstrap replications. RW p-values are computed from the step-down procedure to adjust for multiple hypothesis testing proposed by Romano and Wolf (2005). Covariates: Toilet ownership at baseline, indicator for presence of a child aged 0 - 2 at baseline, ratio of number of sampled clients to village size. Strata and interviewer fixed effects included. HH stands for household. Functioning toilet is defined as toilets that are either in use (household report), or are not in use because of household preferences or a lack of water. The dependent variable in Column 4 is defined based on household reports related to functioning of toilets observed by interviewers. Data source: household survey.

# Are sanitation investments made?

	(1)	(2)	(3)
	Underground	Overground 1	Overground 2
<i>Panel A: Overall</i>			
SL	0.0140 (0.0220)	0.0624 (0.0339)	0.0537 (0.0272)
Cluster-robust p-value	[0.5251]	[0.0660]	[0.0483]
Romano-Wolf p-value	[0.5215]	[0.1309]	[0.1249]
Strata FE	Yes	Yes	Yes
Interviewer FE	Yes	Yes	Yes
Household covariates	Yes	Yes	Yes
Ratio sample clients/GP size	Yes	Yes	Yes
Control Mean	1.379	2.429	0.370
N	1289	1289	1289
<i>Panel B: By toilet ownership at baseline</i>			
SL - toilet at BL	0.0022 (0.0289)	0.0468 (0.0459)	0.0523 (0.0306)
Cluster-robust p-value	[0.838]	[0.341]	[0.078]
Romano-Wolf p-value	[0.838]	[0.663]	[0.296]
SL - no toilet at BL	0.0289 (0.0292)	0.0820 (0.0469)	0.0555 (0.0350)
Cluster-robust p-value	[0.415]	[0.057]	[0.110]
Romano-Wolf p-value	[0.663]	[0.296]	[0.303]
HH owns a toilet at BL	0.00282 (0.0273)	0.0664 (0.0442)	0.0150 (0.0273)
Strata FE	Yes	Yes	Yes
Interviewer FE	Yes	Yes	Yes
Household covariates	Yes	Yes	Yes
Ratio sample clients/GP size	Yes	Yes	Yes
F-test	0.487	0.581	0.930
Control Mean (no toilet BL)	1.361	2.424	0.406
Control Mean (toilet BL)	1.391	2.432	0.345
N	1289	1289	1289

- We find: No impact on toilet quality (some indication that loans improved overground quality, but not robust to multiple hypothesis testing)

# Summary of results thus far

- Households demand the sanitation loans (18.2 percentage point increase) Loan uptake (18-19 ppts)
- Increase in new toilet uptake of around 9 ppts
- Little evidence of loans used for toilet repair or upgrade
- Results on sanitation loan uptake and toilet uptake are robust to multiple hypothesis testing corrections using step-down method of Romano and Wolf (2005)
- **What can explain these findings?**
  1. Credit constraints
  2. Loan attributes: label, (lower) interest rate

# Roadmap

1. Is sanitation credit taken up?
  2. Are sanitation investments made?
- 
1. Does the total amount borrowed increase? Do households switch to other sources of credit?
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# Impacts on overall household borrowing

- If credit constraints are at play, we should also observe increases in overall household borrowing

	(1)	(2)	(3)	(4)	(5)
	Total	Formal	MFIs	Other formal	Informal
SL	-252.1 (1830.9)	76.75 (1872.7)	521.3 (1524.6)	-444.5 (1577.4)	-328.8 (403.3)
Cluster-robust p-value	[0.8905]	[0.9673]	[0.7324]	[0.7781]	[0.4149]
Romano-Wolf p-value	[0.9630]	[0.9670]	[0.9540]	[0.9630]	[0.8322]
Strata FE	Yes	Yes	Yes	Yes	Yes
Interviewer FE	Yes	Yes	Yes	Yes	Yes
Household covariates	Yes	Yes	Yes	Yes	Yes
Ratio sample clients/GP size	Yes	Yes	Yes	Yes	Yes
Control Mean	31738.0	29390.8	14938.2	14452.6	2347.2
N	2813	2813	2813	2813	2813

*Notes:* To remove the influence of outliers in the dependent variable, we drop households in the top of the 1 percent of the distribution of total borrowing. SL refers to sanitation loan treatment arm. Robust standard errors clustered at the village level are shown in round parentheses. \*, \*\*, \*\*\* indicates significance at the 10, 5 and 1 percent level, referring to Romano-Wolf p-values obtained performing 1000 bootstrap replications. RW p-values are computed from the step-down procedure to adjust for multiple hypothesis testing proposed by Romano and Wolf (2005). Covariates: Toilet ownership at baseline, indicator for presence of a child aged 0 - 2 at baseline, ratio of number of sampled clients to village size. Strata and interviewer fixed effects included. Amounts are in Indian Rupees (1 USD = Rs. 67.5). Data source: household survey.

