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Promoting latrine use in rural Karnataka using the risks, attitudes, norms, abilities and self-regulation (RANAS) approach

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Summary

The Swachh Bharat Mission has given more impetus to improving sanitation in the country than ever before, with the explicit agenda of making India open defecation free by 2 October 2019. While the Mission has been very successful in boosting latrine coverage, actual latrine use remains low in many areas of the country. The aim of this study was to develop and rigorously evaluate low-cost and scalable behaviour change interventions to promote latrine use in rural India. 'What works and why?' best summarises the evaluation questions of this impact assessment.

The study was carried out in Raichur district, a district in Northern Karnataka that has poor development indicators (International Institute of Population Sciences and ICF 2017). We used the risks, attitudes, norms, abilities and self-regulation (RANAS) approach to tailor the interventions to the actual mindset of the target population. Thus, the campaign aimed at changing the precise drivers of and barriers to latrine use in the target population. We used a cluster-randomised trial (n = 1,945) with one intervention and one control group to rigorously evaluate the campaign.

Data were collected through standardised face-to-face interviews with household participants before the campaign (baseline survey) and after the campaign (endline survey). In addition to measuring latrine use through reports and spot-check observations, we also measured the behavioural factors potentially steering latrine use. This meant we were also able to determine the mechanisms of actions through which the campaign achieved its impact.

Results indicated that, in both treatment and control arms, latrine use increased by more than 15 per cent. Also in both arms, the safe disposal of child faeces improved by approximately 30 per cent. This suggests that external factors had a strong influence on the project outcomes. Intensive government activities to promote and monitor latrine use were revealed by qualitative data collection, and our findings suggest that these had a substantial impact on latrine use and the safe disposal of child faeces, or the way in which people responded to the survey questions.

Our campaign resulted in an additional, statistically significant increase in latrine use, by approximately 5 per cent. Not only were significant changes reported in latrine use but also the spot-check observations corroborated these results. Insignificant effects on safe disposal of child faeces suggest that our campaign did not create an added value for this outcome.

Key recommendations for programme managers, policymakers, donors and researchers are as follows:

- Latrine use behaviour change to be positioned as an important component of the open defecation free sustainability agenda at all levels (from district to national). Behaviour change strategies to be positioned to promote latrine use behaviours, as well as to sustain latrine use behaviours over time in both open defecation declared districts and those that are yet to be declared. Further, sustained behaviour requires all community members to be engaged;
- Behaviour change strategies and activities identified as effective in this study and others (under this grant window) to be incorporated into ongoing campaigns by

Swachh Bharat Mission on latrine use promotion, by building capacities of government functionaries, development partners and implementing organisations;

- Key behaviour change messages must be reinforced multiple times using different activities (that address different drivers); and
- Cultural and contextual sensitivities related to latrine use (e.g. overt and public display of campaign materials in households, water availability) must be taken into consideration and addressed, to implement a successful behaviour change intervention.

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Abbreviations and acronyms

AWC	Anganwadi centre
BCC	Behavior change communication
BCT	Behaviour change technique
Eawag	Swiss Federal Institute of Aquatic Science and Technology
FGD	Focus group discussion
GP	Gram panchayat
HH	Household
ICC	Intra-cluster correlation coefficient
IEC	Information, education and communication
LU	Latrine use
M	Mean
NARSS	National Annual Rural Sanitation Survey
OD	Open defecation
ODF	Open defecation free
OBC	Other backward classes
PDO	Public development officer
RANAS	Risks, attitudes, norms, abilities, self-regulation
SBM	Swachh Bharat Mission
SD	Standard deviation
SVYM	Swami Vivekananda Youth Movement
VHSNC	Village Health Sanitation and Nutrition Committee
WASH	Water, sanitation and hygiene

1. Introduction

The Swachh Bharat Mission (SBM) has given more impetus to improving sanitation in the country than ever before, with the explicit agenda of making India open defecation free (ODF) by 2 October 2019. SBM has focused on toilet construction and usage promotion, with policy and ground-level experiences emphasising the importance of sustained toilet use for ODF sustainability (Government of India, Ministry of Drinking Water and Sanitation and SBM 2018). In this context, understanding people's motivations for using or not using toilets is critical.

The Ministry of Drinking Water and Sanitation, the nodal ministry for SBM, is cognisant of the role of behaviour change for latrine use and is keen to implement approaches that can encourage and sustain the use of toilets. SBM follows community approaches to sanitation, marking a paradigm shift from the traditional approach that focuses on toilet construction to a community-led and participatory approach that uses triggering tools (drawing from Community-Led Total Sanitation) and the creation of an enabling environment (drawing from the Community Approaches to Total Sanitation) (UNICEF 2009).

A comparison between the traditional and community approaches highlights that the differences arise from community-led approaches being rooted in and driven by communities, and the use of social and behaviour change communication methods. Catalysing community engagement for sanitation without subsidies, identification of champions within the communities, praising progress and making sanitation aspirational were some of the success elements highlighted in sanitation programming in countries like Nepal, Zambia and Sierra Lone (UNICEF 2009).

Null findings in recent field experiments cast significant doubts on the efficacy of water, sanitation and hygiene (WASH) interventions to improve beneficiaries' health (Humphrey et al. 2019; Stewart et al. 2018; Tofail et al. 2018). These studies have triggered a lively debate around whether, and in which contexts, WASH interventions can improve child health and development (Arnold et al. 2018; Coffey and Spears 2018; Cumming and Curtis 2018). Cumming and Curtis (2018) suggest that the results might not be generalisable to populations with initial low latrine coverage and use, while Coffey and Spears (2018) report observational evidence that, in contrast to Kenya and Bangladesh, latrine use in India was indeed related to improved child health.

From a behavioural perspective, the above field experiments did not consider an important intermediate step when testing intervention effects on health outcomes: behaviour. Merely providing an improved latrine or other WASH infrastructure and exposing study participants to behaviour change communication is unlikely to result in intended health effects if the interventions do not actually trigger behaviour change. It remains unclear whether the multiple interventions actually triggered behaviour change, such as substantially increasing the frequency of handwashing or latrine use. However, changes in behaviour are a precondition for health effects to materialise.

From this perspective, developing effective behaviour change interventions is highly relevant, both in the context of ongoing research on the efficacy of WASH interventions and the ongoing work by SBM in India.

A systematic review of behaviour change approaches to sanitation behaviour and handwashing found four promotional approaches: 1) community-based approaches; 2) social marketing approaches; 3) sanitation and hygiene messaging; and 4) elements of psychosocial theory (De Buck et al. 2017). The review notes that community-based approaches yielded the most "consistent results" for sanitation outcomes, such as latrine use, open defecation and safe disposal of faeces. At the time of the review, there was limited evidence on the use of psychosocial theories to promote sanitation and hygiene behaviours. The review also found no evidence that any of the four approaches had "consistent effects on behavioural factors such as knowledge, skills and attitudes" (De Buck et al. 2017, p. 5).

Psychosocial theories for behaviour change have found support from environmental and health psychology that has focused on strategies that can trigger changes in behaviour by shifting mindsets or the underlying drivers of behaviour. Mosler (2012) and Mosler and Contzen (2016) draw upon this to propose the risks, attitudes, norms, abilities, self-regulation (RANAS) approach that identifies potentially relevant factors for behaviour change based on psychological theories. The RANAS approach is used to promote WASH behaviours by triggering a systematic behaviour change through population-tailored interventions.

While the RANAS approach has been intensively tested to promote hygiene behaviours and safe drinking water consumption (Friedrich et al. 2018; Friedrich et al. 2017; Seimetz et al. 2017; Friedrich and Mosler 2016; Inauen et al. 2016; Contzen et al. 2015; Contzen and Mosler 2015; Lilje et al. 2015; Stocker and Mosler 2015; Sonego and Mosler 2014; Tamas et al. 2013; Inauen and Mosler 2013; Huber and Mosler 2013; Mosler et al. 2010), the approach has not been as rigorously tested for developing behaviour change interventions promoting latrine use.

The Swiss Federal Institute of Aquatic Science and Technology (Eawag) and WaterAid India study the effectiveness of the RANAS approach to promote latrine use in Raichur district, India. The key outcomes of this study were the changes in reported latrine use of all household members, changes in signs of use at household latrines measured through spot-check observations and reported safe disposal of child faeces. Only households having a functional latrine were included. Raichur, a district in North Karnataka that has poor development indicators, has five talukas (blocks): Raichur, Manvi, Devadurga, Sindhanur and Lingasugur. As per the 2011 census, Raichur had a population of 1,924,773. The district was lagging behind in latrine construction, as none of the 180 gram panchayats (GPs)[1] had been declared ODF when this project commenced in October 2017. Given this scenario, we anticipated efforts to increase latrine coverage during the project implementation period.

SBM's clear-cut agenda at the national, state and district levels poses several challenges for behaviour change interventions, particularly in relation to the demand for evidence that such interventions complement latrine construction efforts. Two independent assessments on sanitation coverage and toilet usage under the SBM have found high rates of coverage and usage as of 2019. The first National Annual Rural Sanitation

[1] A gram panchayat is a basic unit of governance at the grassroots level. There is a panchayat for every village or a group of villages.

Survey (NARSS) was conducted in 2017–18, and the second round was conducted in 2018–19. Findings from both are presented below.

Table 1: Findings from the National Annual Rural Sanitation Survey

Key findings	NARSS Round 1 (2017–18)	NARSS Round 2 (2018–19)
Proportion of rural households having access to sanitation	77.0	93.1
Proportion of people who had access to toilets and used them	93.4	96.5
Proportion of villages which were previously declared and verified as ODF were confirmed to be ODF	95.6	90.7
Proportion of villages found to have minimal litter and minimal stagnant water	70.0	95.4

While the impact assessment of the RANAS approach commenced before the NARSS Round 1, findings from both rounds have implications for the relevance of the present study.

This report describes the RANAS intervention and design process (section 2), the implementation process (section 2), the evaluation design (quantitative) and qualitative study (section 3) and the findings (section 4), and provides a cost analysis (section 5), a discussion of study implication learnings (section 6), and some recommendations (section 7).

2. Intervention

2.1 Description

The current intervention design builds upon a qualitative formative research study done in March to April 2017 in Raichur, Karnataka and Kamareddy, Telangana, which resulted in the design of a behaviour change intervention to promote latrine use based on the RANAS model. This was the Phase I component of the study. This intervention was developed further by identifying the main drivers of and barriers to latrine use, using quantitative evidence, the behaviour change techniques (BCTs) that can target these drivers and barriers, and the most suitable communication channels to deliver the BCTs. In the current study, an impact assessment has been designed to rigorously evaluate the proposed RANAS intervention using a cluster-randomised trial with one intervention and one control group. This will help quantify the extent to which the RANAS intervention increased latrine use among households that have a latrine.

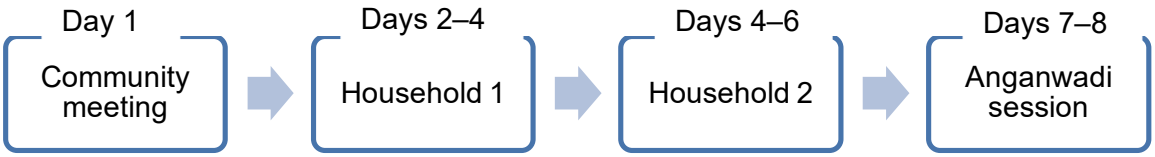
Using the findings from the baseline analysis, the research team used the RANAS catalogue of BCTs (Mosler and Contzen 2016). For each behavioural factor potentially steering the behaviour to be changed, the RANAS catalogue proposes BCTs to change it, based on extensive evidence from environmental and health psychology. The BCTs selected for this intervention correspond to the factors that were identified during baseline as the strongest predictors for latrine use.

2.2 Intervention design

Our hypothesis was that consistent latrine use can be brought about with changes in people's mindsets with respect to the predictors identified as relevant from the baseline assessment. The intervention design was developed with various components, namely: (1) the behaviour change technique to be used; (2) effective communication channels and materials; (3) the appropriate intervention areas to work in for each type of target individual; and (4) specific activities to be carried out in each of these intervention areas.

An intervention matrix and detailed protocols for each of the four intervention strategies were developed. The intervention strategies comprised: (1) an initial village-level community meeting; (2) a first household-level visit; (3) a phone call reminder and a follow-up household-level visit; and (4) a mothers' meeting at the local Anganwadi centre (AWC).[2] We developed protocols for each intervention strategy and related sub-activities, with simple instructions and steps on how to conduct each session.

Figure 1: Mode of intervention delivery in the treatment villages



The intervention was implemented in Raichur, North Karnataka, by WaterAid's long-term implementation partner Swami Vivekananda Youth Movement (SVYM), an organisation well versed with implementing WASH interventions in the district. Their familiarity with the region and communities, intense involvement in community-led total sanitation and latrine construction efforts, and understanding of the complexities of latrine use, made them an ideal implementation partner. The implementation staff comprised 14 inter- personal communicators (4 women and 10 men), 2 supervisors and 1 coordinator. They received rigorous training on the RANAS model and intervention implementation to carry out the intervention in the same manner in all of the treatment villages.

A pair of promoters were in charge of each village. On the first day, the pair visited the village, met community representatives (GP members, front-line workers and other village-level leaders) and scheduled a date, venue and time for a community meeting. They also spent the day mobilising the community for the community meeting. On the day of the community meeting, at the scheduled time, an additional team of three members, comprising two mobilisers exclusively trained to conduct community meetings and one technician responsible for setting up the speakers and projector, conducted the community meeting. After the community meeting, the promoters carried out the first round of household visits over 2–3 days, depending on the size of the village. The second round of household visits was carried out in such a way that the gap time for each house between the two visits would be at least three days. The second round of household visits was completed in two days. This was followed by meetings with the mothers and caregivers at the AWCs. On average, the comprehensive intervention was delivered in a village within 7–8 days.

[2] An Anganwadi centre is an early childhood care centre through which integrated child development services are provided.

The team undertook two rounds of rigorous intervention protocol pretesting of all four strategies, including behaviour change materials, to fine-tune the intervention design in terms of approach, language, conduct and flow of the activities within sessions, and the scheduling of the intervention strategies. This exercise helped the implementation team to prepare for implementation and helped identify logistical and other challenges in intervention delivery and identify solutions for major barriers. Each intervention strategy is discussed below. The numbering of BCT refers to the RANAS catalogue of BCTs in Mosler and Contzen (2016).

Table 2: Strategy 1 – Community meeting

Intervention strategy 1	**RANAS factors targeted**	**Behaviour change technique used**	**Activities implemented**
Community meeting	• Beliefs about costs and benefits • How-to-do knowledge • Personal importance	• BCT 5 Inform about and assess costs and benefits • BCT 15 Provide instruction • BCT 13 Provide positive group identity	• An audio-play, showing why and how Mallanna, a farmer who used to practise open defecation (OD) switched to latrine use (LU), followed by an interactive session on advantages of LU and disadvantages of OD depicted on posters hung up on a clothesline • Dissemination of pit-emptying information through a poster and distribution of handouts • Video clips of people who regularly used latrine within the village and a video of model village Gonniganur, where the entire community used toilets for defecation • An interaction where participants discuss what makes them proud of their village and themselves as families and individuals, and why latrine use is a matter of pride and leadership. Buzzwords like leadership, being intelligent, and caring for the family are elicited • The meeting ends with seeking commitment through sloganeering

Community mobilisation efforts with village-level officials, prior to the community meeting, helped to get their buy-in and was instrumental in encouraging community members to attend the meeting.

Creating and showing videos of regular latrine users in the village as role models during the community meetings aimed to address RANAS factors related to costs and benefits of toilets and personal importance. An audio-play of the story of Mallanna, as well as discussion regarding attitudes towards open defecation and latrine use, were designed to target attitudes promoting latrine use.

