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The 5 Star Toilet Campaign

Improving toilet use in rural Gujarat

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The 5 Star Toilet Campaign: improving toilet use in rural Gujarat

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Summary

Over the past four decades, the Indian government has taken several steps to improve toilet coverage. In 2014, the launch of Swachh Bharat Mission provided impetus to toilet construction and an increased focus on toilet use through communication and behaviour change activities. The 5 Star Toilet Campaign was conducted in the context of the mission. It was based on the theory and process of behaviour centred design. The overall purpose of this programme was to learn how to change toilet use behaviours by addressing the key drivers of toilet use.

This study was a cluster randomised trial with 94 clusters (47 clusters each in the treatment and control arms) of the identified blocks (Mahuva, Talaja and Palitana) in Bhavnagar, Gujarat (Online appendix 10). The primary unit of analysis for the trial was the household. The outcome of interest was the proportion of households (assessed in $n = 30$ households per cluster) that report the use of toilets by all household members. This was measured six weeks after intervention delivery through a self-reported or proxy-reported questionnaire survey and an additional tool masking open defecation questions as a physical activity survey.

The endline study consisted of: (1) the physical activity survey administered in 30 households with 2 members per household in 94 clusters, followed by; (2) a questionnaire survey to understand toilet use in 30 households in 94 clusters and (3) process data collected from 4 clusters (2 from each study arm) during and after the intervention delivery period to assess implementation of the campaign.

The endline study findings did not show clear evidence of a relevant effect of the intervention on toilet use in the intervention setting. The small increase in toilet use by all household members aged above five years was below the anticipated effect size for which the study was powered. We observed a small increase in toilet use of 7 percentage points (95% CI 1.4 / 12.6), which was attenuated to 5.5 percentage points (95% CI 0.0 / 11.0) after adjusting for sample population imbalances. The physical activity tool, which attempted to measure toilet use less intrusively, showed that the prevalence of toilet use was 4.4 percentage points lower, with a prevalence only 1.7 percentage points higher in the intervention arm (95% CI -3.2 / -6.7).

The process evaluation, which was informed by Medical Research Council guidance (Moore et al. 2015), suggested that low exposure of the target population to the intervention may be a possible cause for the results. Only about 10–15% of the intervention households showed evidence of exposure to the intervention. Further analysis revealed that this small exposure was insufficient to change the population's perceptions around toilet ownership and other relevant sanitation-related factors.

Small, positive changes in toilet features and proxy markers of current use were observed, but statistical support for these small changes was low and could have occurred by chance. The intervention also failed to change practices around child defaecation, although the intervention design did not specifically target this behaviour.

There is evidence of another form of impact, however, in that the campaign concept and components have been taken up by other important actors in the sector, including the regional government and Tata Trusts. This kind of impact on government and other civil

actors may eventually result in the research having real consequences for toilet use in Gujarat and further afield.

This study presents important lessons for designing programmes related to behaviour change. The intervention was delivered in clusters with already high levels of toilet coverage and use, which appears to have reduced the proportion of the population that could have benefitted. Thus, the results underscore the need to identify a suitable target population for future interventions that aim to increase the use of existing toilets.

From the implementation perspective, this factor strongly reduces the efficiency of an intervention if it mainly consists of activities performed at the community level. Better targeting of the intervention to households that are not currently using their toilet fully could be key to improving the effectiveness of the campaign and making it more efficient from a cost perspective. Sufficient time and resources for iterative intervention development and pilot testing could help to maximise the potential of this kind of intervention approach.

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Abbreviations and acronyms

BCD	Behaviour centred design
CLTS	Community-led total sanitation
CSPC	Coastal Salinity Prevention Cell
IIPHG	Indian Institute of Public Health Gandhinagar
LSHTM	London School of Hygiene & Tropical Medicine
OD	Open defecation
ODF	Open defecation free
r.i.c.e.	Research Institute for Compassionate Economics
SBM	Swachh Bharat Mission

1. Introduction

Open defecation (OD), a practice of defecating outside in open spaces, is a persistent public health challenge in several countries, including India. Until recently, India accounted for more than 60 per cent of the global population that defecates in the open (UNICEF and WHO 2015).

For more than three decades, the Indian government has made efforts to improve sanitation in rural areas, mainly by providing subsidies for toilet construction alongside information, education and communication activities. Previous initiatives such as the Central Rural Sanitation Programme, the Total Sanitation Campaign and Nirmal Bharat Abhiyan emphasised increasing awareness and demand for sanitary facilities.

However, the past strategy was criticised for its lack of consistent implementation strategy to roll out the larger national programme; inadequate staff capacity and facilitation skill to implement sanitation programmes; political interference; and challenges in accessing government financial incentives for latrine construction.

In 2014, through the launch of Swachh Bharat Mission (SBM)-Gramin, the pace of toilet construction accelerated with the provision of additional funds (MoDWS 2019). Renewed strategies include a decentralised approach to improving sanitation coverage and use, which augments the capacity of state governments to undertake behaviour change activities by ensuring programme roll-out and incentivising performance.

Financial incentives are provided to households below the poverty line for construction and usage of individual household latrines. *Gram panchayats* (village councils) that achieve open defecation free (ODF) status receive monetary rewards and publicity recognising their achievements. In addition, SBM-Gramin focused on mass media campaigns and village-level events to address people's toilet use behaviour.

The status of toilet coverage and use in rural India varies, as reported by a number of surveys. While coverage has improved, villages are far from the mark of universal sanitation coverage where every household has access to a functional toilet. The data on use also varies due to different sample sizes and lack of standardised measurements.

Recent surveys show improvement in the provision of toilets; however, they also raise concerns around inadequate use. The Swachhta Status Report (NSSO 2016) found that around 52 per cent of the country still defecated in the open. A survey conducted by the Research Institute for Compassionate Economics (r.i.c.e.) reported that 40 per cent of households with a working toilet had at least one person who regularly defecated in the open. Further, less than half of households with a government-built toilet used it regularly (Coffey et al. 2014). A recent survey suggests that 44 per cent of the rural population in Bihar, Madhya Pradesh, Uttar Pradesh and Rajasthan still defecate in the open (Gupta et al. 2019).

The present study was conducted in Bhavnagar, Gujarat. Bhavnagar is typical of rural India in many respects, with high levels of agricultural production alongside the rapid growth of industry (e.g. onion processing, ship breaking and diamond polishing). The Swachhta Status Report (NSSO 2016) found that the percentage of people using household and/or community toilets (out of households with a toilet) was 96 per cent for Gujarat.

The National Annual Rural Sanitation Survey 2017–2018, conducted in 6,136 randomly selected villages (including households, *anganwadi* centres [mother and child care centres] and schools), found that about 77 per cent of homes in rural areas have access to toilets, and over 93 per cent of households in villages with access to toilets were reported to be using them. However, according to a recent report of the comptroller and auditor general of India, a survey conducted in 120 *gram panchayats* in eight districts of Gujarat found that nearly 30 per cent of households had no access to toilets, either individual or public (CAG 2018).