- No significant impact on overall borrowing
- Potentially some switching between formal and informal borrowing
- (RBI regulations not binding for these households: borrowing < Rs 100,000)

# Impacts on overall household borrowing

- Positive coefficient on MFI borrowing confirmed when considering credit bureau data (primarily driven by lending from our MFI partner):

	(1)	(2)	(3)
	Any MFI	Partner MFI	Other MFIs
SL	5155.6	3192.9	1962.7
	(4152.3)	(3124.1)	(2423.9)
Cluster-robust p-value	[0.2145]	[0.3069]	[0.4182]
Romano-Wolf p-value	[0.4006]	[0.4775]	[0.4775]
Strata FE	Yes	Yes	Yes
Interviewer FE	Yes	Yes	Yes
Household covariates	Yes	Yes	Yes
Ratio sample clients/GP size	Yes	Yes	Yes
Control Mean	85314.0	50299.9	35014.1
N	2514	2514	2514

- And little switching within MFI:

	(1)	(2)	(3)	(4)	(5)
	Sanitation	Business	Education	Emergency	Consumption
SL	2635.3***	985.4	-504.7	106.4	48.22
	(525.3)	(2252.3)	(876.1)	(143.2)	(99.38)
Cluster-robust p-value	[0.0000]	[0.6618]	[0.5646]	[0.4578]	[0.6276]
Romano-Wolf p-value	[0.0000]	[0.8801]	[0.8711]	[0.8801]	[0.8801]
Strata FE	Yes	Yes	Yes	Yes	Yes
Interviewer FE	Yes	Yes	Yes	Yes	Yes
Household covariates	Yes	Yes	Yes	Yes	Yes
Ratio sample clients/GP size	Yes	Yes	Yes	Yes	Yes
Control Mean	198.4	37868.4	8321.2	699.6	360.2
N	2841	2841	2841	2841	2841

# Roadmap

1. Is sanitation credit taken up?
  2. Are sanitation investments made?
- 
1. Does the total amount borrowed increase? Do households switch to other sources of credit?
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# The role of loan attributes

- Loan attributes matter: collateral (Jack et al., 2017), liability structure (Attanasio et al., 2018), grace period (Field et al., 2013)
- Main difference in our setting: Label and cost of loan (interest/maturity)
- Theoretical model that provides predictions how a labelled loan will influence uptake and use (won't go into detail – partly still under development...).
- Label might work through increasing salience of sanitation, providing an opportunity for reputation building, or mental accounting.

# The role of loan attributes

- **Loan labels matter:**
  - 62% of clients eligible to take a lower interest sanitation loan, choose to take a business loan.
  - Business loans are larger on average, but if clients wanted larger loans, it would be optimal to take a sanitation loan along with a business loan
  - 31% of clients took a large business loan that could have been taken as a sanitation loan and smaller business loan when eligible for a sanitation loan
- **Other loan attributes also likely to matter (i.e. Label not effective for all):**
  - Loan-to-new toilet conversion rate is of around 50%
  - The label effect was thus not strong enough to ensure sanitation loan was used for sanitation investments
  - 28% of clients that took a sanitation loan already had a toilet at baseline

# Discussion

- Providing credit labelled for sanitation allows HHs to invest into toilets they would have otherwise not constructed
- Sanitation loans are taken up, resulting a 9 percentage point increase in toilet uptake
  - Average toilet built costs around Rs. 30,000, which is twice the loan amount
  - Households use savings to cover shortfall
- Total household borrowing does not change
- Loan attributes (label, cost of loan) drive investment choice for some, but not all borrowers
  - Less than 50% of loans *not* used for sanitation.

**Thank You**  
**Any Questions?**

# APPENDIX Slides

# Intervention Details

- Implementing Partner: Large MFI operating in 6 states in India
- Provides loans on a joint liability basis:
  - Typical joint liability group has 5-10 members
  - 3 or so JLGs form a kendra (centre)
  - Villages may have multiple kendras (2 kendras per village on average)
- Only provider of micro-loans for sanitation in study area
- Clients of MFI account for about 7% of households in village
- Exploit a planned expansion of sanitation loan activities to study areas

# Sanitation Loans

- Loan conditions:

Amount:	Up to Rs. 15,000
Interest Rate:	22% (later 18%) per annum on a declining balance
Loan maturity:	2 years; payments were to be made on a weekly/bi-weekly basis
Collateral:	None, but joint-liability

- Loans available to **clients that have been with MFI for at least 1 year**
- Each client can only take 1 sanitation loan
- There are caps on the amount that can be borrowed from the MFI at a specific point in time:
  - Rs. 35,000 for new clients, and Rs. 40,000 for those who have been clients for at least 3 years
  - RBI regulations limit number of loans that a client can hold, and total amount they can borrow from MFIs at any point in time