Table 3: Strategy 2 – Household visit

Intervention strategy 2	RANAS factors targeted	Behaviour change technique used	Activities implemented
Household visit	• Others' behaviour • Barrier planning • Remembering • Action planning	• BCT 10 Prompt public commitment • BCT 30 Prompt coping with barriers • BCT 32 Prompt to resist social pressure • BCT 34 Use memory aids and environmental prompts • BCT 26 Prompt specific planning	• Family photo for the commitment poster and interaction with all family members • The family members are asked if they have experienced barriers to latrine use and for their ideas on how to overcome them. If they do not have coping ideas spontaneously, the promoter suggests barrier plans from other families • Reminder stickers on the lota or water containers • Daily activity planning using a visual planning form with male members – to help make, review and plan their day to include toilet use as a part of their daily routine. Each male participant was given a planning sheet and stickers that represented different activities they undertook during a regular day (e.g. waking up, bathing, going to the field/to work, eating etc). The participant was asked when they go for open defecation during the day, and are engaged in a discussion as to how and when exactly they can chose to use the toilet instead of defecating in the open

The community meetings aimed to facilitate better reception for the intervention at the household level. Timing of intervention delivery was the most critical step in successfully carrying out the household visits especially for sessions that require all household members to be present. Hence, the teams scheduled appointments before 10 AM and after 4.30 PM. The team faced refusals from several households saying that they already used the latrine or had attended the community meeting. The team had to devise innovative ways to convince them and successfully engage intervention households.

Most household-level participants were open to taking and receiving their family photo. Male participants engaged in the routine-planning activity because of its personal nature, particularly the connection with their daily routine. Personal visits to their houses, in-depth discussions about latrine use through these interactive/engaging activities appeared to generate interest and openness in the households. Home visit activities were designed to address many of the RANAS factors identified as relevant for latrine use and are an important component of the intervention. Household visits and public meetings were chosen as the main communication channel for this intervention because the formative study showed that participants preferred them to other communication channels.

Table 4: Strategy 3 – Phone call reminder and follow-up household visit

Intervention strategy 3	RANAS factors targeted	Behaviour change technique used	Activities implemented
Phone call reminder and follow-up household visit	• Remembering • Action control • Confidence in recovering • Others' behaviour	• BCT 34 Use memory aids and environmental prompts • BCT 27 Prompt self-monitoring of behaviour • BCT 29 Highlight discrepancy between set goal and actual behaviour • BCT 25 Prompt coping with relapse • BCT 10 Prompt public commitment	• Participant receives a phone call reminder shortly before the time when he used to go for OD • Participant is asked on the phone if he used the latrine. The commitment to using the toilet is highlighted • In case of relapses to OD, the participant is told that relapses are normal for such a behaviour • Family photo for the commitment: poster displaying the photo is put up outside their house on a template featuring the campaign character and slogan

For the phone call activity, male promoters called male household members primarily on their mobile numbers, collected during the first household visit. The calls were made to male members who undertook the routine-planning activity by the promoters to remind them of their commitment to use toilets and to encourage and reinforce their ability to use the toilet (in line with the RANAS factor identified and the BCTs to address these factors). The calls were made once or twice in a span of two to three days before the second household visit.

The phone call reminders were received well by most intervention recipients, largely due to the personal rapport built up over time during the household visits. During the second household visit, the families were happy to meet the promoter again, and were open to receiving the family photo and to display their commitment to latrine use in public.

Table 5: Strategy 4 – Session for mothers and caregivers at AWCs

Intervention strategy 4	RANAS factors targeted	Behaviour change technique used	Activities implemented
Session for the mothers and caregivers at AWCs	• Health knowledge • Vulnerability • Feelings – disgust • How-to-do knowledge • Confidence in performance • Vulnerability • Feelings – nurture • Commitment	• BCT 1 Present facts • BCT 3 Inform about and assess personal risk • BCT 8 Describe feelings about performing and about consequences of the behaviour • BCT 15 Provide instructions • BCT 18 Prompt guided practice • BCT 36 Prompt to agree on a behavioural contract	• Inform why child faeces are likely to be a great danger for children • Each participant draws a household map of where the child normally defecates and plays. Transfer of faeces from defecation to the playing area is visualised by colours. Discussion focusing on disgust and health consequences • Using posters, participants are informed on how child faeces should be safely handled. Using chalk, the Anganwadi teacher draws a toilet pan on the floor and participants practise with their children. Each participant creates a second household map. This map includes the toilet and stickers showing the mother assisting the child with latrine use or safely disposing of child faeces. The participants make the following commitment: whenever my child has to defecate, I take it to the toilet and safely dispose of the faeces. This is graphically documented on the template and the participant signs it

Anganwadi sessions conveyed key messages using visual aids and activity-based exercises to facilitate interaction and retention among the mothers. However, feedback from the Anganwadi workers immediately after the session emphasised that mothers/caregivers required message reinforcement over several sessions, and continued support to practise safe disposal of child faeces will be required for that behaviour to become ingrained.

2.3 Theory of change

The theory of change for this project is depicted in Table 6. Using inputs and resources in the form of a systematically designed behaviour change campaign, presented above, and well-trained project and field staff, the intervention activities were implemented. Outputs were the participation of target individuals in these activities.

The intervention activities had been specifically designed to change the behavioural factors steering latrine use and safe disposal of child faeces in the target population.[3] By implementing the activities, behavioural factors were thus supposed to change and become more favourable for latrine use (Outcome Level 1). As a consequence of these changes in behavioural factors, behaviour changed (Outcome Level 2), which, in turn, improved health in targeted villages.

The first assumption of the theory of change is that the target audiences of interventions are willing to participate. Intensive pretesting and subsequent revisions of the interventions suggest high acceptability of the interventions and thus high willingness to participate. The second assumption of the theory of change is that behavioural factors can be manipulated through intervention activities and that behavioural factors steer behaviour. Existing and published evidence from other contexts supports the assumptions (Friedrich et al. 2018; Huber et al. 2014; Inauen and Mosler 2013; Mosler 2012).

For this study, behavioural factors steering latrine use in the target population were identified through both qualitative and quantitative formative research. The findings revealed that latrine use was closely linked to the mindsets and beliefs of participants. The psychosocial factors, which the RANAS model postulates to steer sanitation behaviours, explained latrine use well in the study population. The following behavioural factors were identified to be most relevant:

- Positive attitudes towards open defecation (negative correlation);
- Perception of others' behaviour (positive correlation);
- Perception that latrine use was right whereas open defecation was wrong (personal norm, positive correlation);
- Respondent's awareness of his or her goal to use the latrine (action control, positive correlation); and
- Additional factors included the perceived ease and ability to use the latrine, negative attitudes towards latrine use, such as costs and negative emotions, and forgetting to use the latrine despite good intentions.

[3] For example, the qualitative formative research had identified strong habits of specific morning routines which included OD as one of many activities in a sequence. The baseline survey had identified habit for OD to correlate strongly with OD and action control of LU to correlate with LU. As a consequence, one intervention activity was designed to support participants to plan how to modify their morning routine in order to be able to include latrine use.

Table 6: Theory of change

Logistical framework			Key assumptions	Applied theory
Input / Resources	Materials and protocols of systematically designed behaviour change interventions, capacitated project management staff and local promoters			
Activities	Intervention implementation through NGO promoters at village meetings, household visits and phone calls with male household members as primary target audience and other family members as secondary target audience	Intervention implementation through Anganwadi workers in AWC parent meetings with children's caregivers as primary target audience		
Outputs	All adult family members participating in the intervention	Children's caregivers participating in the intervention	Participants are willing to participate	
Outcome (Level 1)	Change in the psychosocial factors steering latrine use of participants	Change in the psychosocial factors steering safe disposal of child faeces by caregivers	Interventions change the intended psychosocial factors	Social cognitive theory, RANAS model
Outcome (Level 2)	All adult household members consistently and correctly use their household latrine for defecation	Caregivers assist their children in using the latrine and safely dispose of child faeces	Latrine use is steered by psychosocial factors	Social cognitive theory, RANAS model
Impact	Improvement in health indicators		Latrine use impacts health	Faecal-oral route of disease transmission

2.4 Monitoring plan

The purpose of the intervention monitoring plan was to ensure uniform delivery of the intervention as per the agreed protocols throughout the intervention phase in all the treatment villages. The monitoring checks for intervention implementation were only conducted in the treatment group. A monitoring team of two supervisors, a project coordinator and the WaterAid team was constituted. Quality monitoring checklists with indicators on adherence to protocols in terms of timing, content, correct use of materials and engagement with participants were developed for the team to document their observations every day. Based on this checklist, the team shared feedback, debriefed the promoter and followed up until the session was conducted as per protocol. The two supervisors were in charge of 3–4 teams each and undertook random accompaniments on a daily basis with the implementing field teams. The project coordinator also undertook random accompaniments with the team once a week. WaterAid team

members conducted monitoring visits to the field every fortnight for 3–4 days and carried out random checks with all field teams. A WaterAid team member conducted a detailed debriefing with the implementing team. Adherence to protocols and uniform delivery of the intervention was reiterated during every visit.

In addition to this, an intervention tracking system using a village-wise and household-wise sheet was developed. Using this sheet, SVYM would report the intervention progress on a weekly basis to WaterAid. This was based on field reports and daily WhatsApp updates. At the end of every month, a team review was held to assess intervention progress against plans. Field data from each team member for the month were triangulated with the weekly updates and daily updates from the supervisors. This was done to arrive at the actual number of households reached and the actual number of villages completed. Based on the variance, a revised field implementation was developed by the supervisors and the field team for the intervention for the next month until completion.

3. Evaluation

3.1 Primary and secondary questions

'What works and why?' best summarises the research questions of this impact assessment.

What works: The principal aim of this impact assessment is to quantify the extent to which the intervention increased latrine use by beneficiaries.

Why: The second aim of this impact assessment is to quantify the mechanisms of action of the tested interventions. The RANAS model postulates that interventions have to change the behavioural factors steering the behaviour and that changes in behavioural factors lead to behaviour change.

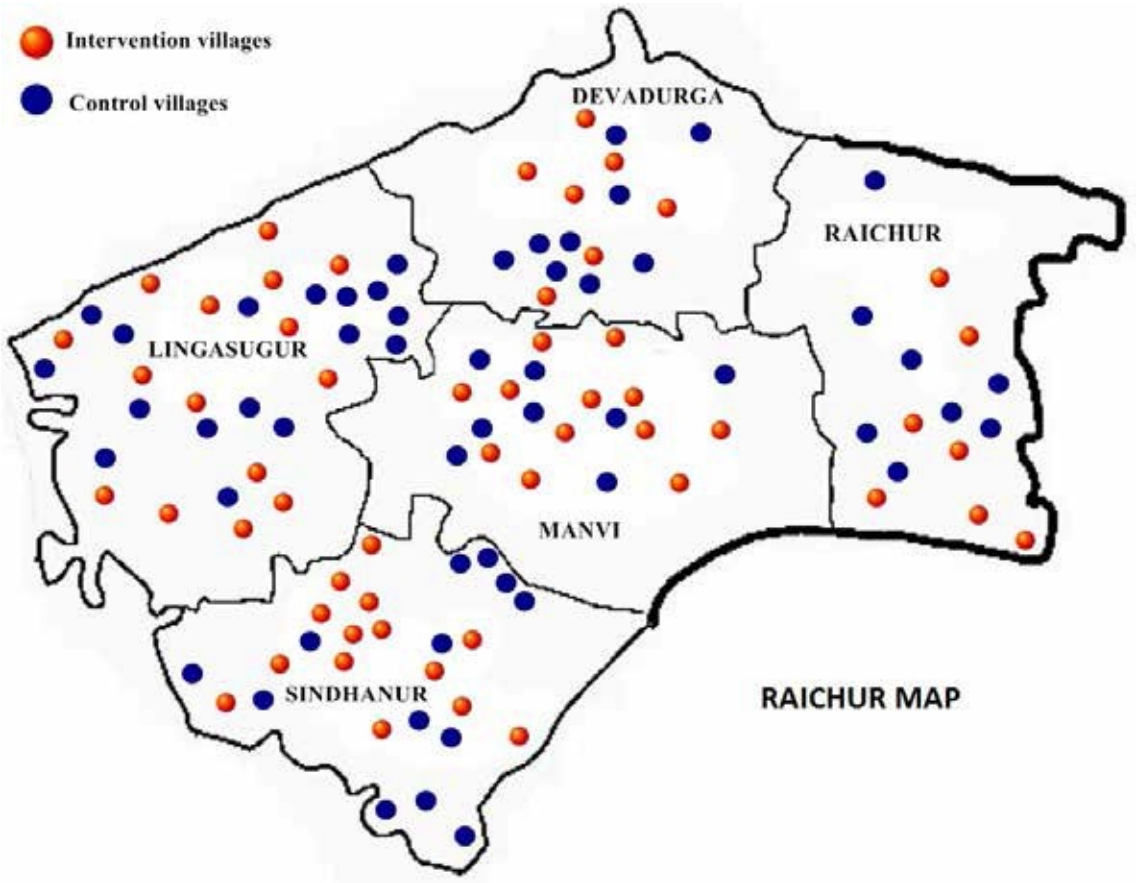
This led to the following hypotheses:

- Hypothesis 1: In treatment households, increases in latrine use are statistically significantly higher than in control households;
- Hypothesis 2: Changes in behavioural factors postulated in the RANAS model mediate changes in latrine use; and
- Hypothesis 3: In treatment households, improvement in safe disposal of child faeces is statistically significantly higher than in control households.

3.2 Evaluation design and methods

We used a pair-matched cluster-randomised design with one treatment and one non-intervention, control arm. In order to minimise spillover to the control group, randomisation was done at the GP level. Only one village per GP was selected randomly. Although the number of clusters was relatively high, simple randomisation may have resulted in an unbalanced allocation regarding latrine coverage, use and SBM activities. We thus chose a pair-matched design, using baseline latrine use as the matching variable.