1.1 Scientific background and rationale

Improving sanitation coverage and use is a public health priority in India and other countries where OD remains high. A limited number of effectiveness trials (Online appendix A) evaluating the health impact of improved sanitation and/or toilet coverage have been conducted in rural India and other countries. However, evidence on the effectiveness of interventions to improve behaviour related to sanitation use and hygiene practices is much more limited.

A recent systematic review by Freeman and colleagues (2017) found a positive impact of sanitation on aspects of health (e.g. diarrhoea, soil-transmitted helminths infections, trachoma, schistosomiasis and nutritional status). In their assessment of effectiveness trials, the authors found few studies reporting coverage and use. The authors propose that, since sanitation acts as a barrier to faecal exposure (both individual and communal), assessments of community-level coverage and use – rather than just at the individual level – may provide meaningful and relevant insights. The authors emphasise the need for experimental cluster randomised trials to provide data on the role of increased sanitation coverage and use, as well as research that describes interventions and their implementation.

Garn and colleagues (2017) carried out another systematic review and meta-analysis of 64 studies to assess the impact of sanitation interventions on toilet coverage and use. Their review found that most interventions had a limited impact on increasing latrine coverage and use, which may be due to a high baseline coverage level that might have restricted the absolute increase in coverage (as there is less room for improvement). The review found that most studies did not assess sustained adoption of interventions beyond the initial impacts on toilet coverage or use.

The review also quantitatively characterised sanitation interventions that increase latrine coverage and use, as well as factors associated with higher use. Different types of household-based sanitation interventions that increased latrine use included: the Indian government's Total Sanitation Campaign; latrine subsidy or provision interventions; other latrine subsidy or provision interventions that also incorporated education components; sewerage interventions; sanitation education interventions; and community-led total sanitation (CLTS) interventions. The review found that people were more likely to use a toilet that was functional, well maintained, accessible, clean, private and provided amenities for practicing hygienic behaviours like anal cleaning and menstrual management (defined as adequate sanitation, which meets the needs of the user) (Garn et al. 2017).

As Schmidt (2015) points out, if an intervention is unable to achieve a reasonable change in sanitation coverage and use (demand), then it is unlikely to have any effect on health outcomes. Interventions providing toilets in rural areas may have not substantially improved health, likely because of incomplete coverage and low usage (Duflo et al. 2015).

Taken together, the above studies suggest that although improving toilet coverage is of course one important component in the reduction of OD, it is not the whole solution (Barnard et al. 2013; Routray et al. 2015; Coffey et al. 2014). Efforts should always be made to ensure that toilets that are built are also used. This is a particularly marked problem in India, where there is a strong history of OD. As Luby (2014) concludes, we need to develop and assess interventions that both improve coverage and significantly shift defecation behaviour in order to reduce environmental contamination.

The literature also highlights serious problems with the measurement of toilet use, particularly the potential measurement biases of self-reported toilet use. Curtis and colleagues (2011) therefore suggest that there is a need to invest in the design, management, rigorous measurement and evaluation of large-scale sanitation and hygiene promotion programmes. Although building sanitation infrastructure is an important step in the delivery of sanitation services, individual and community behaviour must change to ensure that there is demand for these services. There is an important role for behaviour change interventions to address these determinants of toilets use.

1.2 The 5 Star Toilet Campaign

The Gujarat government has reported steady progress in improving the availability of toilets in rural areas, and in October 2017 all districts in Gujarat were declared ODF. The government recognises the need to move to a new phase of activity that makes toilets and their use sustainable, and to account for households that were not covered in the previous targets. These include households with now-defunct toilets and households that did not exist in the 2012 baseline survey. It recognises that a sharper focus on influencing the behavioural determinants of toilet use may help achieve the desired effects (i.e. improved toilet use and better health indicators).

Despite improved coverage of toilets, their consistent use by all family members remains a problem. Through our discussions with the state government and key stakeholders working in Gujarat, we understand that the Gujarat government is looking for solutions to further improve the sustained use of toilets.

During the formative research phase of our study (Online appendix B), we found that not all toilets built through government support were being used. Additionally, in some villages, even if the government had approved toilet construction or the release of the financial subsidy, the realisation of those funds by households and the construction and completion of some toilets is still pending. We also found that men in households were more reluctant than females to use their new toilets. Thus, intervention components in the 5 Star Toilet Campaign are targeted at men (e.g. toilet makeover, pit emptying and community events).

This study of the 5 Star Toilet Campaign is a cluster randomised trial of an innovative, theory-based intervention that aims to improve toilet use in select clusters of Bhavnagar.

The trial tested an intervention based on behaviour centred design (BCD) to address determinants of toilet use in three blocks of Bhavnagar district in rural Gujarat. The campaign was delivered at the cluster level, and the evaluation was conducted on a randomised sample of 30 households (with government contractor-built toilets) per cluster in 94 clusters (with 47 clusters in each study arm).

The process evaluation helped to identify the causes of success and/or failure of the intervention in improving toilet use behaviours, and to study the hypothesised pathways to change of the intervention components. From a methodological point of view, it is difficult to ascertain toilet use, which is typically measured through different self-reported questionnaires, as responses are difficult to validate and outcomes are not easily comparable. Thus, in addition to self-reported measures, our study used an alternative tool that masked OD questions as a physical activity survey in order to measure toilet use.

The trial team includes: a principal investigator from the London School of Hygiene & Tropical Medicine (LSHTM) (Professor Val Curtis); a BCD co-founder from LSHTM (Dr Robert Aunger); a lead-study statistician from LSHTM (Dr Wolf Peter Schmidt); a research fellow and trial coordinator from LSHTM (Kavita Chauhan); a co-principal investigator from the Indian Institute of Public Health Gandhinagar (IIPHG) (Professor Dileep Mavalankar); a field epidemiologist from IIPHG (Dr Deepak Saxena); and research assistants from IIPHG (S Yasobant, Vebhav Patwardhan and Priya Bhavsar).

The intervention was managed by a programme manager (Ketan Hingu) and delivered by trained facilitators from the local implementing partner organisation, Coastal Salinity Prevention Cell (CSPC), as well as trained community-level volunteers and professional artists engaged locally. The creative development agency Upward Spiral (led by Balaji Gopalan and Nipa Desai) developed the intervention design and supervised the quality of intervention delivery.

1.3 About the report

This report is organised into seven chapters and 10 online appendixes. Chapter 2 of this report describes the process followed to develop the intervention, its theory of change and the intervention components. We then present the intervention monitoring plan. In Chapter 3 we explain the cluster randomised trial methodology. The findings of this study from process and impact evaluations are presented in Chapter 4. In Chapter 5 we set out the cost analysis of the intervention delivery and the discussion is presented in Chapter 6. The study recommendations are detailed in Chapter 7.