# Credit products offered by the MFI

Product	Loan Amount		Interest rate (%)	Tenure (weeks)	Frequency
	<i>Min</i>	<i>Max</i>			
Education	5000	15000	22 (later 18)	52	Weekly
Emergency	1000	1000	0	10/11	Weekly
Festival	2000	2000	22 (later 18)	24	Weekly
IGL Pragati Plus (Business)	15000	50000	25 (later 22)	104	Weekly
IGL Pragati (Business)	10000	20000	25 (later 22)	52	Weekly
Pragati Supplement Loan	5000	10000	26 (later 22)	52	Weekly
Sanitation Loan	10000	15000	22 (later 18)	104	Weekly

# Weak monitoring

- Degree of monitoring does not affect loan uptake and toilet construction differently:
  - Proxy degree of monitoring by percentage of education loans provided to clients without children in the age range 6-18 in the HH.

	(1)	(2)	(3)
	Sanitation loan	Own toilet	Own toilet (interv.)
SL - High monitoring	0.128*** (0.0482)	0.0666* (0.0366)	0.0642* (0.0351)
SL - Low monitoring	0.205*** (0.0498)	0.100** (0.0393)	0.112*** (0.0353)
High monitoring	0.0952*** (0.0328)	0.0257 (0.0361)	0.0260 (0.0336)
Strata FE	Yes	Yes	Yes
Interviewer FE	Yes	Yes	Yes
Household covariates	Yes	Yes	Yes
Ratio sample clients/GP size	Yes	Yes	Yes
F_SL	0.309	0.540	0.332
Control mean (low monitoring)	0.00803	0.472	0.428
Control mean (high monitoring)	0.0220	0.417	0.387
N	2841	2841	2841

# Sample Description and Balance

	Treatment Status			N
	Whole Sample	Control	SL only	
Nr of HH members	5.04 (0.037)	5.02 (0.084)	5.05 (0.073)	2841
HH owns BPL card	58.6 (0.92)	59.0 (2.08)	58.0 (2.61)	2841
Primary activity HH: agriculture	53.5 (0.94)	52.1 (4.13)	55.3 (3.29)	2841
Primary activity HH: Waged employment	26.8 (0.83)	27.5 (2.35)	25.9 (2.37)	2841
Primary activity HH: Self-employment	10.9 (0.59)	11.7 (2.12)	9.98 (1.44)	2841
Dwelling structure: Pucca House	18.9 (0.73)	17.8 (2.46)	20.3 (2.01)	2841
Dwelling structure: Semi-pucca house	65.3 (0.89)	65.6 (3.10)	64.9 (2.66)	2841
Floor materials: poor	35.2 (0.90)	35.9 (3.23)	34.4 (2.74)	2841
Floor materials: bricks or stones	29.0 (0.85)	27.5 (3.15)	31.0 (3.19)	2841
Floor materials: improved	13.2 (0.63)	13.6 (1.98)	12.6 (1.88)	2841

Note: Standard Errors in parenthesis, clustered at the gram panchayat, \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Source: Household survey.

# Sample Description and Balance

	Treatment Status			N
	Whole Sample	Control	SL only	
HH head religion: Hinduism	66.6 (0.88)	67.6 (3.56)	65.4 (3.90)	2841
HH head religion: Islam	20.2 (0.75)	18.6 (3.89)	22.3 (4.04)	2841
HH head religion: Buddhism	12.4 (0.62)	12.8 (2.39)	11.8 (2.29)	2841
HH head caste: Backward	32.9 (0.88)	33.9 (4.08)	31.6 (3.50)	2841
HH head caste: Scheduled	40.9 (0.92)	41.6 (4.16)	40.1 (4.42)	2841
HH head caste: General	25.5 (0.82)	24.1 (4.04)	27.4 (4.24)	2841
Gender HH head (fraction male)	90.5 (0.55)	89.7 (1.04)	91.4 (0.92)	2841
Age HH head	45.4 (0.19)	45.3 (0.48)	45.5 (0.35)	2841
Years of education HH head	5.92 (0.088)	5.85 (0.20)	6.01 (0.20)	2841

Note: Standard Errors in parenthesis, clustered at the gram panchayat, \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Source: Household survey.

# Sample Description and Balance

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	Treatment Status			N
	Whole Sample	Control	SL only	
HH owned a toilet at baseline (panel)	26.2 (1.31)	25 (3.15)	27.5 (2.87)	1134
HH owned a toilet at baseline (reconstructed)	26.6 (0.83)	25.1 (2.06)	28.5 (2.14)	2841

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Note: Standard Errors in parenthesis, clustered at the gram panchayat, \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Source: Household survey.