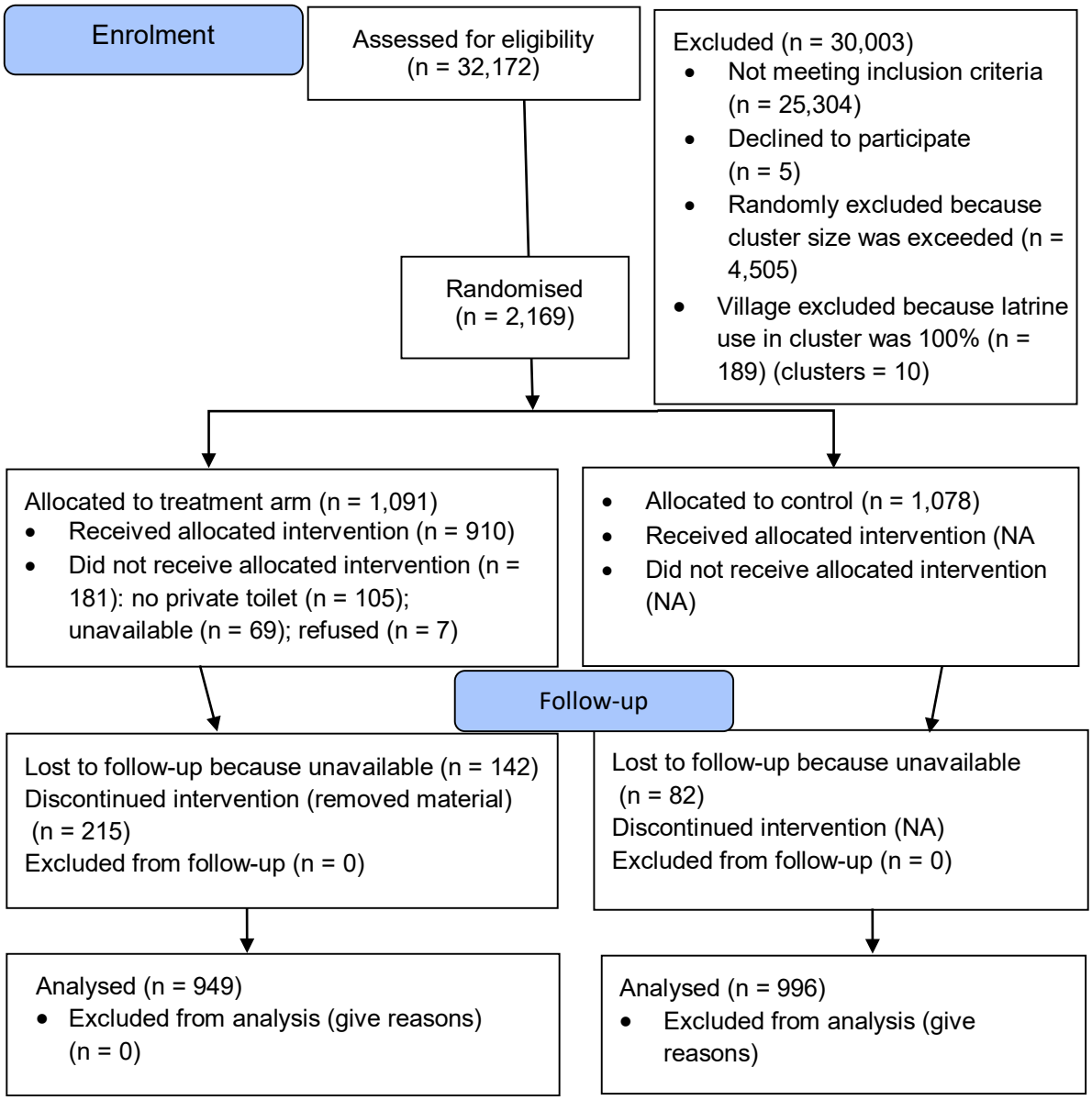
Figure 2: A map of the study areas



Source: SVYM.

Allocation of villages to the treatment or control arm was done at the village level. First, latrine use of all household members was computed for each village. The two villages being most similar in terms of latrine use were paired. Finally, for each village, a random number was generated using Microsoft Excel's RAND function. In each pair, the village with the higher number was allocated to the control condition and the village with the lower number was allocated to intervention. The evaluation design and flowchart of the sample are represented in Figure 3. We report intention to treat effects throughout this report. This means that all baseline participant, irrespective of intervention participation, were included in the endline survey and analysis. We chose this design to maintain the random selection of participants.

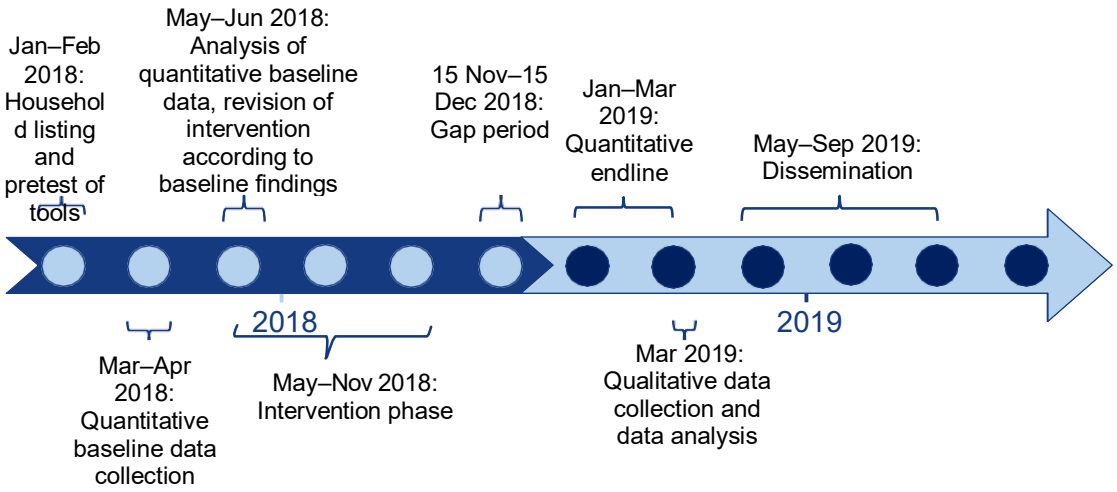
Figure 3: Flow chart of the sample



Note: Numbers (n) refer to number of households. NA represents "not applicable."

The sample size has been adjusted for the clustering of the sample. Baseline data yielded a mean latrine use of 79.0 per cent (SD = 35.6) with an intra-cluster correlation coefficient (ICC) amounting to 0.202. Aiming to achieve a power of 0.8 and alpha-probability of 0.05, a minimal detectable effect size of 10 per cent change in outcome and a cluster size of 15 households yielded a minimal sample size of 1,221 households across 81 villages. Considering an attrition rate of 25 per cent yielded 20 households per village. Before baseline, we had anticipated lower mean latrine use and a slightly higher ICC and consequently, more villages had been included into the baseline survey. After baseline, we decided to remove 10 villages from the study, which already reported 99 or 100 per cent latrine use. We decided to keep all other villages in the study to get maximum statistical power possible. The timeline of the impact evaluation is presented in Figure 4.

Figure 4: Timeline of the study



3.3 Ethics

This study was approved by the institutional review board at the Faculty of Arts, University of Zurich.

In a specific training session on good field practices, enumerators and promoters were trained on how to communicate with respondents from the moment of first interaction to the completion of interaction. This session included basic social skills such as greeting and thanking the participant, taking informed consent in a standardised way, tactfully handling hesitant participants, creating a positive rapport, and basic rules for asking questions. For enumerators, a checklist with dos was compiled as a summary of this briefing. This was also used by supervisors during accompanied household visits, and enumerators were debriefed accordingly.

Participants' confidentiality was protected during all stages of the evaluation. During data collection, enumerators were instructed to request privacy for the interview with the respondent to the extent possible. Data were entered on computer-assisted personal interviewing devices and were only accessible to the enumerators. Once the data were submitted online, they were only accessible to the data managers of the hired data collection agency. After receiving the final data set, identified data were separated from the data set and stored in a separate file. We did not share findings with participants.

3.4 Sampling and data collection

Villages were selected according to the following procedure:

- Compile a list of all villages in Raichur district which match the inclusion criteria;
- To each village, allocate a random number between 0 and 1 using the RAND function in Microsoft Excel;
- Allocate ranks within the villages of each GP based on the random number;
- Select villages ranked 1; and
- Sort the file by the random number and select the first 120 villages for the trial and following 4 villages for qualitative data collection.

According to SBM data (MDWS 2018) 250 villages out of a total 1,071 villages in Raichur district were eligible for inclusion in the study.

Households were selected using a similar procedure:

- Select all households with a functioning latrine according to census data;
- To each household, allocate a random number between 0 and 1 using the RAND function in Microsoft Excel®;
- Sort the households by the random number and select the first 20 households for the trial; and
- Select the next 10 households as back-up households, in case of locked households or refusals.

In the census survey, 32,172 households were listed. Out of these, 21 per cent (6,868 households) had a functioning latrine and were eligible for the study.[4] The baseline sample includes data from 2,328 households, which corresponds to 34 per cent of eligible households. We excluded 10 villages after baseline, because self-reported latrine use was 99 per cent or higher. This yielded a final sample size for the impact assessment of 2,169 participants from 110 villages.

Within households, participants were selected as follows:

- Select all household members aged 18 or above;
- To each household member, allocate a random number between 0 and 1 using the RAND function in Microsoft Excel;
- Within each household, sort the members by the random number and select the first member to be the key respondent for the household visit; and
- The next household member in the random sequence was selected as back-up.

The sample for the qualitative study (conducted after the intervention) constituted a sub-sample of endline participants. From the control and treatment arm respectively, three and two villages were selected, for which endline had revealed a strong increase in latrine use. In addition, one control village, where latrine use had drastically decreased was selected.

From these six villages, participants from the endline survey were randomly selected for qualitative data collection. The tools used to collect qualitative data primarily aimed to gather information to identify sanitation-related activities in relation to promotion of latrines that have occurred in the trial villages during the past year, to assess if these activities, seasonal changes, social pressure or survey effects may account for increases in self-reported latrine use and spillover effects if any between treatment and control villages.

The methods of data collection included 18 in-depth interviews with randomly sampled respondents of trial villages, six focus group discussions (FGDs) with key village-level representatives, including the GP representatives, school teachers, frontline workers, self-help group members, Village Health Sanitation and Nutrition Committee (VHSNC) members, etc. In-depth interviews were also carried out with six Anganwadi workers to

[4] The inclusion criteria of latrine coverage of at least 30 per cent referred to government data, which were used to select villages. Actual latrine coverage, as revealed by the census survey, was substantially lower leading to the average latrine coverage of 21 per cent.

understand the extent of sanitation-related activities in promoting safe disposal of child faeces among mothers. In addition to this, key informant interviews with the district-level SBM consultant and the District Secretary regarding SBM activities towards promoting latrine use were undertaken.

For quantitative data collection at baseline and endline, we used two tools: first, a structured, quantitative face-to-face questionnaire, and second, structured, quantitative spot-check observations of the household latrine. The same tools were used in the control and treatment arms. The questionnaire was administered by trained enumerators in the local language Kannada. The key objective of the questionnaire was to measure the reported latrine use of all household members, self-reported latrine use of the key respondent and the behavioural factors potentially steering latrine use of the key respondent. The key objective of the spot-check observations was to obtain a more objective measure of latrine use. The observations were performed after the interview at the end of the household visit. The questionnaire was intensively pretested, both qualitatively and quantitatively.

A rigorous monitoring plan was devised through a carefully planned team structure and a responsive system for constant monitoring and quality control during baseline and endline data collection. The main purpose of the monitoring system was two-fold: 1) to ensure that the respondents interviewed during baseline were reached out to during endline as well; 2) to ensure that the endline survey was undertaken in exactly the same way as that during baseline (as per the protocol). To enable this, there were seven supervisors trained to monitor 14 enumerators using a monitoring checklist of key pointers of protocol adherence during the interviews. Every team comprised one supervisor and two to four enumerators, depending on the village size being targeted.

The supervisors were trained separately and thoroughly in the RANAS approach and participated in the initial pilot exercise of the endline tool. This was followed by prior on-field exposure to the actual data collection process including its challenges, protocol to be followed during data collection and handling of field-level challenges. While the structured spot-checks of the latrine were conducted in both treatment and control groups, so were the monitoring checks for data collection.

The supervisors were tasked with accompaniments and back-checks to check the quality of the surveys being conducted, in addition to ensuring that the targeted number of calls were met for the day. In order to ensure that the enumerators accomplished their targets for the day, a micro-level plan was developed with details of the selected households along with their addresses, phone number, caste, surnames and availability. This helped the enumerators plan their time for the day and schedule calls as per targets.

The complex tool was easier to navigate through by use of hints and instructions to enumerators wherever needed. Based on observations made during the accompaniments, the enumerators were debriefed immediately after the calls in order to facilitate improvement in their performance in the subsequent household visits.

To monitor the field team, three field executives were put in place. Their role was to randomly observe and support the field teams every day and monitor for adherence of the data collection process as per the agreed protocol.

Once data were derived from the CAPI platform, both the field manager and data manager checked for the actual count of records against the extraction count, data consistency based on the consistency checks provided by the core team, shared erroneous records/data with the core team and subsequently the field team for suspected anomalies, and ensured validation of core indicators as per set procedures.

Data dumps that were shared within WaterAid-Eawag on a weekly basis and feedback was shared with Nielsen. With periodic data reviews and feedback-sharing, the field teams were re-oriented on the correct interview methods, commonly occurring errors and missed out items and in turn help improve data quality.

Core team members from Nielsen, WaterAid and EAWAG undertook monitoring visits in both treatment and control villages, throughout the data collection process. Random accompaniments with the field team and observation of the data collection process followed by immediate one-on-one and team-wise debriefing as per the observation checklist were undertaken.

Post-completion of the data collection process, an exercise of matching identifiers like gender, age and relationship with the head of the household between baseline and endline was undertaken to ensure that the correct respondent was interviewed.

The data collection agency and team were not informed about treatment and control villages and were trained to carry out data collection in the same manner across all villages in the study.

3.5 Outcomes and data analysis

The primary outcomes of this study were as follows:

1. Latrine use household is an aggregate measure of latrine use across all households' members the last time they defecated. It ranges from 0 (indicating none of the household members used the latrine) to 1 (indicating all household members used the latrine).
2. Safe child faeces quantifies safe disposal of child faeces in the household on the day preceding data collection. It ranges from 0 (indicating that none of the child faeces were safely disposed) to 1 (indicating that all of the child faeces were safely disposed).
3. Observation index is an index summarising signs of use measured through spot-check observations of the latrine. It ranges from 0 (indicating that all spot-check items suggest that the latrine is being used) to 1 (indicating that none of the spot-check items suggest that the latrine is being used).[5]

To assess whether the intervention had statistically significantly increased these outcomes, we computed multilevel linear models explaining change in latrine use across

[5] The following items were used to compute the index with equal weights. Is the latrine being used for some other purpose? Is the squatting pan clogged with leaves/dirt/other materials? Water container, like *lota*, mug or coke bottle (for washing after defaecation), in the latrine? Slippers outside or inside the latrine? Is there electric light in the toilet? Are there supplies to clean the latrine pan (i.e. toilet brush, cleaning fluid like Harpic)? According to your (enumerator's) judgement, does the latrine look like it is likely being used?

household members and change in safe disposal of child faeces through treatment arm and baseline values of the respective outcome. The following specification was used:

$Y_{ij} = (b_0 + u_{0j}) + b_1X_{ij} + b_2Z_{ij} + b_3Z_{ij}*X_{ij}+\varepsilon_{ij}$
Y_{ij}: change in outcome for household i, in village j
b_0: fixed intercept
u_{0j}: deviation from fixed intercept in village j
b_1: fixed effect of the treatment
X_{ij}: treatment condition of household i in village j
Z_{ij}: baseline value of outcome for household i in village j
ε_{ij}: error of household i in village j

Adding random slopes to the models resulted in redundant covariance estimates and did not statistically significantly improve the model fit. Thus random slopes were not included. All participants were included in the analyses.

We only selected villages that were at least 5 kilometres away from any other study village. In addition, only one village per GP was included in the study to avoid spillover through local leaders. Through these two measures, we do not expect any spillover from the treatment to the control. However, contamination of the control cannot be categorically ruled out. Although not on a daily basis, villagers from control and treatment villages might have met on market days when visiting neighbouring villages.

We do not expect control participants to have compared themselves with intervention participants. First control participants did not know that there was an intervention and that they were part of the control. Second, they probably met few intervention participants and were unlikely to compare their own behaviour with intervention participants' behaviour. Consequently, we do not expect the John Henry effect to have been a major origin of bias.

Both individuals from the control and treatment arms were aware that they were part of a study. We learned from district government officials and local leaders that SBM activities had intensified in the district from July 2018, in terms of monitoring checks at the household level, and SBM information, education and communication activities on latrine use at the community level potentially exposing control villages to several activities on latrine construction and use (more details are discussed under the qualitative findings later in this report). Therefore, reactivity, for example in the form of over-reporting of latrine use, was probably similar in both study arms and we do not expect the Hawthorne effect to have been a major source of bias.