2. Intervention

2.1 Description

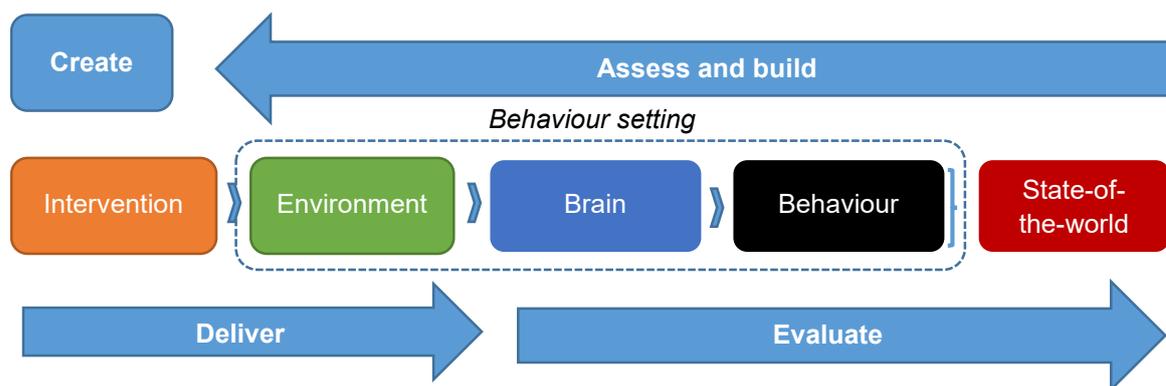
The overall purpose of our study was to learn how to improve toilet use in rural India. Our aim was to evaluate the effect of the 5 Star Toilet Campaign on the toilet use of all members of a household aged five years or older. The intervention aimed to address the complex determinants of low toilet use in rural Gujarat and improve use among all members of households with government contractor-built toilets in selected villages of Bhavnagar, Gujarat.

2.2 Diagnostic process followed to design the intervention

The 5 Star Toilet Campaign used the BCD framework and theory of change to design its intervention (Aunger and Curtis 2016) (Figure 1 and Online appendix 8). BCD uses design thinking for the process of designing and testing interventions. BCD addresses both psychological and environmental determinants of behaviour and has a built-in design process suitable for intervention design and delivery. It has provided guidance for successful behaviour change interventions concerning handwashing with soap in India (Biran et al. 2014); oral rehydration solution use in Zambia (Greenland et al. 2016); food hygiene in Nepal (Gautam et al. 2017); infant feeding behaviour in Indonesia (Gibson et al. 2017) and post-operative exercise in Ireland (Doyle 2015). It has also been applied to the marketing of sanitation and hygiene products.

The 5 Star Toilet Campaign's design process involved a double diamond concept (Drew 2019), which maps the divergent (where the number of possible ideas are created) and convergent (refining and narrowing down to the best idea) stages of the design process, showing the different modes of thinking that were used to develop the intervention (Online appendix C).

Figure 1: Behaviour centred design (Aunger and Curtis 2016)



BCD's theory of change involves five steps: Assess (research); Build (field-based data collection); Create (creativity and imagination); Deliver (implementation) and Evaluate (analysis).

In 'A' we started by listing basic assumptions on drivers of toilet use, followed by a review of published and grey literature. We also held a framing workshop with input from local and international experts in order to specify the target behaviours, their hypothetical drivers and additional insights. This included the factors discovered in the literature review as well as other hypotheses developed by the study team and other experts on the basis of experience. This was important, as small-scale interventions and innovative programmes are often not documented in the public domain. These insights were then organised using the BCD checklist of potential factors in the environment, setting and brain, and included: water availability, caste-related taboos, pit filling, knowledge about disease, manners, shame, dignity, safety, comfort, nurture, routine and habit (Online appendix C).

Table 1 below outlines the remaining steps in the diagnostic process, based on BCD, which were followed to design and develop the intervention.

Table 1: Diagnostic process followed to develop the intervention

Process steps	Activities
B BUILD	Formative research was conducted in the inception phase of the project to identify the key determinants of toilet use and non-use in the study population and to arrive at a design brief. The research methods included structured conversations with the help of a discussion guide and varied research tools (such as stories, games and personifications) as well as a survey of 200 households to understand toilet coverage and functionality.
B1 Interviews/survey	In-depth interviews with key informants and surveys in randomly selected households (10 households per cluster in 20 clusters of Bhavnagar) were undertaken.
B2 Brainstorming	Brainstorming was undertaken to consolidate the design brief (design challenges and insights).
C CREATE	The intervention was based on the design brief, which was developed using a creative development research process. The philosophy of this ‘development’ approach (as opposed to a ‘testing’ approach) is that it focuses on gaining insights to develop an idea to its full potential, rather than a simple ‘yes’ or ‘no’ answer. The process is iterative when necessary (i.e. based on responses, the idea is reworked and researched again).
C1 Ideation	This process involved creative brainstorming and reflection to generate specific ideas to address the key determinants of toilet use.
C2 Orchestration	To develop the ideas into a finished form and products (films, song, virtual reality film, posters), we worked with a range of organisations and people who had the required skills such as graphic design, film production, scriptwriting, virtual reality, learning models and song production.
C3 Concept	Some creative ideas were researched at the concept level such as the central campaign branding idea and the film scripts. Respondents were exposed to the concept briefly (e.g. shown the logo) and their responses were taken to improve the concept.
C4 Execution	Some creative ideas were researched at the execution level such as skits, toilet makeovers and demonstrations for reducing anxiety around pit filling. Respondents were exposed to the idea in a live context (e.g. performance of a skit) and their responses were taken to improve the execution.
C5 Package	During stages C3 and C4, the creative ideas were researched as individual elements. In C5, the whole package was researched, and responses were taken from the audience to improve the package.
<i>Note: The creative development process is not linear. For instance, C1 or C2 could follow any round of creative development research steps (C3, C4 or C5).</i>	

Process steps	Activities
D DELIVER	The intervention delivery involved planning, organising different resources, training of human resources, providing guidance, reviewing performance and addressing challenges.
D1 Planning	To plan for different resources and timelines, there were extended discussions between Upward Spiral, CSPC and LSHTM.
D2 Organisation	CSPC organised different resources that were required for the project implementation such as people, infrastructure and materials.
D3 Training	Three rounds of training were conducted for the implementation team of facilitators and CSPC staff: two at the beginning and one midway. The method of training was experiential (involving personal experiments and roleplay). One round of volunteer training (25 volunteers) and a refresher training (20 volunteers) were provided.
D4 Guidance	The teams were provided with guidance on the ground during the first few days of the rollout.
D5 Reviews	Direct observations of field-level activities and two reviews were conducted with the implementation team: one midway through implementation and one at the end. The midway review was conducted to understand implementers' experiences and to provide training for the next round of implementation. The review at the end of the implementation cycle was done to understand their experiences, challenges faced and community response to the intervention.
D6 Learning group	A learning group was created in WhatsApp®. Through this group, the implementation team could interact with the trainers to clarify doubts and raise issues they faced. The implementers also shared pictures from each day's activity with the project team.

The 5 Star Toilet Campaign (Tables 2 and 3) emerged from this iterative design process and was rolled out by our implementation partner CSPC from mid-September to December 2018. The intervention was delivered by two teams comprising three trained facilitators per team and locally trained performing artists. The time gap between the Day 1 and Day 2 intervention delivery in each cluster was around four weeks. This was based on the overall project timeline and intervention schedule. The intervention was delivered in the Talaja (21 clusters), Mahuva (19 clusters) and Palitana (7 clusters) blocks of Bhavnagar, Gujarat.

2.3 The 5 Star Toilet Campaign: theory of change

The 5 Star Toilet Campaign's theory of change consists of different streams of activity, each of which has its own logic in the theory of change (Online appendix D). It was intended that family members and men will improve and use their contractor-built toilets, as measured by a follow-up evaluation six weeks post-intervention delivery.

The overall campaign theme was 'the world is getting smarter', and 'smart people build smart toilets'. A smart toilet was one identified as 5 stars or 5 star+. The central concept is that 'smart' people have modern toilets, which are like five-star hotels in that they are of the best quality. This introduces a sense of social competition within a village to have the best toilet, and associates household sanitation with the social status of that household in the community.

In this concept, each star stood for an aspect of comfort (light, ventilation and water) and aesthetics (paint, patterns and cleanliness), and '+' stood for inclusivity (support and toilet chairs for elderly or differently abled users). The intervention components include a 5 star toilet makeover promotion, addressing pit filling and emptying anxiety (explaining that it takes longer for a pit to fill and the compost doesn't smell), community motivational events (to impart the idea that 'all the smart people are using toilets because it saves time and effort'), and the creation of new social norms (Bicchieri et al. 2017) aiming to change the environment of the target population.

The campaign aimed to inspire the community and encourage them to revalue their toilets by recognising that they provide benefits associated with the motives of hoard, create, convenience (comfort) and affiliation, and to provide a reward pathway for transitioning to a new toilet use routine.

The intervention was delivered at cluster level to reach households with government contractor-built toilets. Our assumption was that exposure to this environmental change will influence the psychology of the target population – all members in a household, especially men – to value their toilets. This would then encourage them to modify their new toilets by painting the walls and installing features like ventilation, light and toilet chairs for differently abled or elderly people, which enhance the user experience.

This was expected to prompt people to improve their existing toilets and change their behaviour from OD to using their contractor-built toilets, which may impact health and well-being in the long term. The households were not provided with any materials or money to undertake these changes. The intervention aimed to initiate a cascade of changes by providing activities that are surprising, cause revaluation of the target behaviour and affect the performance of the behaviour in its setting.

Tables 2 and 3 outline the steps involved in the delivery of the 5 Star Toilet Campaign. Below is a brief description of materials used in the delivery of the campaign:

1. **Campaign van:** A van was used to carry materials and a team of facilitators to clusters. In the cluster, the van was used for street events and making announcements. The van design was customised to display the campaign theme;
2. **Song:** A song was composed for the campaign that communicated the core message of the intervention, i.e. the world is getting smarter, people are getting smarter, therefore, use a toilet;
3. **World of toilets:** Slides with pictures of toilets from different parts of the world were displayed on a light box;
4. **Toilet model:** A small toilet model that looked similar to the government-built toilets, with all features of the 5 star toilet promoted by the campaign, was displayed;

5. **Virtual reality experience:** This included a virtual reality experience of a 5 star toilet. People could experience what it feels like to enter a clean toilet with cross ventilation, light, water inside the toilet and painted or tiled walls;
6. **Skit:** A skit was performed where a man and a woman reverse their roles for a day to experience each other's life and its associated intricacies, including issues related to OD. The core message of the skit was that given the complexities of life, both men and women need to use a toilet to save time and for comfort and convenience;
7. **Short films:** Six short films were produced for the campaign to communicate that toilet use saves time and effort and to promote the concept of comfort and convenience associated with it. They also sought to reduce anxiety around pit filling, shared the experience of a family that had undertaken a toilet makeover and talked about toilet chairs and their benefits;
8. **Toilet board:** A display board was placed in the village square with photographs of families that had improved their toilet or had a 5 star toilet;
9. **Compost guessing game:** Six jars were filled with different kinds of soil, sand, pebbles and compost, and the audience was asked to come forward and guess which jar had compost. The purpose of this game was to dispel the myth that compost smells and to show people that faeces is converted into compost, which can be used in farmland;
10. **Life-size pit:** A standee of the life-size pit was shown to people and they were asked to guess the time it takes for a pit to fill;
11. **Certificates and stickers:** Stickers were pasted on the toilets of families with a 5 star toilet or those who had converted their toilet into one. Later, the families were awarded a certificate; and
12. **Smart network Wi-Fi:** A Wi-Fi dongle was placed in the van so that community members could freely download the films and song produced by the campaign.

Figure 2: The 5 Star Toilet Campaign theme



'The world is getting smarter' denotes:

- Smart people build smart toilets; and
- A smart toilet has **five stars** and each star stands for an aspect of
 - **Comfort:** light (natural and light bulb), cross ventilation and water;
 - **Aesthetics:** paint, patterns on the wall and cleanliness; and
 - **+**: inclusivity (e.g. a handle and toilet chair).

Table 2: Day 1 activities

Activity	Description	Tools
Pre-intervention delivery		
Meetings to seek support	Meetings were held with village leaders to discuss the campaign and gain support to plan and organise the Day 1 event.	Facilitation script
Recruitment of volunteers	One volunteer was identified from each village with help from local NGO partners or the <i>sarpanch</i> (village head), who would promote the 5 star toilet concept, help the team of facilitators to deliver the Day 1 and Day 2 interventions, and follow up with community members for 5 star toilet makeovers.	Training of volunteers
Three days before Day 1 event	Calls were made to each village volunteer to ensure that the WhatsApp® broadcast groups are formed to share information on the campaign with the community members, mobile teasers have been passed around, leaders have been met and locations are identified for events.	WhatsApp® teasers, phone calls
Day 1		
Announcements	A customised campaign vehicle went around the village to make announcements and carry all material for the events.	Vehicle design, announcement script, song recording, media player
Interaction with volunteers	Facilitators, with the help of volunteers, identified the location for the evening event and created a route plan for the household visits and street events.	
Interaction with children	Children were exposed to a VR experience of a 5 star toilet design, as well as the idea of 5 star toilets, and taught slogans around 5 star toilets.	VR app on 5 star toilet design, VR goggles, phone
Household visits	Two teams of facilitators, as well as artists, children and the van went from street to street, making household visits. They presented the idea of 5 star toilets, enquired if people would like to know the rating for their toilets, rate their toilets and express appreciation for what they already have. If people had a 5 star toilet, they were awarded with a 5 star toilet sticker, which was pasted on their toilet and they were invited to the evening event to receive certification. Photographs were taken. If they did not have five stars, they received an explanation as to what they needed to do to get five stars.	5 star toilet leaflets, 5 star toilet poster

Activity	Description	Tools
Van in the community	The van was parked in the street and announcements were made and songs played. Three-dimensional photographs of different toilet innovations from around the world were displayed, as well as a small toilet model and a VR experience of a 5 star toilet.	Music player, photographs, mobile, VR goggles, VR app
Preparations for the evening event	The venue was set up for the evening event: audiovisual and seating arrangements were made for community members; photographs were downloaded of the day's activities from phones and cameras; and certificates were written for 5 star toilet awardees.	Certificates, audiovisual system, rug for seating arrangement
Enrolment corner	In parallel, an enrolment corner was created for households willing to improve their existing toilets into 5 star toilets, with a standee on 5 star toilets, a table to showcase a 5 star toilet model and a toilet chair on display for differently abled people.	Leaflets and documentation sheet, toilet chair, smart network Wi-Fi
Evening event	<ol style="list-style-type: none"> 1. Campaign song played, team interacted with children and made announcements; 2. Films played (<i>Saving Time</i> and <i>Saving Effort</i>); 3. Skit performed; 4. World of toilets (slide show) presented; 5. Toilet makeover films and toilet chair films played; 6. Those with 5 star or 5 star+ toilets celebrated by awarding them with certificates; 7. Those who enrolled were introduced and called to the front to celebrate them; and 8. Farewell: 'All the best! We will come back in 2–3 weeks to celebrate again.' 	Audiovisual equipment, films, artists, certificates

Note: VR = virtual reality.