In order to test the mediation hypothesis (Hypothesis 2), a multiple mediation model was computed using the PROCESS macro in SPSS. The intervention condition was included as a dependent variable in the model. Changes in behavioural factors which correlated significantly with the intervention condition were included as mediators. The change in latrine use of the main respondent was included as a dependent variable. We chose change in latrine use of the main respondent because behavioural factors were measured only for the main respondent and not for all household members.

4. Findings

4.1 Intervention implementation fidelity

The intervention consisted of four elements:

1. Community meeting
2. Household visit
3. Phone call reminder and a follow-up household visit
4. AWC meeting

Originally, we had planned to undertake two household visits, during which all family members would be present. However, because of logistical and time constraints, the activities that required all household members to be present were removed after the first household visit, and the follow-up household visit was done when as many household members as were present.

Implementation fidelity was checked in two ways. First, monitoring data from the implementation team showed that 910 out of the 1,091 households allocated to the treatment arm received the intervention, while 181 did not receive the intervention (see Figure 3). Second, we included survey questions and observations of intervention material in the endline survey. Results are presented in Table 7.

In about 73 per cent of treatment households, the survey respondent stated that at least one household member had participated in the community meeting. This is corroborated by the fact that handouts that had been distributed during the meeting were observed in 64 per cent of households. Participation of the survey respondent in the meeting was noted. This was corroborated by an open intervention check item, in which the respondent was requested to recall specific activities of the community meeting. Overall, 68 per cent of respondents could recall at least one specific activity.

In 84 per cent of treatment households, at least one household member was reported to have participated in the household visit. This is corroborated by the fact that at least one item of the intervention material was observed in 78 per cent of households. Participation of the main respondent was similarly high, although only 35 per cent of respondents could actively recall a specific activity from the meeting.

Self-reported participation in the phone call amounted to roughly 70 per cent, while participation in the AWC meeting was at 80 per cent. However only 45 per cent of the main respondents could recall a specific activity from the meeting.

Participation in the community meeting by men was slightly higher than participation by women: 73 per cent of surveyed men reported participation, compared with 63 per cent of women. For the AWC meetings, a slightly greater number of women than men reported knowing whether a family member had attended the AWC meeting.

Table 7: Implementation fidelity

Activity Indicator of implementation fidelity	Control M	 *SD*	Treatment M	 *SD*
Community meeting				
Participation by at least one HH member	3.3	*17.8*	72.8	*44.5*
Handout observed	0.8	*9.1*	63.6	*48.2*
Participation by main respondent	3.0	*16.9*	68.1	*46.6*
Main respondent recalls specific activity	3.0	*16.9*	67.7	*46.8*
Household visit	0.0	*0.0*	0.0	*0.0*
Participation by at least one HH member	4.2	*20.1*	84.0	*36.6*
Commitment photo observed	1.3	*11.2*	74.1	*43.8*
Action plan observed	1.4	*11.6*	72.0	*44.9*
Sticker observed	1.3	*11.2*	73.1	*44.4*
At least one material observed	1.6	*12.5*	78.4	*41.2*
Participation by main respondent	4.1	*19.9*	83.2	*37.4*
Main respondent recalls specific activity	0.7	*8.6*	35.7	*47.9*
Phone call[†]	0.0	*0.0*	0.0	*0.0*
Participation by at least one HH member	1.8	*13.3*	69.9	*45.9*
Participation by main respondent	1.4	*11.6*	66.1	*47.4*
AWC meeting[‡]	0.0	*0.0*	0.0	*0.0*
Participation by at least one HH member	2.5	*15.6*	79.1	*40.7*
Participation by main respondent	2.0	*14.0*	75.4	*43.1*
Main respondent recalls specific activity	1.2	*10.7*	45.4	*49.8*

Note: HH = household; M = mean; SD = standard deviation; n = 949 in control arm; n = 996 in treatment arm. † Due to a programming error, sample n = 664 in control and n = 869 in treatment arm. ‡ Due to a programming error, sample n = 601 in control and n = 795 in treatment arm. All values represent percentages.

Taken together, the quantitative evidence from the intervention check suggests high participation in the community meeting by at least one household member. Presence of intervention material in most households also suggests that almost all households were reached. The discrepancy between high self-reported participation in the household visits and AWC meetings and considerably lower ability to recall specific activities requires explanation.

With SBM striving to make India ODF by October 2019, intensive latrine promotion happened in Raichur district. Qualitative analysis revealed that, in both treatment and control areas, a number of government activities to promote latrine use, in addition to toilet construction, were undertaken. In all of the six villages where the qualitative survey was undertaken, it appeared that the local government/GP had been extensively involved in toilet construction over the past year (2018), given the number of new toilets constructed. This was emphasised by respondents who had been residing in the villages for many years (many since birth). According to most respondents, over the past year (2018), many houses in their villages had constructed toilets. Government officials (Public development officers or PDOs), GP members, front-line workers and school teachers actively followed up with the households until toilets were constructed. Government officials and agents used various means to encourage households to construct toilets, including emphasising the health benefits of toilets, and subtle and overt pressure tactics (e.g. threats by GP that ration cards and job cards would be confiscated

if the household did not have a toilet, standing outside toilets until they were cleared of other materials stored in the toilet). In addition to toilet construction, the government carried out significant toilet-related awareness activities in all the villages under SBM. In all the villages, the in-depth interviews found that activities like street-plays, house visits, microphone announcements, mothers' meetings in AWCs and VHSNC meetings to sensitise the communities to the benefits of latrine use were undertaken under SBM. Key messages emphasised the importance of toilets for disease prevention, explaining the faecal-oral route of transmission of diseases. Community members recalled being told how mosquitoes can transmit germs from faeces to food and water, adversely affecting people's health. Messages also emphasised the convenience of latrines, and how open defecation makes the village look dirty. In the treatment villages, respondents shared how SVYM carried out awareness activities through village meetings, household visits, taking photographs and putting up stickers in the houses telling people to use toilets.

> There was a community meeting. Some government people also came house-to-house telling people to use toilets. Awareness activities have been carried out about how bad open defecation is for our health. Sometimes, wherever toilets were used for storage purposes, they would even wait until the household members took out all the scrap materials from the toilet and kept the toilet ready for use. — Household respondent during in-depth interview

Data from the FGDs supported the observations made by individual respondents. Those actively engaged in SBM activities in communities were government representatives, such as the GPs, the front-line workers, school teachers and sometimes self-help group members, VHSNC and School Development and Monitoring Committee members. All the six focus groups revealed that toilet construction activities in their villages intensified in 2018, along with tremendous awareness-generating activities carried out both at village level and household level. This was especially the case in those villages that were closer to the taluka or district headquarters, where PDOs and educational officers were directly involved in the awareness activities.

> By Nov 1st 2018 (Kannada Rajyotsava), we had 270,000 toilets and still we had to construct 16,000 more to become ODF. We tried to complete the target by Nov 14th. Now, we have 3,000 pending due to migration issues and 129,997 more to be constructed by Mar 31st 2019. As on date (1st Feb 2019), we have about 900 ODF villages. — District SBM consultant, Raichur

In-depth interviews with Anganwadi workers also revealed that under the Integrated Child Development Services, meetings with mothers were organised every week under the Government of India's Nutrition Mission or POSHAN Abhiyaan. The Primary Health Centre doctor would visit the AWC and explain the importance of safe disposal of child faeces for the growth and development of the child.

> We have spent 14 Lakhs on awareness activities in all taluks to carry out door-to-door awareness. Under Poshan Abhiyaan, all the 2,500 AWCs have been given 2,000 rupees each to conduct meetings with mothers and sensitise them on safe disposal of child faeces. — District secretary, Raichur

All in all, these activities may have resulted in increased self-reported participation of households in the intervention and suggest that since the government-led SBM activities also included multiple household visits and AWC meetings, it is possible that the treatment participants, and a small proportion of control village households, may have confused the government activities and the RANAS intervention.

The data from the control group suggest that up to 4 per cent of control households were exposed to intervention activities. However, the results of our qualitative analysis suggest that in the control villages studied (under the qualitative study), participants had never seen our campaign materials before when showed the materials during the FGDs. This suggests that no contamination of the control had taken place. Control households reporting intervention participation may have confounded this study's intervention with the intensive SBM activities, simultaneously happening in the study area.

The qualitative study asked respondents how often they visited other villages. Most of the male respondents visited villages located at a distance of between 2 and 40 kilometres. Women typically travelled only when they needed to visit their parental home or the hospital when unwell. The frequency of visiting other villages varied from about two to four times a year. When probed as to whether they would talk about latrine use during these visits, the majority were surprised and questioned why they would talk about toilets when visiting other villages. On probing further, a few respondents recalled discussing delays in reimbursements, and checks by government officials to verify and encourage toilet use. During the FGDs, none of the participants and AWCs in control villages recognised the materials that were used as part of the project in the treatment villages. This suggests that it may not be a spillover from the RANAS campaign in the control households but participants referring to other SBM-related activities not part of this project.

Of all households who received the RANAS intervention, 20–30 per cent of households did not report participation in intervention activities, and no intervention materials were seen in these households. Our qualitative results suggest that, since all the materials were put up in open spaces around the household, when neighbours or guests visited the household particularly during festivals or any family gatherings (during the festival season of Dussera and Diwali), the materials showing latrine use may have been embarrassing to the participants and thus may have been removed intentionally. While the reminder stickers were waterproof, some had peeled off the *lota* during use or had been pulled off by little children in the household. In addition, there were a few houses where the posters did not stick as the walls were powdery, rough and coated with limestone.

Finally, the finding that only 35 per cent of respondents could recall at least one specific activity from the household visit requires an explanation. Despite this statistic, the presence of intervention material in 78 per cent of households at follow-up provides evidence that at least this proportion of households was reached by household visits. In line with this, a similar share of intervention respondents stated that they had participated in the intervention. We thus assume that, although participants had been involved in household visits, they might have forgotten the specific activities or confounded them with other household visits. This is plausible given the number of other activities implemented by SBM during the time of the intervention of this study.

Referring to the theory of change, our data suggest that the project outputs were achieved for the majority of respondents.

4.2 Impact analysis

4.2.1 Descriptive statistics and balance tables

Descriptive statistics of the qualitative sample are presented in Table 8 and descriptive statistics of the quantitative sample are presented in Table 9. In addition to data for the overall quantitative sample of 1,945 study participants, data disaggregated by sex, age group and caste are presented.

Table 8: Socio-demographic characteristics of qualitative sample

	M	*SD*
Female respondent (%)	66.7	*48.5*
Age of respondent (years)	36.1	*13.4*
HH size (members)	5.0	*2.4*
HHs which own a house (%)	100.0	*0.0*
HHs which own agricultural land (%)	94.4	*23.6*
Size of land owned (acres)	5.4	*4.5*
HHs which have ration card (%)	94.4	*23.6*
Highest level of education in the HH (years)	8.6	*4.5*
Muslim HHs (%)	5.6	23.6
Christian HHs (%)	0.0	0.0
HHs which belong to SC/ST (%)	66.7	*48.5*
HHs which belong to OBC (%)	22.2	*42.8*

Note: SC = scheduled caste; ST = scheduled tribe; OBC = other backward classes; n = 18.

Table 9: Socio-demographic characteristics of overall sample and subgroups

Overall sample			By sex				By age group				By caste			
			Male (n = 941)		Female (n = 1,004)		Age < 60 (n = 1,723)		Age 60+ (n = 222)		Regular (n = 380)		SC/ST/OBC (n = 1,565)	
	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*
Female respondent (%)	51.6	*50.0*					51.8	*50.0*	50.0	*50.1*	48.9	*50.1*	52.3	*50.0*
Age of respondent (years)	38.4	*13.9*	38.9	*14.0*	38.0	*13.7*	35.1	*10.8*	64.5	*4.5*	40.2	*13.5*	38.0	*13.9*
HH size (members)	5.0	*2.4*	5.0	*2.3*	4.9	*2.5*	5.0	*2.4*	4.8	*2.6*	4.4	*2.1*	5.1	*2.5*
HHs which own a house (%)	99.0	*10.1*	99.3	*8.6*	98.7	*11.3*	99.0	*10.2*	99.1	*9.5*	98.9	*10.2*	99.0	*10.1*
HHs which own agricultural land (%)	79.9	*40.1*	81.8	*38.6*	78.1	*41.4*	80.2	*39.9*	77.5	*41.9*	82.6	*38.0*	79.2	*40.6*
Size of land owned (acres)	4.5	*7.4*	4.7	*8.2*	4.2	*6.6*	4.3	*7.1*	5.6	*9.3*	5.5	*7.2*	4.2	*7.5*
HHs which have ration card (%)	93.2	*25.2*	92.9	*25.7*	93.5	*24.6*	93.5	*24.7*	91.0	*28.7*	90.2	*29.7*	93.9	*23.9*
Highest level of education in the HH	9.7	*4.8*	10.0	*4.7*	9.5	*4.8*	9.9	*4.6*	8.4	*5.6*	10.8	*4.7*	9.5	*4.8*
Muslim HHs (%)	4.6	*21.0*	5.3	*22.5*	4.0	*19.6*	4.5	*20.7*	5.9	*23.5*	1.1	*10.2*	5.5	*22.8*
Christian HHs (%)	1.0	*9.8*	0.6	*8.0*	1.3	*11.3*	1.1	*10.4*	0.0	*0.0*	0.3	*5.1*	1.2	*10.7*
HHs which belong to SC/ST (%)	44.2	*49.7*	45.0	*49.8*	43.4	*49.6*	44.5	*49.7*	41.4	*49.4*	0.0	*0.0*	54.9	*49.8*
HHs which belong to OBC (%)	36.3	*48.1*	34.4	*47.5*	38.0	*48.6*	36.1	*48.0*	37.8	*48.6*	0.0	*0.0*	45.1	*49.8*

Note: n = 1,945; SC = scheduled caste; ST = scheduled tribe; OBC = other backward classes; HH = household; SD = standard deviation; M = mean

Socio-demographic characteristics and baseline values of outcomes for the treatment and control arms are presented in Table 10. At baseline, latrine use was relatively high, at 77 per cent, corroborated by a similarly high observation index. In contrast, safe disposal of child faeces was low. Independent sample t-tests yielded no statistically significant differences with regard to socio-demographics. However, minor but statistically significant differences were detected for the latrine observation index and habit strength for open defecation. Handwashing facilities with soap and water were considerably more frequently observed in the treatment arm than in the control arm.

Table 10: Balance table

	Control		Treatment		Difference			
	M	*SD*	M	*SD*		t	Df	P-value
Female respondent (%)	51.95	49.99	51.31	50.01	0.64	0.284	1,943	0.776
Age of respondent (years)	38.91	*13.82*	37.94	*13.91*	0.98	1.551	1,943	0.121
HH size (members)	5.01	*2.39*	4.89	*2.42*	0.12	1.089	1,943	0.276
HHs which own a house (%)	98.84	*10.71*	99.10	*9.47*	-0.26	-0.560	1,942	0.575
HHs which own agricultural land (%)	80.80	39.41	79.02	40.74	1.79	0.981	1,942	0.326
Size of land owned (acres)	4.78	*7.63*	4.15	*7.22*	0.63	1.875	1,934	0.061
HHs which have ration card (%)	93.57	*24.55*	92.87	*25.74*	0.69	0.608	1,942	0.544
Highest level of education in the HH	9.71	*4.77*	9.75	*4.79*	-0.05	-0.218	1,942	0.827
HHs which belong to SC/ST/OBC (%)	79.56	*40.35*	81.33	*38.99*	-1.77	-0.983	1,943	0.326
Latrine use household (%)	77.40	*36.51*	77.54	*36.26*	-0.14	-0.084	1,943	0.933
Safe child faeces (%)	11.89	*30.47*	10.30	*26.16*	1.59	0.565	407	0.572
Latrine observation index	70.37	*26.76*	68.17	*28.17*	2.20	1.766	1,943	0.078
Handwashing facility (%)	47.84	*49.98*	39.56	*48.92*	8.28	3.693	1,943	0.000
Latrine use main respondent (%)	76.20	*35.61*	78.43	*33.57*	-2.23	-1.421	1,943	0.156
Habit OD	0.27	*0.30*	0.24	*0.28*	0.04	2.768	1,943	0.006
Habit LU	0.72	*0.30*	0.73	*0.28*	-0.01	-1.110	1,943	0.267
Intention LU	0.77	*0.26*	0.77	*0.25*	0.00	0.209	1,943	0.834

Note: M =; SD = standard definition; t =t-statistic; Df = degrees of freedom; n = 1,945; M = mean SC = scheduled caste; ST = scheduled tribe; OBC = other backward classes; HH = household

4.2.2 Research analyses

For each study arm and outcome, baseline and endline values and change scores are presented in Table 11. In addition, ICCs and the differences in change scores are reported. Effects of the intention to treat are reported, which means that all participants of the respective group are included in the computation, irrespective of the self-reported participation in the intervention. Excluding self-reported non-participants would have biased the results because it would have compromised the randomised design of the study.