Table 3: Day 2 activities

Activity	Description	Tools
Follow-up activities pre Day 2	Volunteers promoted 5 star toilet makeovers between Day 1 and Day 2 events. Photographs were taken of families who have modified their existing toilets.	Home visits and follow-up on phone
Share films and song	Films and the campaign song were shared in the village WhatsApp® groups.	WhatsApp®, YouTube® link: https://www.youtube.com/channel/UCqmL6DxtcDpAKelU4lo33ig

Day 2

Organise	All the pre- and post-toilet-makeover photographs from the village were compiled into a presentation, clearly marking the names of people.	Laptop/tablet
Announcements	Announcements were made about the evening event.	Van, audio system, announcement script
Testimonial videos	Videos were recorded of families that undertook the 5 star toilet makeover.	Phone camera
Evening community event	Preparations were made and site was identified.	
Guessing contest: pit filling	Participants were asked to guess how fast a pit fills up. This was done through a life-size pit standee. The facilitator explained the time it takes for a pit to fill and the process of composting.	Life-size pit standee
Guessing contest: compost	Jars with normal soil and compost were kept on a table. Participants were invited to guess which jar contains compost.	Glass jars with soil and compost
Films of pit filling and testimonial videos	Films of pit filling were showcased and videos of people who undertook toilet makeovers were played.	Testimonial films, short films
Toilet board	Photographs of people who did toilet makeovers were displayed on a board, which was placed in the village centre or <i>panchayat gahr</i> (council office).	Board, pictures, printer
Toilet makeover	There was a presentation of certificates to those who improved toilets. Participants were invited to come and share their experience with those in attendance.	Pre/post presentation
Farewell	People were thanked for their participation.	

2.4 Implementation monitoring

The implementing team, based on the intervention design protocol and in discussion with collaborators, developed a set of input and process indicators to monitor roll-out of the intervention in the study clusters. The indicators were developed to capture the delivery of specific activities and attendance of participants in the events. In order to have regular updates on the programmatic activities and the data, a WhatsApp® group was formed during the implementation phase.

Data from each day's activity were reported to the project coordinator by the facilitators through WhatsApp® and paper records of the event. The implementation team of facilitators recorded attendance, number of events and activities conducted, challenges faced and any unintended consequences. This data, along with photographs from the day, were shared over WhatsApp® and through facilitators' field notes.

At the end of each day, both teams also shared information on participants, the number of 5 star toilets identified and commitments made. This was done through an assessment sheet designed to assess five-star eligibility. Data entry was done by the CSPC's project coordinator at the block level (Online appendix E).

Table 4: List of indicators used to monitor the activities of Day 1 and Day 2 events

1. Number of people who visited the street events (men, women and children)
2. Number of people who attended the evening event (men, women and children)
3. Number of times activities were conducted in street events (toilet model, toilet chair, virtual reality, number of people who experienced virtual reality)
4. Day 1 activities conducted in the evening event (photographs from the day and household visit, skit, films on saving time and effort, toilet makeover film, toilet chair film)
5. Day 2 activities conducted in the evening event (smart village board, testimonial videos, films on pit filling, compost guessing game, pit emptying)
6. 5 star toilet (number of people who enrolled in 5 star toilet makeover; number of people who reported a 5 star toilet; number of certificates awarded to 5 star toilets)
7. Most liked activity of the day
8. Least liked activity of the day
9. Unintended consequences (positive and/or negative)

The intervention delivery reports were reviewed every fortnight by the monitoring officer with CSPC. Activities conducted were mapped against the plan, and feedback was discussed with the programme manager and project coordinator.

CSPC's programme manager visited the treatment villages periodically and reviewed the data capturing process at the field level, reviewed progress, and guided the field team by demonstrating and anchoring at the village-level events. The project coordinator made logistical arrangements such as: providing vehicles, an audiovisual system and lodging for the team and artists; coordinating with local government authorities and the village *sarpanch*; and reporting activities to the programme manager.

The creative design team from Upward Spiral and researchers from LSHTM provided feedback to the implementation team based on information posted on WhatsApp® by the facilitators and through periodic visits to the field. Skype® calls were held to seek an update on progress and provide inputs to the intervention delivery process. The frequency of these calls was around 3–4 calls per month during the design phase and 2 calls per month during the implementation phase. In addition, the team shared regular updates via a management group on WhatsApp®, which comprised the LSHTM team (principal investigator, BCD co-founder and programme manager), the Upward Spiral team and the CSPC programme manager.