The data show that latrine use across household members in the treatment arm increased by 20 per cent, and amounted to 97 per cent at endline. Latrine use in the control arm increased by 15 per cent to 92 per cent at endline. The difference in the change of latrine use was statistically significant,[6] F (1, 192.756) = 4.567, p = 0.034. The latrine observation

[6] Since hypotheses were directed, p-values of .1 need to be considered statistically significant if testing for single outcomes. Correcting for testing of multiple outcomes using the Benjamini–Hochberg procedure yielded that p-values of the first, second and third outcome would need to be lower than 0.033, 0.067 and 0.1 respectively to be considered statistically significant.

index increased by 7% to 77% in the control group and by 13% to 81% in the treatment group. The difference in change scores between groups was statistically significant, F (1, 290.515) = 5.636, p = 0.018. This means that both household-level outcomes indicated that latrine use increased. Consequently, Hypothesis 1 is accepted.

Safe disposal of child faeces increased by 36 per cent in the control group, compared with 32 per cent in the treatment group. The difference in changes was not statistically significant, F (1, 109.047) = 0.204, p = 0.653. Consequently, Hypothesis 3 is rejected.

Qualitative study participants reported high levels of latrine use. Out of the 18 households participating in the qualitative study, a majority had functional toilets that appeared to be in use. Only five were observed to be used for purposes other than defecation. Fifteen household members reported that they almost always used the toilet, but there were a few households (3) that reported that none of the members used the toilet for defecation. Observations of 15 household toilets suggested that 10 of them were in use given the presence of a bucket of water and cleaning materials, all of which were placed in the toilet itself. In the observed households, handwashing spaces in proximity to the toilet were conspicuously absent.

On perceptions of latrine use, the FGD participants divulged that latrine use had increased over the past year but not as much as desired. They shared that there were instances where only some of the household members used the toilet and many instances where the toilets looked like they were used. The groups observed that since open defecation had been a habit for generations, change was difficult in such a short space of time. Continued awareness activities, persistent latrine checks for usage and continued pressure from the government were noted as crucial for the promotion of latrine use.

> We visited houses, checked their toilet and told them to use it if they were not using it. We did this twice in our village. About two months ago, we also visited other villages to check if they were using it. —- School teacher, FGD.

For changes in the remaining outcomes, statistical significance tests were not computed in order not to inflate the false discovery probability. However, comparison of mean values suggests that observed availability of a handwashing station near the latrine decreased in the control group but increased in the treatment group. Only for two of the remaining outcomes, differences in change scores larger than 5 per cent were observed. Perceived barriers to latrine use increased in the control group by 10 per cent but decreased in the treatment group by 4 per cent. The perceived difficulty of water collection during the hot season increased by 3 per cent in the control group but decreased by 4 per cent in the treatment group. Other behavioural factors, in particular vulnerability (the perceived likelihood of contracting a disease when practising OD), attitudes towards OD and perception of others' behaviours changed similarly in both study arms.

ICCs for all outcomes are also presented in Table 11. Data from all households were used to compute the ICCs. ICCs are generally low, which suggests that participants across villages were relatively similar to each other, or in other words, that the village effect on outcomes was relatively small.

Table 11: Baseline, end line and change scores of all outcome variables for control and treatment arm.

Outcome		ICC	Control						Treatment						Difference in	
			BL		EL		Change		BL		EL		Change		difference	
			M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*		
Main outcomes	Latrine use household (%)	0.24	77.40	*36.51*	92.42	*24.92*	15.02	*44.11*	77.54	*36.26*	97.10	*15.31*	19.57	*39.39*	4.55	*
	Safe child faeces (%)	0.14	11.89	*30.47*	47.38	*48.04*	35.83	*56.83*	10.30	*26.16*	42.45	*46.84*	32.06	*52.70*	-3.77	
	Latrine observation index	0.24	70.37	*26.76*	77.18	*22.99*	6.80	*34.43*	68.17	*28.17*	81.25	*18.45*	13.08	*32.84*	6.28	*
Additional outcomes	Handwashing facility (%)	0.20	47.84	*49.98*	44.36	*49.71*	-3.48	*67.02*	39.56	*48.92*	46.29	*49.89*	6.73	*69.20*	10.20	£
	Latrine use main respondent (%)	0.23	76.20	*35.61*	90.22	*24.67*	14.03	*43.28*	78.43	*33.57*	94.64	*16.84*	16.22	*37.52*	2.19	£
	Habit OD	0.21	0.27	*0.30*	0.13	*0.23*	-0.15	*0.37*	0.24	*0.28*	0.09	*0.15*	-0.15	*0.32*	0.00	£
	Habit LU	0.27	0.72	*0.30*	0.85	*0.22*	0.13	*0.38*	0.73	*0.28*	0.87	*0.16*	0.14	*0.33*	0.01	£
	Intention LU	0.21	0.77	*0.26*	0.82	*0.20*	0.05	*0.33*	0.77	*0.25*	0.85	*0.15*	0.08	*0.30*	0.03	£
Risks	Health Knowledge	0.23	0.71	*0.12*	0.71	*0.14*	0.00	*0.18*	0.73	*0.11*	0.74	*0.14*	0.01	*0.17*	0.01	£
	Vulnerability	0.27	0.43	*0.32*	0.65	*0.31*	0.22	*0.46*	0.40	*0.32*	0.66	*0.30*	0.27	*0.45*	**0.05**	£
	Severity	0.18	0.76	*0.15*	0.77	*0.13*	0.01	*0.20*	0.76	*0.13*	0.77	*0.12*	0.01	*0.17*	0.00	£
Attitudes	Attitudes LU positive	0.25	0.74	*0.21*	0.79	*0.19*	0.05	*0.28*	0.75	*0.19*	0.82	*0.15*	0.06	*0.24*	0.01	£
	Attitudes LU negative	0.30	0.16	*0.17*	0.11	*0.16*	-0.05	*0.23*	0.13	*0.16*	0.09	*0.12*	-0.04	*0.20*	0.01	£
	Attitudes OD positive	0.19	0.21	*0.23*	0.11	*0.18*	-0.09	*0.29*	0.17	*0.22*	0.08	*0.13*	-0.09	*0.25*	0.00	£
	Attitudes OD negative	0.21	0.64	*0.19*	0.74	*0.18*	0.11	*0.25*	0.65	*0.17*	0.75	*0.14*	0.10	*0.22*	-0.01	£
Norms	Others behaviour	0.15	0.62	*0.17*	0.71	*0.13*	0.09	*0.20*	0.62	*0.16*	0.73	*0.11*	0.11	*0.20*	0.02	£
	Personal norm	0.23	0.73	*0.23*	0.77	*0.19*	0.04	*0.30*	0.72	*0.22*	0.79	*0.14*	0.07	*0.27*	0.03	£
	Others' (dis)approval	0.35	0.65	*0.21*	0.71	*0.21*	0.05	*0.30*	0.65	*0.21*	0.73	*0.18*	0.07	*0.29*	0.02	£
Abilities	How-to-do knowledge	0.31	0.55	*0.11*	0.53	*0.10*	-0.02	*0.15*	0.53	*0.11*	0.53	*0.09*	0.00	*0.14*	0.03	£
	Confidence in performance	0.21	0.76	*0.23*	0.80	*0.19*	0.04	*0.30*	0.77	*0.22*	0.83	*0.14*	0.07	*0.26*	0.02	£

Outcome		ICC	Control						Treatment						Difference in difference	
			BL		EL		Change		BL		EL		Change			
			M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*		
	Confidence in continuation	0.26	0.66	*0.22*	0.71	*0.20*	0.05	*0.30*	0.65	*0.21*	0.74	*0.17*	0.09	*0.27*	**0.04**	£
	Confidence in recovery	0.21	0.71	*0.26*	0.72	*0.21*	0.01	*0.34*	0.71	*0.25*	0.76	*0.19*	0.05	*0.31*	0.03	£
Self-regulation	Action Planning	0.22	0.39	*0.19*	0.40	*0.16*	0.01	*0.25*	0.37	*0.18*	0.42	*0.15*	0.06	*0.23*	**0.05**	£
	Action Control	0.17	0.68	*0.27*	0.74	*0.21*	0.06	*0.34*	0.68	*0.25*	0.76	*0.17*	0.08	*0.31*	0.02	£
	Hindrance	0.23	0.20	*0.40*	0.30	*0.46*	0.10	*0.58*	0.26	*0.44*	0.22	*0.42*	-0.04	*0.59*	**-0.14**	£
	Coping planning	0.25	0.77	*0.34*	0.94	*0.16*	0.17	*0.37*	0.79	*0.34*	0.95	*0.14*	0.16	*0.36*	-0.01	£
	Forgetting	0.13	0.09	*0.29*	0.06	*0.24*	-0.03	*0.36*	0.10	*0.30*	0.05	*0.21*	-0.05	*0.37*	-0.02	£
	Commitment	0.21	0.72	*0.23*	0.77	*0.19*	0.05	*0.30*	0.71	*0.23*	0.79	*0.15*	0.08	*0.28*	0.03	£
Context: Water access	Difficulty water collection now	0.36	0.26	*0.35*	0.20	*0.32*	-0.06	*0.49*	0.22	*0.33*	0.18	*0.30*	-0.04	*0.45*	0.01	£
	Difficulty water collection during hot season	0.32	0.59	*0.41*	0.62	*0.39*	0.03	*0.58*	0.64	*0.39*	0.60	*0.38*	-0.04	*0.53*	**-0.07**	£

Note: £ No significance test computed. Since hypotheses were directed, p-values of .1 need to be considered statistically significant if testing a single outcomes. Correcting for testing of multiple outcomes using Benjamini & Hochberg procedure yielded that p-values of the first, second and third outcome would need to be lower than 0.033, 0.067 and 0.1 respectively to be considered statistically significant. Significance levels were obtained by modelling the respective outcome variable depending on experimental condition, the baseline value of the outcome and the interaction of the two variables. The relationship between the intervention and the respective outcome showed significant variance in intercepts across participants. Adding random slopes to the models resulted in redundant covariance estimates and did not statistically significantly improve the model fit. To not inflate the changes of false discovery, tests were only computed for the main outcomes of the study.

In order to reveal the mechanisms of action through which the intervention changed latrine use and to test Hypothesis 2, we performed a mediation analysis. Treatment was the independent variable, changes in behavioural factors were mediators, and latrine use of the main respondent was the independent variable. Preliminary correlation analyses yielded that changes in negative attitudes towards latrine use, in the perceptions of other people's latrine use (Other's behaviour), in knowledge of how to correctly use and maintain the latrine (How-to-do knowledge), in confidence in ability to continuously use the latrine (Confidence in continuation), in the level of planning of when to use the latrine during the daily routine (Action planning[7]), in perceived hindrances ,and in perceived expenditure of time for water collection during the hot season, were triggered by the intervention. Only these factors were included as mediators in the model. Results of the multiple mediation analysis are presented in Figure 5.

In line with the preliminary correlations, the model shows that the intervention triggered marginal increases in the perception of Others' behaviour, How-to-do knowledge, Confidence in continuation and Action planning. The strongest effect of the intervention was detected on Hindrance: the intervention decreased the number of barriers to latrine use that participants reported.

The arrows on the right of the diagram indicate the relationship between changes in the behavioural factors of the model and latrine use. The numbers indicate unstandardised coefficients of a multiple regression model, predicting the change in latrine use from change in behavioural factors.

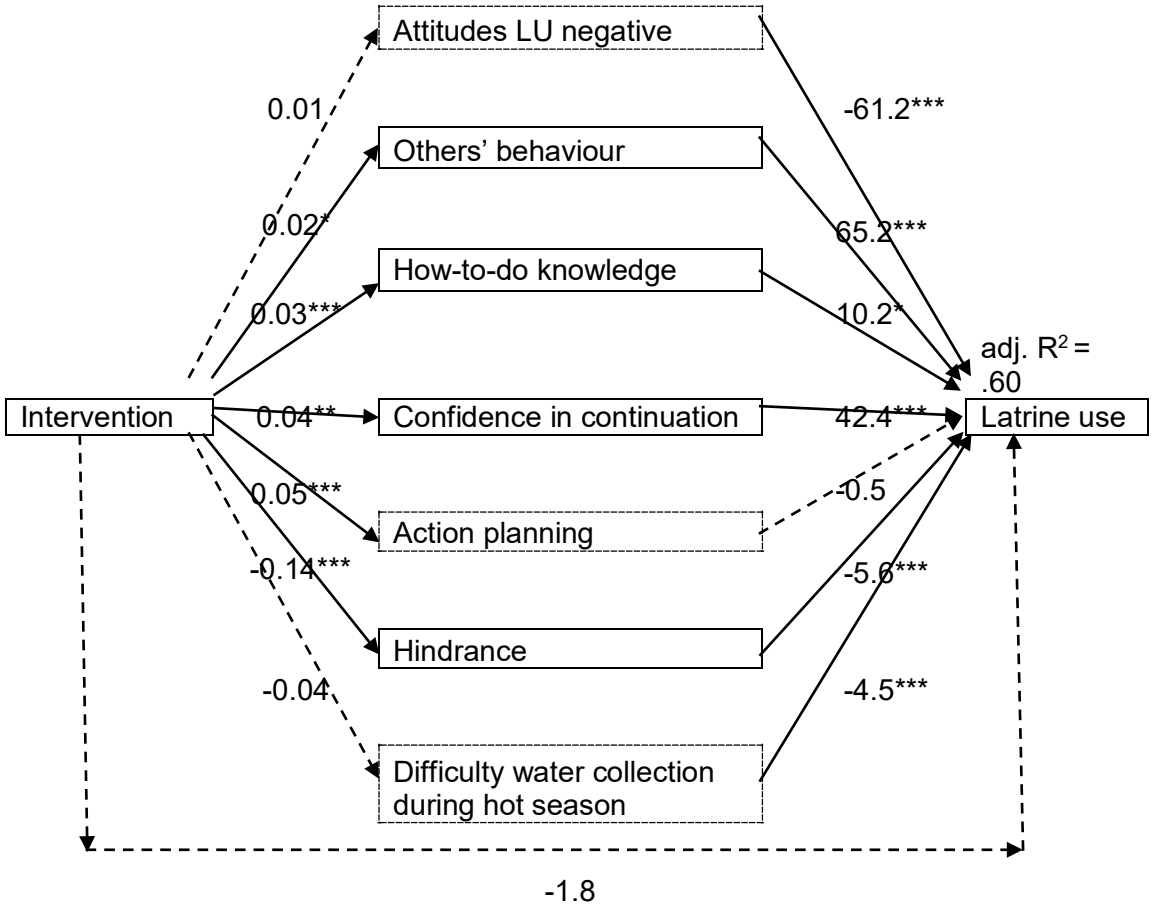
The strongest effect was detected for Others' behaviour, followed by negative attitudes towards latrine use, Confidence in continuation, How-to-do knowledge, Hindrance (negative effect) and perceived difficulty of water collection during the hot season (negative effect). Together the changes in these factors explain 60 per cent of the changes in latrine use from baseline to endline.

Combining both sides of the model indicates the extent to which changes in behavioural factors (Outcome Level 1 in the theory of change) triggered by the intervention (output) translated into changes in behaviour (Outcome Level 2 in the theory of change). For negative attitudes towards latrine use, we learned that changes in this factor were related to changes in latrine use. However, the intervention did not trigger any changes in this factor. Accordingly, the mediation model did not yield a statistically significant indirect effect, indicated by the dashed box. For Others' behaviour, in contrast, both pathways were significant. This means that the intervention triggered an increase in Others' behaviour and that this increase was related to an increase in latrine use. Similarly, significant indirect effects were detected for How-to-do knowledge, Confidence in continuation and Hindrance. In this vein, the intervention successfully increased the level of Action planning in participants. In contrast, however, this increase in Action planning did not translate into a change in behaviour. Therefore, no significant indirect effect was detected. Conversely, the perceived difficulty of water collection during the hot season was negatively associated with changes in latrine use. However, the intervention did not trigger any change in this and the indirect effect was thus not significant.

[7] Action planning is both an intervention (planning activity with participants) and a behavioural factor (the level of detail that the participant can report for their plans).

Taking all indirect effects together, they fully explain the effect of the intervention on latrine use. The remaining direct effect of the intervention, as illustrated by the dashed arrow from intervention to latrine use, was insignificant. This means that the mediation accounts for the mechanism of action of the intervention. Accordingly, Hypothesis 2 is accepted. This suggests that the assumptions of the theory of change at Outcome Level 1 and 2, namely that the intervention changes behavioural factors and that behavioural factors steer latrine use, are met.

Figure 5: Results of multiple mediation analysis



Note: Levels of significance are represented by asterisks (* p < .05, ** p < .01, *** p < .001).

With regard to the ongoing activities to promote latrine use, which were not part of our study, qualitative results yielded the following motivators in the study population. When asked as to why toilets are used for defecation, the common responses from the individual respondents was that toilets were convenient, good for their health, and help to keep the village clean. It was evident from these responses that awareness-generating activities had focused on disseminating the important link between using toilets and disease prevention. The respondents felt that the awareness activities helped most of the community members to start using toilets.

> When village officials visit houses and check toilets, people become alert and start using toilets. — Accredited social health activist (ASHA) worker, FGD

> There is pressure from the PDO to keep our village clean. In the mornings, GP members and PDOs tell a lot about it to people who go out to defecate on why we must keep our village clean. They even came and checked our toilets at least twice in the past one year. Pressure to use has increased in the past one year not just from the gram panchayat but also from people around us. — Village, in-depth interview.

The qualitative study did not probe for differences in toilet use and non-use among men and women, as the quantitative study did not reveal significant gender differences. Among those who reported not using toilets, the main barriers reported included limited water availability during the summer months, habit of defecating in the open, long working hours in the field typically located away from their homes, large family size that made it difficult for everyone to use the single latrine in the morning. It is important to note that these barriers were noted both during in-depth interviews and FGDs, and reflect perceptions of the barriers faced by the community. The relative importance of these barriers was not discussed. While families using latrines may have overcome these barriers, family not using the latrine consistently may not have been able to overcome these barriers through shifts in underlying psychological factors.

4.2.3 Loss to follow-up analysis

Table 12 presents baseline values of socio-demographics and outcome variables for participants participants who were lost to follow-up and those who remained in the study. With regard to socio-demographics, no statistically significant differences are revealed. With regard to outcomes, safe handling of child faeces at baseline was higher in the evaluation sample than in dropouts.

Table 12: Socio-demographic characteristics and outcomes for evaluation sample and dropout

	Evaluation Sample		Lost to follow up					
	M	SD	M	SD	Mean difference	t	Df	P-value
Female respondent (%)	51.62	49.99	50.89	50.10	0.73	0.206	2167	0.837
Age of respondent (years)	38.41	*13.87*	35.89	*14.55*	2.53	2.567	2167	0.010
HH size (members)	4.95	*2.41*	4.84	*2.37*	0.11	0.636	2167	0.525
HHs which own a house (%)	98.97	*10.09*	97.77	*14.81*	1.20	1.185	247.441	0.237
HHs which own agricultural land (%)	79.89	40.09	81.70	38.76	-1.81	-0.642	2166	0.521
Size of land owned (acres)	4.46	*7.43*	4.14	*6.98*	0.31	0.596	2156	0.551
HHs which have ration card (%)	93.21	*25.16*	93.75	*24.26*	-0.54	-0.305	2166	0.760
Highest level of education in the HH (years)	9.73	*4.78*	9.45	*4.84*	0.28	0.827	2166	0.409
HHs which belong to SC/ST/OBC (%)	80.46	*39.66*	83.48	*37.22*	-3.02	-1.142	284.580	0.254
Latrine use household (%)	77.47	*36.37*	73.39	*39.40*	4.08	1.480	268.617	0.140
Safe child faeces (%)	11.12	*28.44*	2.08	*14.43*	9.03	3.594	97.262	0.001
Latrine observation index	69.25	*27.51*	65.37	*29.62*	3.88	1.868	269.193	0.063
Handwashing facility (%)	43.60	*49.60*	44.20	*49.77*	-0.60	-0.171	2167	0.865
Latrine use main respondent (%)	77.34	*34.59*	74.15	*37.75*	3.19	1.206	267.908	0.229
Habit OD	0.25	*0.29*	0.29	*0.32*	-0.03	-1.515	267.291	0.131
Habit LU	0.72	*0.29*	0.69	*0.31*	0.03	1.597	270.602	0.111
Intention LU	0.77	*0.26*	0.75	*0.28*	0.02	1.037	268.032	0.301

Note: n (evaluation sample) = 1,945; n (dropout) = 224' ; SC = scheduled caste; ST = scheduled tribe; OBC = other backward classes; HH = household; SD = standard deviation; M = mean

4.2.4 Heterogeneity of impacts

Tables 13 to 18 present selected outcomes disaggregated by sex, age group and caste. Since this study was not powered to perform subgroup analysis, statistical significance tests are not computed.

Table 13: Baseline, endline and change scores of selected outcomes (male respondents)

Outcome		Control						Treatment						Difference in difference
		BL		EL		Change		BL		EL		Change		
		M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	
Main outcomes	Latrine use household (%)	79.03	35.31	90.42	27.87	11.39	44.09	80.22	34.75	96.89	16.53	16.66	38.38	5.27
	Safe child faeces (%)	9.89	28.01	50.40	47.30	39.15	53.08	6.10	21.52	45.44	48.14	39.25	54.51	0.11
	Latrine observation index	72.43	25.62	75.81	24.67	3.38	34.78	69.72	27.27	81.38	17.67	11.66	31.54	8.28
Additional outcomes	Handwashing facility (%)	50.00	50.05	41.23	49.28	-8.77	68.02	38.14	48.62	45.57	49.85	7.42	69.43	16.19
	Latrine use main respondent (%)	75.96	35.86	88.40	27.54	12.44	44.80	79.28	32.73	93.99	18.49	14.71	37.47	2.26
	Habit OD	0.29	0.31	0.14	0.25	-0.15	0.38	0.23	0.27	0.09	0.17	-0.14	0.33	0.01
	Habit LU	0.71	0.31	0.84	0.25	0.12	0.39	0.74	0.28	0.87	0.17	0.14	0.33	0.01
	Intention LU	0.78	0.25	0.81	0.21	0.03	0.32	0.77	0.25	0.84	0.16	0.07	0.30	0.04

Table 14: Baseline, endline and change scores of selected outcomes (female respondents)

Outcome		Control						Treatment						Difference in difference
		BL		EL		Change		BL		EL		Change		
		M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	
Main outcomes	Latrine use household (%)	75.89	37.55	94.27	21.72	18.38	43.90	74.99	37.49	97.31	14.07	22.32	40.16	3.95
	Safe child faeces (%)	13.76	32.62	44.40	48.75	32.67	60.27	13.27	28.71	40.33	45.95	27.07	51.05	-5.61
	Latrine observation index	68.47	27.66	78.44	21.28	9.97	33.84	66.70	28.95	81.13	19.18	14.43	34.01	4.46
Additional	Handwashing facility (%)	45.84	49.88	47.26	49.98	1.42	65.78	40.90	49.21	46.97	49.96	6.07	69.04	4.65
outcomes	Latrine use main respondent (%)	76.42	35.41	91.91	21.56	15.49	41.82	77.61	34.36	95.26	15.10	17.65	37.55	2.16
	Habit OD	0.26	0.29	0.11	0.20	-0.14	0.36	0.24	0.29	0.08	0.13	-0.16	0.32	-0.01
	Habit LU	0.72	0.30	0.86	0.20	0.14	0.37	0.73	0.29	0.88	0.15	0.15	0.33	0.01
	Intention LU	0.76	0.27	0.83	0.19	0.07	0.33	0.76	0.26	0.85	0.13	0.09	0.29	0.02

Table 15: Baseline, endline and change scores of selected outcomes (respondents under 60 years)

Outcome		Control						Treatment						Difference in difference
		BL		EL		Change		BL		EL		Change		
		M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	
Main outcomes	Latrine use household (%)	77.66	36.67	92.00	25.57	14.34	44.57	78.09	35.88	96.99	15.61	18.90	39.27	4.57
	Safe child faeces (%)	11.51	29.83	47.00	47.73	36.16	56.97	9.31	24.55	43.30	46.87	33.30	51.14	-2.86
	Latrine observation index	70.10	27.06	77.08	23.06	6.98	34.59	68.43	27.98	81.22	18.57	12.79	32.57	5.81
Additional outcomes	Handwashing facility (%)	46.59	49.91	44.92	49.77	-1.67	66.15	38.71	48.74	46.05	49.87	7.34	68.25	9.01
	Latrine use main respondent (%)	76.18	35.59	89.74	25.39	13.56	43.74	78.44	33.48	94.62	16.91	16.18	37.49	2.62
	Habit OD	0.27	0.30	0.13	0.23	-0.14	0.37	0.23	0.28	0.09	0.15	-0.15	0.32	-0.01
	Habit LU	0.72	0.30	0.85	0.23	0.13	0.38	0.73	0.28	0.88	0.16	0.14	0.33	0.01
	Intention LU	0.77	0.25	0.82	0.20	0.05	0.33	0.77	0.25	0.85	0.15	0.08	0.30	0.03

Table 16: Baseline, endline and change scores of selected outcomes (respondents 60 years and over)

Outcome		Control						Treatment						Difference in difference
		BL		EL		Change		BL		EL		Change		
		M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	
Main outcomes	Latrine use household (%)	75.45	35.39	95.58	19.18	20.13	40.30	73.08	39.08	97.98	12.70	24.90	40.12	4.77
	Safe child faeces (%)	14.17	34.54	50.00	50.80	33.65	56.98	18.18	36.34	34.72	46.86	21.67	64.91	-11.99
	Latrine observation index	72.45	24.46	77.93	22.60	5.48	33.34	66.10	29.72	81.56	17.56	15.45	35.05	9.97
Additional outcomes	Handwashing facility (%)	57.14	49.71	40.18	49.25	-16.96	72.15	46.36	50.10	48.18	50.20	1.82	76.60	18.78
	Latrine use main respondent (%)	76.29	35.96	93.82	18.07	17.53	39.71	78.30	34.45	94.85	16.40	16.55	37.94	-0.98
	Habit OD	0.28	0.30	0.09	0.15	-0.18	0.33	0.24	0.29	0.08	0.14	-0.17	0.33	0.02
	Habit LU	0.71	0.30	0.86	0.18	0.15	0.34	0.71	0.30	0.87	0.15	0.16	0.33	0.01
	Intention LU	0.75	0.28	0.84	0.15	0.08	0.32	0.76	0.27	0.85	0.15	0.08	0.31	0.00

Table 17: Baseline, endline and change scores of selected outcomes (households from general caste)

Outcome		Control						Treatment						Difference in difference
		BL		EL		Change		BL		EL		Change		
		M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	
Main outcomes	Latrine use household (%)	88.15	26.72	98.07	11.61	9.92	29.48	89.80	27.45	97.73	13.84	7.93	30.62	-1.99
	Safe child faeces (%)	8.75	27.47	61.36	48.06	50.00	57.32	16.05	30.48	41.09	43.98	27.88	58.64	-22.12
	Latrine observation index	79.16	21.82	83.51	17.00	4.34	27.61	78.49	23.50	87.10	13.62	8.60	27.44	4.26
Additional outcomes	Handwashing facility (%)	55.15	49.86	51.55	50.11	-3.61	69.32	51.61	50.11	59.68	49.19	8.06	68.10	11.67
	Latrine use main respondent (%)	85.63	26.74	95.79	13.00	10.16	29.12	88.82	24.33	96.15	14.42	7.33	27.98	-2.83
	Habit OD	0.20	0.24	0.08	0.12	-0.12	0.26	0.15	0.21	0.07	0.12	-0.08	0.25	0.04
	Habit LU	0.78	0.24	0.89	0.14	0.11	0.27	0.81	0.21	0.89	0.13	0.07	0.26	-0.04
	Intention LU	0.82	0.23	0.84	0.13	0.03	0.25	0.83	0.20	0.85	0.12	0.02	0.24	0.00

Table 18: Baseline, endline and change scores of selected outcomes (households from SC/ST/OBC)

Outcome		Control						Treatment						Difference in difference
		BL		EL		Change		BL		EL		Change		
		M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	M	*SD*	
Main outcomes	Latrine use household (%)	74.64	38.15	90.97	27.13	16.33	47.07	74.72	37.45	96.96	15.64	22.24	40.69	5.91
	Safe child faeces (%)	12.62	31.16	44.44	47.63	32.66	56.41	9.39	25.39	42.64	47.31	32.73	51.85	0.07
	Latrine observation index	68.12	27.45	75.55	24.04	7.44	35.96	65.80	28.63	79.91	19.15	14.11	33.89	6.67
Additional	Handwashing facility (%)	45.96	49.87	42.52	49.47	-3.44	66.47	36.79	48.25	43.21	49.57	6.42	69.49	9.86
outcomes	Latrine use main respondent (%)	73.77	37.18	88.79	26.68	15.02	46.19	76.04	34.93	94.30	17.34	18.26	39.12	3.24
	Habit OD	0.29	0.31	0.14	0.24	-0.15	0.39	0.26	0.29	0.09	0.16	-0.17	0.33	-0.01
	Habit LU	0.70	0.32	0.84	0.24	0.14	0.40	0.71	0.30	0.87	0.17	0.16	0.34	0.02
	Intention LU	0.75	0.26	0.81	0.21	0.06	0.34	0.75	0.26	0.84	0.15	0.09	0.31	0.03

Comparing the effects on male main respondents with those on female main respondents showed that the changes reported by female respondents are generally higher than the changes reported by male respondents. This is surprising, particularly because the difference was seen not only in individual measures of latrine use but also at the household level. However, the differences are relatively small and statistical significance was not assessed.

Comparing the effects on respondents aged under 60 years with those aged 60 or above, latrine use by the elder age group increased slightly less in the treatment arm than in the control arm. Among respondents aged less than 60 years, in contrast, increases in latrine use were slightly stronger in the treatment group than in the control group. However, differences are relatively small and statistical significance was not assessed.