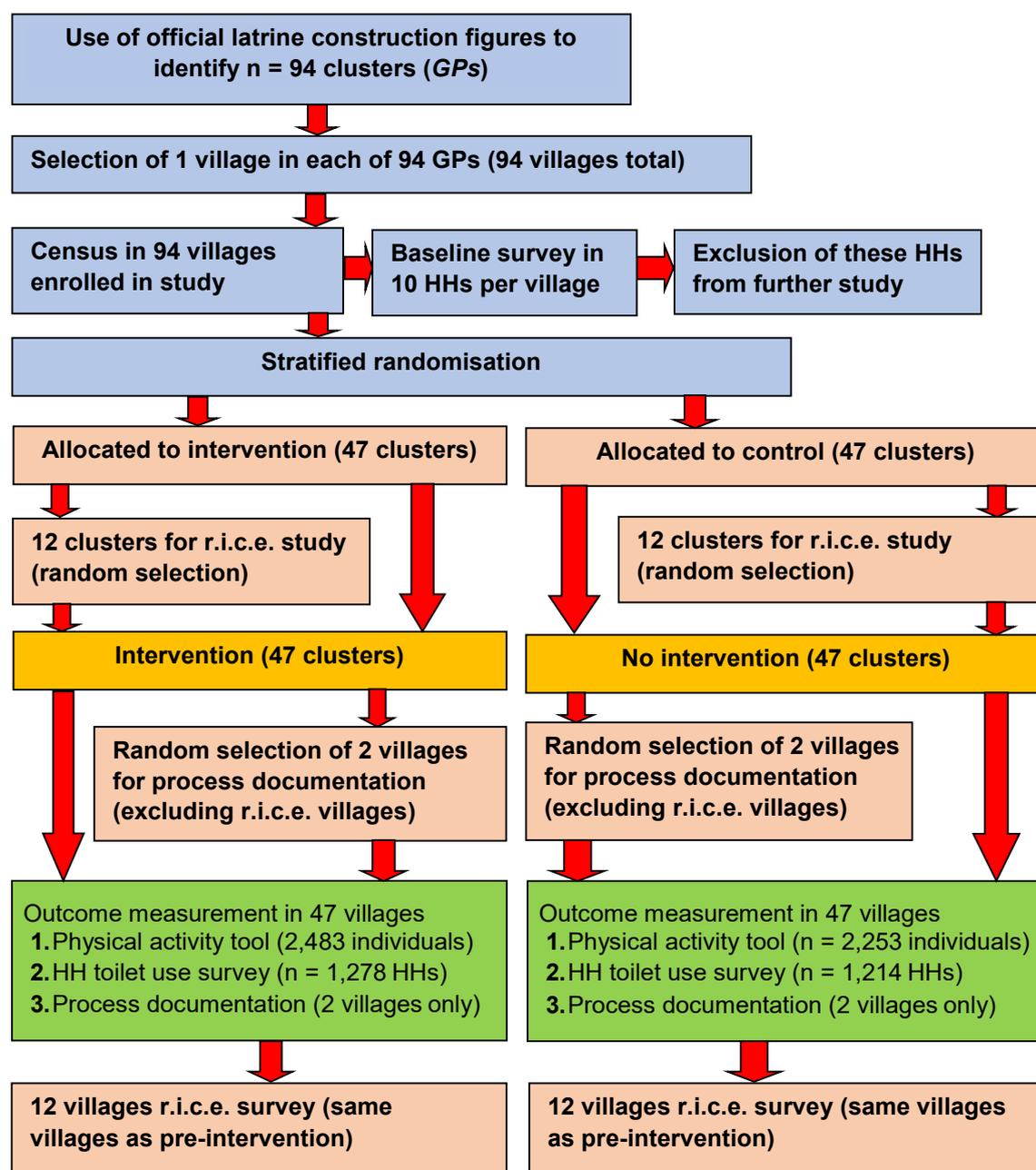
3. Evaluation

3.1 Research question and hypothesis of the impact evaluation

The 5 Star Toilet Campaign was a cluster randomised trial conducted in 94 clusters in four *talukas* (blocks) of Bhavnagar district in Gujarat. It aimed to evaluate the effect of this intervention on toilet use behaviours. As can be seen in Figure 3, the baseline survey had included about 10 households per village, which were then excluded from the endline survey. The endline survey enrolled a new set of households from the census data. Throughout the report, we refer to the baseline data for information purposes, even though these data did not feed directly into the analysis.

The key research question of this study was: ‘Does an innovative, theory-based intervention increase toilet use of all members in a household with government contractor-built toilets in intervention clusters, as compared to control clusters, in Bhavnagar, Gujarat, India?’ (Online appendix E illustrates the pre-analysis plan).

Figure 3: Trial flow diagram



Note: HH = household; GP = *gram panchayat*.

Our primary hypothesis was that an innovative theory-based behavioural intervention can improve toilet use amongst households with government contractor-built toilets in high coverage areas of rural Gujarat. Toilet use for the primary outcome was defined as the proportion of households where all members above the age of five years are reported to use the toilet (the last time they defaecated), and where the toilet is observed by field staff to be in use.

To make the primary outcome more meaningful and valid, it was decided to add apparent use status, as observed by field staff, to the definition of the primary outcome. Apparent use was based on on-the-spot observation of the enumerators. This involved

several indicators, including availability of water and a water container inside or outside the toilet, cleanliness, availability of cleaning supplies near the toilet, and observation of 'the toilet in use'. This judgement was eventually made by the field enumerator and cross-checked on the spot using photos by the field supervisors.

In our outcome evaluation study – in addition to this primary outcome measure based on reported use – we used an alternative tool consisting of a short questionnaire on physical activity to compare the outcomes across the tools.¹ Thus, as an additional outcome we conducted a questionnaire survey with up to two household members where a question on toilet use and OD was embedded in a questionnaire on physical activity, with the aim of reducing socially desirable responses and responder bias (Table 5).

Table 5: Outcome indicators

Outcome	Indicator	Data source	Measurement
Prevalence of households with contractor-built toilets reporting toilet use by all family members aged five years or older during the last time they defaecated, and toilet is in apparent use as judged by field staff	Primary outcome measure	Combination of self-reported use, assessed by a standardised questionnaire (in a household roster for each individual member of households that own government contractor-built toilets) for all members in a household. In case members are not present, other family members or the primary respondent are asked about where the person defecated last. Mothers are asked about the defecation behaviour of younger children. Information about all household members over the age of five is obtained (Online appendix G).	Assessed six weeks after intervention delivery.
Prevalence of OD amongst individual household members	Secondary outcome measure	'Physical activity questionnaire' that asks individual household members about time spent on different physical activities (e.g. field work, cow herding, water fetching, OD) (Online appendix G).	Assessed in a separate survey prior to the main latrine use questionnaire

3.2 Purpose of the process evaluation

The process evaluation aimed to understand the reasons for the results of the 5 Star Toilet Campaign. Data collection methods and sources used to assess the process included the following:

1. A document review (reports, newspaper clippings and the government behaviour change communication strategy paper) was done to understand the context of evaluation;
2. Field observations (n = 6) and a review of activity logs were done to assess intervention fidelity and participation of the community;

¹ Please note the primary and secondary outcome measurements were a divergence from the original stated outcome in the pre-analysis plan.

3. Semi-structured interviews (n = 14) were conducted with SBM officials, the design team, the intervention delivery team, participants from intervention clusters and non-recipients from control clusters. These were used to understand the SBM context, the implementation and design teams' perspectives, recruitment strategies, and participant responses and perspectives on the campaign;
4. Focus group discussions (n = 6) were held with programme staff (n = 1) and participants (2 each with women and men, 8–10 participants per group and 1 mixed group) to solicit participant views on the campaign and perspectives on toilet use and non-use; and
5. An endline survey tool administered in 30 households per cluster in 94 clusters was used to capture socio-demographic variables of the study context and assess the reach of the intervention.

3.3 Geographical area of the study

The study sites include three blocks (Mahuva, Talaja and Palitana) of Bhavnagar district in Gujarat. The blocks were selected based on the recommendation of the state government and in consideration of the operational feasibility of roll-out, as CSPC has a presence in these blocks.

Bhavnagar is situated in the south-eastern part of Gujarat. According to the 2011 census, Bhavnagar district has a total population of 2,880,365, out of which 1,182,401 are urban while 1,697,964 are rural. The average literacy rate of Bhavnagar is 76 per cent, which is slightly less than the state average (79%). Livelihood options include plastic monofilaments, ship breaking, diamond polishing, agricultural production and onion processing.

The state has 29 districts, which in turn have been further subdivided into *talukas*. In Gujarat, the community development blocks are coterminous with the *talukas*, which contain a large number of villages and possibly several towns. The villages are administered by *gram panchayats*, each of which may constitute one revenue village or several revenue villages (group *panchayat*, or group councils), or may be a part of a larger village.

Mahuva has total population of 452,011 (229,719 males and 222,292 females) according to the 2011 census. In 2011 there were a total of 77,075 families residing in there, and the average sex ratio is 968 (the highest in the state). There are three towns and 131 villages within Mahuva.

Palitana has total population of 230,271 (117,629 males and 112,642 females) as per the 2011 census. In 2011 there were a total of 41,260 families residing there, and the average sex ratio is 958. There is one town and 93 villages within Palitana.

Talaja has total population of 325,667 (174,482 males and 151,185 females). In 2011 there were a total of 58,712 families residing in there, and the average sex ratio is 866 (the lowest in the state). There are three towns and 113 villages within Talaja.

Development partners such as the World Bank, Tata Trusts and multiple NGOs provide technical and on-the-ground support to SBM implementation. SBM activities in the state

included providing subsidies; organising the building of individual household toilets (nominally through self-help groups); making construction material available; building the capacity of service providers; and mobilising the community through information, education and communication.

The 5 Star Toilet Campaign was delivered in a context where subsidies for toilet construction were no longer provided. However, the government continued its effort to identify households without a toilet, or those not included as beneficiaries, from the 2012 baseline survey, and NGOs continued to promote toilet construction in some clusters.

3.4 Design and methods

The primary unit of analysis for the trial is the household. The outcome of interest is the proportion of households ($n = 30$ households per cluster) that report the use of toilets by all household members more than five years of age. This is measured six weeks after intervention delivery through a self-reported questionnaire survey and a physical activity survey.

The endline study consisted of: (1) a physical activity survey administered in 30 households with 2 members per household in 94 clusters of the identified blocks (Mahuva, Talaja and Palitana) in Bhavnagar; followed by (2) a questionnaire survey to understand toilet use in 30 households in all clusters; and (3) process data collected from 4 clusters (2 from each study arm) during and after the intervention delivery period.

This was done to assess implementation of the 5 Star Campaign (recruitment strategies, fidelity, dose delivered and participant response) and was measured through: event logs maintained by CSPC; unannounced field observations ($n = 6$); semi-structured interviews ($n = 14$); focus group discussions ($n = 5$) with campaign facilitators, CSPC project coordinators, participants in intervention arms, unexposed individuals in the control arm, and the creative design team; and the endline household survey.

3.5 Ethics

LSHTM and IIPHG obtained ethical approval for conducting the study from their institutional review boards. LSHTM received trial insurance and sponsorship from the Research Governance and Integrity Office at LSHTM. The trial was registered on the Registry for International Development Impact Evaluations.²

Written informed consent was requested, prior to surveying and interviewing, from participants in their native language (Gujarati) and each form was assigned a unique identifying number. Participants were fully informed of the aims and objectives of the study and of their right to decline to participate at any point. The intervention collected a minimum of personally identifying information and did not involve any medical treatment or collection of biological specimens.

Respondents had the freedom to discontinue or withdraw their participation if they felt uncomfortable. Observations were made with consent of household members. Trained enumerators conducted the survey. All senior project staff received prior training of

² <http://ridie.3ieimpact.org/index.php?r=search/detailView&id=736>

human subject research ethics. Questions were asked cordially, and observations were recorded in a non-interfering, non-intimidating and non-judgmental manner. No information was asked that may have had a negative impact on the respondent. The filled consent forms were stored securely and will be kept for review by senior project staff only. This information is not linked to data in the processing, analysing or reporting of results.

3.6 Sampling and data collection

3.6.1 Selection of clusters

In the inception phase of the study, the project team had a discussion with the commissioner of rural development from the Gujarat government, who recommended Bhavnagar district as the site for this trial. Our local implementing partner, CSPC, has a long presence in Bhavnagar, which made it operationally feasible to implement the project. The selection of clusters for this study was based on discussion with CSPC and other NGOs working on sanitation in the district.

As a first step, we obtained a list of all villages in Mahuva, Talaja and Palitana. According to the national census, there are a total of 335 villages (clusters) from 325 *gram panchayats* in the Mahuva, Talaja and Palitana blocks of Bhavnagar (Figure 3). In north Gujarat, especially Saurashtra region, group *panchayats* are not common; therefore, in most cases one *gram panchayat* consists of one village. For the purpose of this study, we consider one village sampled from one *gram panchayat* – in case there are multiple villages within it – as one cluster.

In discussion with the stakeholders working on sanitation in Bhavnagar – including UNICEF, Aga Khan Agency for Habitat India, Mahiti, CSCP, Gram Nirman Samaj and SBM officials – the study team decided that the clusters with greater than 70 per cent toilet coverage would be included in the study. This was agreed so that a sufficient number of households could be found that met our eligibility criteria (i.e. households that include a shared kitchen, have received assistance [monetary or any other] under any government programme to construct a toilet, and have a functional toilet).

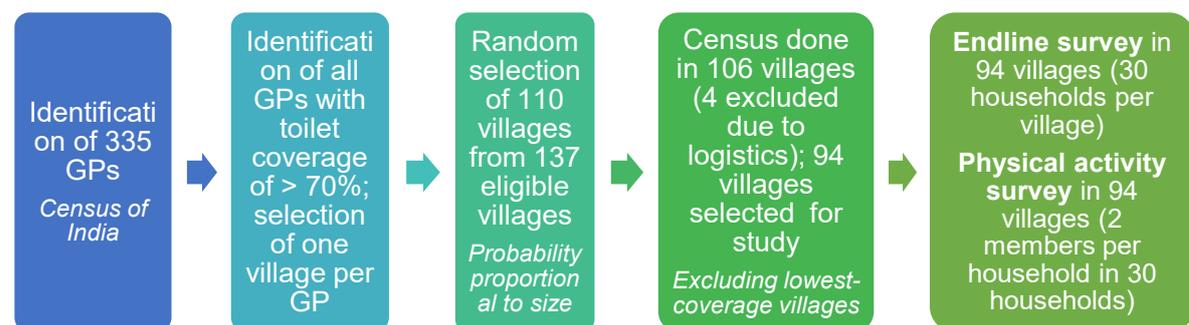
As per SBM-Gramin data, Bhavnagar district was declared ODF in October 2017, which means that all clusters have 100 per cent toilet coverage. These figures were judged implausible by local NGO partners. Therefore, we enrolled villages based on records from NGOs working on water and sanitation in Bhavnagar. As per the toilet coverage data from these records, we identified 137 clusters or villages where the toilet coverage was deemed to be greater than 70 per cent and where each cluster belonged to a different *gram panchayat*. In case multiple eligible clusters belonged to a single *gram panchayat*, we randomly sampled only one cluster where the toilet coverage was greater than 70 per cent.

Although the required study sample size was 94 clusters, we decided to sample 20 per cent more clusters, for a total 110 clusters. This was meant to account for any potential loss of entire communities because of inadequate toilet coverage, non-response, seasonality or not meeting the study eligibility criteria. Thus, from the list of 137 clusters with greater than 70 per cent toilet coverage, 110 clusters were selected using probability proportional to size sampling, where the size was the population as per the

2011 census. A census (household listing) survey was done in 106 of the 110 clusters (4 were excluded due to logistics), and finally 94 clusters were selected for the study.