Disaggregating the data by caste revealed that, for scheduled castes, scheduled tribes or other backwards classes households, baseline values of outcomes were generally lower than for households from general caste. All outcomes except availability of a handwashing station increased in both subgroups and in both treatment and control arms. In treatment households, however, increases tended to be stronger in these households than in general caste households. This resulted in similar endline values across outcomes in both subgroups. These data suggest that the intervention was able to reach marginalised groups in a community, reducing caste differences observed at baseline.

5. Cost analysis

The total budget for the study was estimated to be USD349,548 (actual project cost will be calculated at the end of the project period). This total project cost includes: (1) study design and preparation; (2) data collection; (3) data analysis; (4) stakeholder engagement for evidence uptake; (5) study management and monitoring; and (6) capacity building. The cost of the evaluation (i.e. census, baseline and endline) across treatment and control arms was USD115,787.

The cost of delivering the intervention per household was estimated taking into consideration implementation costs (including pretesting of campaign strategies and materials, finalisation of materials, training, implementation and monitoring).

A total of 2,627 households were reached through the intervention. The total costs of implementation are presented in Table 19.

Table 19: Costs of implementing RANAS intervention in Raichur treatment villages

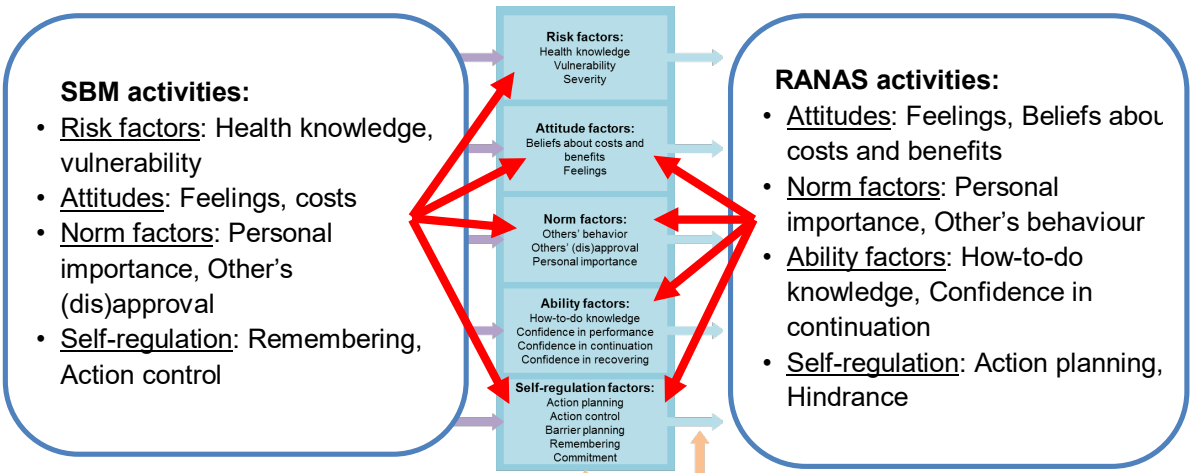
	INR	USD
Project coordinator (n = 1)	257,400	4,021.875
Field supervisor (n = 2)	540,000	8,437.5
Interpersonal communicators (n = 14)	1,080,000	16,875
Finance officer (n = 1)	120,000	1,875
Travel for project coordinator	45,000	703.125
Travel for field supervisors	90,000	1,406.25
Travel for interpersonal communicators	540,000	8,437.5
Training cost for interpersonal communicators	253,000	3,953.125
Community mobilisation meetings	93,000	1,453.125
Stationery	13,500	210.9375
Communication cost for field staff	67,500	1,054.688
Total implementing costs	3,099,400	48,429

The cost of implementing the intervention per household is USD18.4.

A quick analysis of SBM activities suggests that SBM information, education and communication (IEC) activities may have addressed RANAS factors as well (Figure 6). The difference between SBM activities and intervention activities under this intervention is the way they addressed the RANAS factors. SBM, for instance, may have used pressure tactics to trigger changes in norm factors (e.g. checks by GPs, vigilance committees focused on those who do not use latrines), whereas the RANAS intervention focused on Other's behaviour (of latrine use) and approval of toilet use. Tackling attitude factors was common under SBM and this RANAS intervention; however, SBM tends to focus on disgust and fear of non-use, and potential health risks involved, while the RANAS intervention focused on feelings of personal importance and pride in using toilets.

This brief analysis suggests that elements of this RANAS intervention can be incorporated into ongoing SBM activities, given that both may address the same psychological factors (directly like RANAS or indirectly like SBM). However, SBM activities will have to be modified in terms of messaging to tackle these factors. The costs of doing so, however, are difficult to estimate. Initial discussions with the district administration in Raichur suggest that SBM is open to incorporating some RANAS activities, and it does not anticipate high costs in doing so.

Figure 6: Comparison of behavioural factors targeted by SBM and RANAS activities



6. Discussion

6.1 Introduction

The objective of this impact assessment was to rigorously evaluate a population-tailored behaviour change campaign, which promoted latrine use and safe disposal of child faeces in Karnataka, India. The hypotheses were as follows:

- Hypothesis 1: In treatment households, increases in latrine use are statistically significantly higher than in control households;
- Hypothesis 2: Changes in behavioural factors postulated in the RANAS model mediate changes in latrine use; and
- Hypothesis 3: In treatment households, improvement in safe disposal of child faeces is statistically significantly higher than in control households.

The results presented in this report revealed a statistically significant effect of the intervention on latrine use, which amounted to approximately 5 per cent difference between the treatment and control arms. The positive effect of the intervention on reported latrine use is corroborated by the significant effects of similar magnitude on observed signs of toilet usage, which are aggregated in the latrine observation index. However, effects were smaller than anticipated, which calls for a robust explanation.

The data show that in both treatment and control groups, substantial increases in latrine use were noted. Looking at the absolute values at endline, latrine use in the treatment group amounted to 97 per cent, compared with 92 per cent in the control group. This suggests that the intervention achieved the promotion of latrine use among the most change-resistant population. At the same time, this suggests that the detected effects were constrained by a ceiling effect.

With regard to the safe disposal of child faeces, no statistically significant effect was detected. This suggests that the AWC session specifically designed to promote safe disposal of child faeces did not work to change the target behaviour. This may be due to the fact that the intervention comprised only one AWC meeting and was thus substantially lower in intensity. Another potential reason is that the AWC intervention did not target the correct behavioural factors since the intervention had not been designed

based on a quantitative doer or non-doer comparison, but was based on qualitative findings only.

The significant increases in latrine use and safe disposal of child faeces in both groups requires exploration, as the control condition of this trial was a no-intervention control. Given the quantitative findings, the qualitative study focused on understanding SBM-related activities and their potential intensity in the control and treatment villages during the intervention period. We are unable to disentangle the effects of SBM and our intervention because SBM activities were intensive in the entire study area. Discussions with the office of the district collector yielded that SBM activities were implemented across Raichur district with similar intensity. With regard to our study, this suggests that the treatment and control arms had similar exposure to SBM activities.

The areas of qualitative inquiry do provide some insights into the potential mechanisms of action which could have led to the detected increase in reported latrine use across both study arms. First, with pressure to declare India ODF by October 2019, latrine promotion efforts increased in Raichur district from July 2018, compared with previous months (keeping in mind that the state wanted to declare ODF status by November 2018). These activities could have triggered substantial increases in reported latrine use across the district.

Increased pressure to use latrines, especially over the past one year (2018), was noted in all the villages. Surprise spot-checks of the household toilets, ‘meet and greet with a rose’ by GP members for people returning from open defecation in the early mornings and late evenings, sometimes even threats of confiscation of ration card and job cards, all exert pressure (subtle or overt) to use toilets or report toilet use. These pressure tactics, including confiscation of ration cards or any other benefits, were reported only in 4 out of 18 in-depth interviews when the respondents were specifically asked about the pressure perceived in the village to use toilets. One focus group out of the six revealed that withdrawal of benefits was one of the tactics used to get people to use toilets. Many respondents suggested that if the government did not pressurise communities, people would not use toilets.

> The Government did survey our village twice. We ourselves did it because we doubted if people were using the toilets. We checked houses and observed their toilets. If this were not used, we would call the families and insist that they have to start using the toilet. We sometimes try to tell them that we will cut rations, job cards. — GP member, FGD.

The district officials acknowledged that getting people to actually use toilets, the biggest challenge, had improved.

> There is water scarcity, defecating in the open feels more free, problems with people’s attitude towards toilets and this has been an old habit most difficult to break. Earlier toilet use was about 20 per cent but now it has improved to 40 per cent. — District SBM consultant

Second, the promotion activities may have been implemented in combination with similarly intensive monitoring and/or measurement of latrine use across villages, which may have introduced a substantial repeated measurement bias, leading to over-reporting of latrine use.

FGD participants, who were engaged with SBM at a village level, including the GP members, front-line workers, schoolteachers, self-help group members and VHSNC members, affirmed that they undertook household-level observations to check if people had toilets and if they actually used them. It also came to light that there were GP-level teams constituted by the PDOs. These teams carried out cross-GP verification, where one GP team visited households in another GP to check on toilet use.

> People from other villages have come to our village to check if we are using toilets. We have also gone to their villages to do the same. This has happened twice in the last six months. — GP member, FGD.

Third, seasonal effects may have contributed to the substantial increase between baseline and endline in both groups. Baseline was conducted from February to April 2018, which is the beginning of the hot season in Raichur, when water supply is minimal and erratic. In contrast, the endline was conducted in the cool season from December 2018 to January 2019. During this time, water is more readily available. Lack of water to flush the latrine during baseline and potentially better water availability during endline may explain why reported latrine use was higher at endline in both groups. During the summer, most respondents admitted that they would invariably go out to defecate in the open.

> But when there is less water, we all go out to defecate. This usually happens in the summer. — qualitative in-depth Interview respondent

This is partly corroborated by the results presented in Table 11. The perceived difficulty of water collection during the current season for flushing the latrine decreased across the sample from baseline to endline. Water collection was perceived to be easier at endline than baseline. However, the difference between the perceived difficulty of water collection during the current season and during the hot season was similar at baseline and endline. This suggests that, during both measurement points, participants judged water collection to become similarly more difficult during the hot season.

With regard to Hypothesis 2, the data analysis revealed that the intervention effects on latrine use were mediated by changes in behavioural factors. The following mechanisms of action were revealed. The intervention increased the perception that other people used the latrine frequently, made participants more knowledgeable about how to use and maintain the latrine, bolstered their confidence in being able to use the latrine consistently, and removed barriers. These changes in mindset were, in turn, related to changes in latrine use. These mediating factors accounted for the full effect of the intervention on behaviour change. It is important to note that these results refer only to the effect of this study's intervention on behaviour. The effects of SBM activities and external factors on behaviour cannot be identified because of the lack of a strict non-intervention control arm without SBM activities. It is thus possible that mechanisms, beyond those identified in the mediation model, accounted for the change in behaviour seen across study arms.

Existing evidence on promoting latrine use in India has been comprehensively summarised by Lahiri and colleagues (2017). The authors reviewed findings from 11 studies and categorised them into: (1) community mobilisation including Community-Led Total Sanitation; (2) construction of latrines; (3) subsidies; and (4) IEC campaigns. The

authors define community mobilisation as ‘Bringing together members of a community to achieve a specified outcome’ and IEC campaigns as ‘to raise awareness in the target population, with the subsequent expectations that its behaviour will change positively’ (Lahiri et al. 2017: 10).

Parts of our intervention, in particular the community meeting, can be seen as community mobilisation and IEC campaign. The aim of the meeting was to generate awareness of the advantages of latrine use and the disadvantages of open defecation, and to ignite the perception in participants that open defecation was inconsistent with their values and morally wrong. However, the household visits in particular, which included reminders, action planning, coping planning and a photo commitment, clearly go beyond the categories given by Lahiri and colleagues (2017). These particular activities aimed at supporting individuals to put their good intentions of using the latrine into practice, and can be described as self-regulation interventions. To our knowledge similar interventions have not been tested to promote latrine use in India.

With regard to the effects on behaviour, Lahiri and colleagues (2017) report four impact evaluations. The estimates of intention to treat effects reported in these studies are between 10 and 27 per cent and are considerably higher than the effects detected in our study. However, considering the absolute values reveals that none of these studies achieved almost complete endline latrine use. With regard to the drivers of and barriers to latrine use, our findings also extend the evidence base further. Mediation results showed that increases in the perception of how frequently other people use the latrine, the knowledge about how to use and maintain the latrine, and the confidence to be able to consistently use the latrine, and decreases in reported barriers, correlated with higher latrine use. To our knowledge, this is the first study revealing these behavioural factors as important determinants of latrine use and demonstrating how to change them.

This study has important limitations. First, the evaluation is primarily based on self-reports and reports. Although the detected increases in latrine use are consistent with spot-check observations, spot-check observations seem to give little information about the frequency with which latrines are used by individuals but rather constitute a household-level proxy of whether or not the latrine is used at all. Second, with regard to the revealed mechanisms of action of the intervention through behavioural factors, the direction of causality between the changes in behavioural factors and changes in behaviour cannot be determined. This would require collection of intensive time-series data, which was beyond the logistical feasibility of this study.

The findings of this study come at a critical time, with SBM aiming to achieve 100 per cent ODF status by October 2019. The latest NARSS has revealed high coverage and usage of toilets among those who have access to toilets. In this context, the role of evidence-based behaviour change strategies must be carefully presented to show its value in engendering and sustaining latrine use. Since this study coincided with an active phase of SBM implementation in Raichur, latrine promotion activities may have affected the impact of the RANAS approach. With SBM promotion activities at a high during and immediately after this intervention, people may have felt immediately motivated to use the latrine and to report latrine use. Behaviour change interventions can play an important role in sustaining these changes and ensuring that everyone in the community is reached with behaviour change messages.

6.2 Policy and programme relevance: evidence uptake and use

Several stakeholder engagement activities, particularly with district-level officials, were carried out from the start of the study.

At the district level, periodic meetings with district administration facilitated regular sharing of project progress, as well as and their support for the smooth implementation of the evaluation and the intervention in the trial villages. National and state-level engagements with the Ministry of Drinking Water and Sanitation, Department of Panchayat Raj, ensured that the departments were appraised of the project progress and their interest was sparked in study findings. Findings are yet to be shared at the national and state levels due to the upcoming elections.

Internal dissemination events with WaterAid India teams and partners (spanning 11 states) about the baseline findings, intervention implementation and endline findings were carried out. There were also external dissemination events, with the International Public Policy Network at a conference in Delhi University (in February 2019) and UNC Water and Health Conference (October 2018).

Given that endline was completed in January 2019, data analysed in February 2019 and evaluation findings submitted to donor in March 2019, final dissemination events were planned for April to June 2019 after approval from the donor. With the upcoming Lok Sabha (Parliamentary) elections, dissemination of findings in the month of April has been restricted to district administration, as well as key WaSH sector players and NGOs engaged in behaviour change interventions.

Key points raised by stakeholders during dissemination meetings related to the following:

- Contextual nature of behaviour change intervention such as RANAS;
- Scalability of the RANAS intervention;
- Feasibility of a behaviour change intervention given its intensity; and
- Relevance of any behaviour change intervention given that the latest NARSS survey shows high rates of usage among those having a toilet.

In terms of uptake, SVYM has already planned to implement RANAS activities in other villages of Raichur, and the Raichur district administration is keen to implement some of the intervention activities as well. A practice note with practical guidance on the implementation of RANAS is being developed for this purpose.

A reflection exercise within the study team highlighted that a dissemination activity on the RANAS impact assessment alone may not be the most effective way for stakeholders to use the findings. A more effective way may be to hold a behaviour change workshop where different types of behaviour change models are shared and discussed, to identify which approach, strategy and activities can potentially work for different stakeholders.

This study offers important learnings for other districts in India that are in the yet-to-be declared ODF phase. These districts are currently witnessing increased construction activities, and are well placed to receive strong, positive and constructive messaging on latrine use. The administration in these districts can incorporate relevant RANAS activities into their ongoing IEC and BCC (Behavior change communication) plans to encourage latrine use. In districts that have achieved ODF status and are now faced with

issues related to slippage, RANAS activities, particularly those addressing factors related to confidence in using the latrine, overcoming barriers to latrine use and the perception that others in the community frequently use latrines, can be incorporated into ongoing SBM activities.

The relevance of the study findings for sanitation-related policy and practice must be considered and presented to decision makers and programme implementers in light of the following:

- The study was conducted during a phase of intensive SBM activities. The intervention implementation, in particular, coincided with intensive latrine promote in Raichur (July 2018 onwards);
- The findings of this study come at a time when the Second National Annual Rural Sanitation Survey findings reveal high rates of coverage (93.1%) and toilet usage (96.5%). Given this, the relevance of this and other behaviour change studies must be positioned as being a part of the ODF sustainability agenda, having the potential not just to engender universal and consistent latrine use, but also to sustain these behaviours over time;
- Raichur is yet to be declared ODF. With increased latrine construction, components of the RANAS intervention can be implemented to encourage and sustain usage among households who now have latrines;
- The activities implemented differed under SBM and RANAS, but may not have been perceived as different by the communities. SBM strategies used to promote latrine use are often based on verification of latrine ownership and signs of latrine use, with actions undertaken by local government and other prominent village members (e.g. teachers) to ensure that households are able to use latrines. Some of these actions may be perceived as pressure tactics and may have resulted in over-reporting of latrine use. A recent paper by Gupta et al. (2019) on a study in four northern Indian states suggests the use of coercive tactics and sanctions to promote latrine use;
- Baseline latrine use in households that had latrines was quite high. Increases in latrine use suggest that interventions (related to SBM and RANAS) implemented from May 2018 onwards were able to engender latrine use in those households that, until that point, may have been resistant to latrine use or used toilets inconsistently;
- The relevance and importance of behaviour change interventions is not just to promote latrine use but also to sustain latrine use. While this was not the scope of this study, it is an important consideration for policy and practice during the next phase of India's sanitation policy;
- The study has identified psychological drivers that are most strongly associated with latrine use, and developed intervention strategies and activities to address them. The overarching intervention modalities deployed by the RANAS intervention (community meetings, household visits, Anganwadi sessions) are in line with SBM modalities. This presents scope for incorporating into SBM activities successful behaviour change activities that tackle underlying drivers;
- Intervention activities in this study were positive (in terms of messaging) and interactive, and refrained from using strategies that pressurised households and communities; and

- Cultural and contextual sensitivities related to latrine use promotion (e.g. materials on latrine use prominently and publicly displayed in households, water availability) must be factored into the design of campaign materials and activities.

6.3 Challenges and lessons

6.3.1 Census and baseline phase

Selection of villages for the trial

The use of the SBM data to select villages for inclusion into the study proved to be an issue as the SBM data tended to overestimate latrine coverage. As a result, certain villages selected for census did not have an adequate number of functional latrines for them to be considered for the baseline data collection.

Identifying eligible households during census

The census tool was a simple tool that was explained in detail to the data collection agency. Supervision and feedback were provided to all census teams during census rollout as well. Despite this, a critical question on the presence of a household latrine was misinterpreted by several enumerators, and consequently asked incorrectly, resulting in faulty data regarding the number of households with a functional latrine. The data collection agency had to collect census data from a set of 30 new villages, to replace villages where not enough households with latrines were listed. To assist with this, SVYM and WaterAid had to undertake screening of new villages to ensure that at least 30 households in a newly selected village had functional latrines, before passing on this list to the data collection agency to carry out the census.

Establishing baseline

The baseline questionnaire was quite complex and called for substantial training of all members who were involved in data collection. At the same time, many enumerators' skills and level of commitment to the survey was poor, and supervision and logistical planning and support provided by the data collection agency was insufficient during the baseline survey. To assist with baseline data collection, team members from Eawag and WaterAid India worked closely with senior members, supervisors and enumerators from the data collection agency, monitoring data collection on a weekly basis.

6.3.2 Intervention phase

On community mobilisation

Meeting the village-level officials before mobilisation was identified as the most crucial element that was instrumental in making the community meetings a success. Getting people to actually be there in the meeting and on time required additional efforts of mobilisation on the day of the meeting as well. Reaching the identified venue early for the meeting and reminder announcements around the village several times right before the meeting was also identified as important in mobilising the community for the meeting.

Community meetings

Disruptions and complaints from the participants that they did not get reimbursements from the government were common. Once they were informed about the specific aim of this campaign, the mobilisers collected details and helped facilitate the release of payment through interaction and follow-up with GPs/PDOs and also with district administration. There has been pressure from the community to address other pressing

issues in the villages like poor transport, road connectivity, water supply and electricity. The teams were asked a lot of times: 'Why do you do interventions on only latrine use? Why don't you help improve roads and means of transport to our village?' This highlighted the fact that the community did not see open defecation as a problem that needed an intervention. So that the teams were able to carry out the meetings, they would convince the community that the only purpose of the intervention was latrine use and its benefits for the health of the village. Teams would then discuss these other issues when they met with PDOs or district officials.

Household visits

Most household participants seemed happy about posing and receiving their family photo. The participants also enjoyed the routine planning activity because it was about their day and they were happy that outsiders were interested in their typical day. Personal visits to participants' houses, involving engaging conversations about the importance of latrine use, using interactive activities centred around them, all generated a lot of interest in households.

However, in a few households, as soon people knew that the visit was about latrine use, some reluctance was observed. There were even refusals from some households: 'We have heard everything from the meeting at the village level. We are not interested! We don't need this.' Only when the team put in additional effort to convince them of the benefits latrine use would have on their health, did the households permit the visit. The team needed to talk about health in a maximum of 20 per cent of households.

The availability of all household members between 10am and 4.30pm was the biggest challenge noted. Hence, the teams scheduled appointments before 10am and after 4.30pm. In a few households, family members did wonder why they received the intervention and not their neighbours. Another important factor during the phone call exercise was that, if it was a female participant, the team had to schedule prior appointments with a male member of the household in order to carry out the household visits. There was strong resistance palpable from the male members of the households, especially when the promoter was male.

As for the reminder stickers, despite being waterproof, sometimes they would not be in place on follow-up visits. They would have fallen off during use of the lota for agricultural purposes or have been pulled off by little children in the household during use. There were also a few cases where the walls in the house were powdery, rough and coated with limestone, so they were not able to stick.

Some members of the team also reported instances of people pulling off the stickers intentionally because they found them embarrassing. A few others refused to keep the routine planning on the wall, given that it was about latrine use, and they did not want guests or neighbours to see it. This was particularly the case during festivals. This could have undermined the intervention in those households.

The phone call reminders were received well by most respondents, mostly because of the personal rapport built up over time during the household visits. However, there were a few instances where responses were not positive, particularly since the calls were made in the mornings or at a time noted as when defecation would usually take place.

People would say, 'Why do you follow up with me like this?' or 'This is something personal. Why are you bothering me so much?' and even abruptly disconnect the call.

Anganwadi sessions

Subsequently, the repeated points of contact and feel-good experiences during the community meetings and two household visits made the village representatives constantly follow up with the field team members and ask 'When are you doing the Anganwadi session?' Due to a closed network among the Anganwadi workers, teachers of neighbouring villages were complaining that the promoters did not do a similar exercise in their respective villages. For the AWC session, it was felt that additional mobilisation efforts were needed to ensure that all eligible mothers from the treatment households were present. 'When we talk to Anganwadi teachers, she will call all mothers who have toilets, but when she calls, she would not have given focused attention to mobilise our baseline participants.'

6.3.3 Endline survey

Identification of correct respondents for endline

Considering that the study was based on psychosocial factors, it was a key mandate that the same respondents interviewed within the selected households during baseline be interviewed again during endline. Strategies to identify the correct respondents by use of relevant identifiers from baseline including name, age, gender and relationship with head of household were devised. In addition, rigorous training and monitoring of the field team, and quality checks between baseline and endline identifiers, helped to ascertain the correct selection of respondents.

Availability of specific respondents at the time of visits

Most of the time, the availability of respondents during visits to the village did not turn out to be as big a challenge as it was during baseline, thanks to the timing of the survey. It was pre-harvest season (early December to mid-January). Issues with the availability of respondents was observed in some cases; for example, when there was temporary migration of specific respondents to other villages or cities for alternate means of income, or water scarcity issues in some villages meant that entire families had migrated to other villages. This was tackled through prior appointments with the specific respondent, and multiple visits to the same household at a time most convenient to the respondents.

Means of transport to remote villages and travel times between households within large villages

As experienced during baseline, villages with low connectivity were identified and visits to these villages were scheduled once accommodation and travel arrangements for the specific survey teams had been made. In most cases, the strong team of supervisors were stationed at taluka and district headquarters, and usually equipped with a personal vehicle. In large and remote villages, the supervisors ensured that the field enumerators reached the households on time.

Evaluation of the intervention during endline

During intervention checks at endline, some treatment households had reported not having participated in the intervention. Possible reasons identified were anxiety and fear of retribution because they had removed all visible signs of the intervention materials and, therefore, would feel safer simply denying that they had been part of the intervention itself.

In addition, all the materials were put up in open spaces around the household. The promoters divulged that the materials showing latrine use may have become a source of embarrassment to the participants when neighbours or guests came to visit the household, especially during festivals or any family gatherings.

It also came to light that the participants might fear that, if they confirmed participation in the intervention to the endline team, they would be subjected to another time-consuming process. To avoid further contact, some treatment households stated that they were not exposed to the intervention. Village-level officials recognised SVYM team members but it is unlikely that households would remember individuals, given that these villages are new areas for the SVYM team. However, they would be very likely to remember when it was mentioned that it was an intervention related to latrine use.

7. Conclusions and recommendations

This impact assessment showed that the combination of SBM activities and the population-tailored RANAS interventions of this study effectively increased latrine use to 97 per cent. A modest but statistically significant added effect of the RANAS of approximately 5 per cent behaviour change was demonstrated, despite intensive efforts to promote and monitor latrine use by other actors in the study area and an already high base of latrine use before the beginning of the impact assessment. Significant changes not only in reported latrine use but also in the spot-check observations corroborate these results. Insignificant effects on the safe disposal of child faeces could either be attributed to the lower intensity of our intervention (only one AWC meeting) or to the fact that the intervention was not rigorously designed based on quantitative doer/non-doer analyses but on qualitative findings only.

Substantial increases in latrine use and safe disposal of child faeces in the control group were revealed. Although the study design means that we cannot draw a direct causal link, intensive activities by the government to promote latrine use are the most likely trigger for at least part of this change. Our results thus suggest that the ongoing SBM activities successfully promote latrine use, and other government initiatives under the Nutrition Mission/POSHAN Abhiyaan promote safe disposal of child faeces. Future studies would be needed to disentangle the effects of these activities from seasonal effects and repeated measurement biases.

Our findings suggest that the RANAS approach was an effective tool to design a behaviour change intervention in this challenging setting. They also show that interventions beyond risk communication and awareness-raising can play a crucial role in prompting change in those individuals who have resisted previous attempts. Our results suggest that understanding the target audience’s mindset first and, based on this understanding, systematically developing interventions could be a promising approach to changing other target behaviours.

The study presents recommendations to key stakeholders.

Policymakers and programme participants
An analytical review of SBM IEC and BCC strategies can be undertaken with recommendations on how existing SBM activities can be strengthened by incorporating

evidence-based, promising and effective behaviour change strategies and activities. Such an analysis and recommendations can enable states to allocate funds to intensify behaviour change campaigns under SBM, using positive, constructive and interactive activities, in ODF and non-ODF GPs.

At the national and state level, the Women and Child Development Department can leverage the POSHAN Abhiyaan and other Integrated Child Development Services platforms to promote and reinforce latrine use and the safe disposal of child faeces. The focus here needs to be on reinforcing key messages through repeated sessions with caregivers attending Anganwadi meetings.

District administration can draw upon behaviour change approaches to modify SBM activities to be more interactive and inclusive, so as to reach the marginalised members and households of a community. This can be done by identifying those who do not have toilets or who have recently built toilets (often an indicator of the 'last mile'). Key activities could be incorporated that address the following RANAS factors in ongoing SBM IEC and BCC activities in non-ODF GPs and districts: Others' behaviour, How-to-do knowledge, Confidence in continuation, Action planning, overcoming hindrances. Emphasis should be on replacing pressure-based tactics with positive messaging focused on the key drivers of latrine use.

When incorporating behaviour change activities into ongoing SBM activities, a systematic and structured approach must be followed. It is important to select the most appropriate activities, implement them so that the entire community (and all members of a household) is reached, and ensure periodic reinforcement of behaviour change messages (at least three times).

District-level stakeholders can organise district and block-level trainings on latrine use behaviour change strategies and activities with local institutions and community members engaged in SBM activities. Capacity-building activities can be supported through the allocation of budgets or directives issued by the district administration that IEC budgets under SBM can be used for trainings and for the development of campaign materials. During trainings, the relevance and potential impact of behaviour change activities that address the underlying psychological factors must be stressed. This will help government agents engaged in latrine promotion activities on the ground to go beyond awareness generation to address key behavioural issues, such as habit, self-efficacy, attitudes and social norms. Sensitising block-level and GP-level players on the behaviour change techniques that can potentially address the underlying RANAS factors (e.g. personal norms, social norms, costs and benefits of latrine use) can be implemented through certain strategies (e.g. community meetings) and activities (e.g. videos that increase the perception that others in the community use latrines).

Of crucial importance is devising and implementing solutions to ensure water availability to communities and households throughout the year, especially in the summer season.

Programme managers, civil society organisations
It is recommended that NGOs engaged in behaviour change activities conduct an initial formative research in intervention communities, to identify whether the RANAS factors found to be relevant in this study hold true for that community. Based on this formative

research, behaviour change techniques and relevant intervention materials from this study or those being used under SBM to address the underlying drivers of latrine use can be used to trigger the process of behaviour change.

Researchers, donors

The main recommendation to institutions engaged in research is to conduct studies on how behaviour change interventions, such as RANAS, sustain behaviour change in communities over time (6 months, 12 months, 18 months post-intervention). There is a need to identify other methodologies (e.g. longitudinal studies, immersive research) to verify usage of toilets, beyond surveys, spot-checks and qualitative interviews or FGDs. Such methodologies could allow for long-term and in-depth understanding of the behaviour and contexts of individuals, families and communities. A comparative review of IEC and BCC strategies used under SBM and by other behaviour change interventions (e.g. under the 3ie grant window) would also be useful, suggesting how impactful behaviour change strategies may be incorporated into SBM activities at scale and with minimal additional resources.

Online appendixes

Online appendix A: Tools used for the qualitative data collection

https://www.3ieimpact.org/sites/default/files/2019-08/TW14.1010-Online-appendix-A-Tools-used-for-the-qualitative-data-collection.pdf

Online appendix B: Tool used for quantitative data collection

https://www.3ieimpact.org/sites/default/files/2019-08/TW14.1010-Online-appendix-B-Tool-used-for-quantitative-data-collection.pdf

Online appendix C: Pre-analysis plan

https://www.3ieimpact.org/sites/default/files/2019-08/TW14.1010-Online-appendix-C-Pre-analysis-plan.pdf

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