The endline survey took place between mid-January and early March 2019. Data collection was done simultaneously in intervention and control clusters. We administered the physical activity survey followed by the toilet use measurement survey. A gap of approximately 5–7 days was kept between the two surveys based on the available timeframe. This was done to ensure a maximum gap between the two surveys. Data analysis and report writing took place from March to April 2019. The process evaluation was interspersed with the intervention delivery. Four randomly selected clusters (two from each study arm) were identified for the qualitative data collection.

Figure 4: Sampling process



GP = *gram panchayat*

3.6.2 Randomisation

The 94 identified clusters were randomised into intervention ($n = 47$) and control clusters ($n = 47$) using a combination of stratification (13 strata based on village-level toilet coverage and tap water access) and restricted randomisation, based on the balancing of six socio-economic variables collected in the census. Randomisation was carried out using the census data (not the reported toilet use data) through a combination of stratified and restricted randomisation.

First, we created five different strata of toilet coverage (0–24%, 25–44%, 45–59%, 60–74% and 75%+) and three different strata of household tap water coverage at the village level (0–49%, 50–74% and 75%+). These two variables were thought to possibly correlate with toilet use and the success of the intervention. The combination of these two strata resulted in 13 different strata (stratum size ranging from 2 to 20 villages).

Randomisation was carried out within these strata, ensuring overall equal numbers of control and intervention clusters. We largely followed methods described in Chapter 6 of Hayes and Moulton (2017). The restriction was using overall mean village-level proportions. Restricting the randomisation procedure to the 30 households per village enrolled for endline was not possible, because at the time of randomisation this information was not yet available.

We restricted randomisation by only accepting randomisations resulting in balance across the following cluster-level variables: proportion of lower-caste households; proportion of general-caste households; proportion of *pukka* (sturdy, permanent) houses; proportion of *kutchha* (mud brick) houses; proportion of literate respondents; and

proportion of landowning households. Balance was assumed if the difference in any of these variables was two percentage points or less. Randomisations not meeting this criterion were rejected. The number of possible allocations was about 4.8×10^{21} . Therefore, we did not enumerate each possible randomisation.

Randomisation was done using a random algorithm in Stata®. In a first step, the algorithm sorted the 94 clusters by the toilet coverage strata, the tap water coverage strata and a uniform random number (in this order).

In a second step, the ranked clusters were in an alternating way assigned to 0 or 1 (control or intervention). In a third step, the resulting randomisation was explored by comparing the means of the balance variables between intervention and control.

If any of the comparisons of the six variables resulted in an intervention or control imbalance of more than two percentage points, the randomisation was deleted. The first randomisation in the algorithm that met these criteria was chosen as allocation. However, we ran 10,000 randomisations overall to estimate the proportion of randomisations that met the balance criteria. This showed that about one per cent of allocations (93 out of 10,000) met the balance criteria, resulting in more than 10^{19} possible allocations. Given the large number of clusters and possible allocations, we did not conduct formal bias and validity checks of the randomisation procedure.

A minimum three-kilometre distance was maintained between intervention and control clusters.

3.6.3 Sampling households

The study used the census definition of a household: a group of persons related or unrelated or a mix of both, who normally live together and take their meals from a common kitchen, unless the exigencies of work prevent any of them from doing so.

Households within the randomised clusters were recruited based on study selection criteria, which includes a shared kitchen, having received assistance (monetary or any other) under any government programme to construct a toilet, and having a functional toilet. A functional toilet includes: (1) a pan that is not broken; and (2) a functional connection to a pit (single or twin pits).

At the beginning of the study, a census survey (a house-listing exercise) was carried out in 106 clusters. Since the toilet coverage identified in the census was lower than expected, we excluded clusters or villages with the lowest coverage until 94 clusters remained. Out of the 94 clusters, 3 had populations of more than 300 households. Therefore, we used chunking to segment the village into multiple parts and select two segments of approximately 150 households, which were both enrolled as the same cluster.

Thus, in each of the 94 clusters among eligible households meeting these criteria, a simple random sample of 40 households was selected in Stata®. From these 40, 10 households were randomly selected for the baseline household survey and the rest were the sample for the endline survey. Since not all villages had 40 eligible households, the initial list of households comprised 1,384 households in the intervention arm and 1,333 households in the control arm.

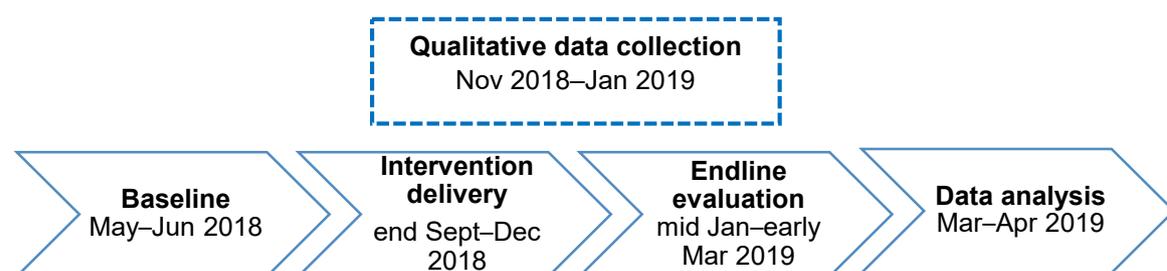
To account for non-availability of households due to migration, not being found, refusal to take part in the survey and other related factors, we identified an additional 15 randomly selected households per cluster, or fewer depending on availability. The data collection teams selected from this additional list households to replace those that were not available. For the physical activity tool (which was delivered about 5–7 days before the endline questionnaire), household sampling also started with the same list of up to 30 households per village.

However, often only one eligible person was available for the interview. An eligible person was primarily a male household member, more than 18 years of age and preferably someone responsible for making decisions in the household. In these cases, the team continued to enrol additional households from the list in random order until they reached the target number of 60 individuals or no further eligible households were available in that village.

The enrolment of additional households was done randomly using the SurveyCTO® tool. Replacement households were randomly selected from the complete list of randomised households in each cluster. As the two teams for the physical activity tool and the endline toilet-use questionnaire worked independently, their final samples overlapped but were not identical.

Of the 1,384 intervention households selected for the endline survey prior to the intervention, 351 (25.3%) could not be found or did not in fact have a latrine (were ineligible), and 26 (1.9%) did not consent. A total of 271 households were added from the list in random order, resulting in 1,278 households enrolled for the endline survey. Of the 1,333 control households selected for the endline survey prior to the intervention, 331 (24.8%) could not be found or did not in fact have a latrine (were ineligible) and 33 (2.5%) did not consent. A total of 245 households were added from the list in random order, resulting in 1,214 households enrolled for the endline survey.

Figure 5: Evaluation timeline



3.6.4 Data description

Physical activity survey: A questionnaire was developed for this survey in English, which was translated into Gujarati and field tested before finalisation. We developed and tested a quick survey tool, which camouflages the real purpose of the inquiry by asking 20 short questions related to intake of food and physical activity. This makes use of the fact that OD may not be a stigmatised behaviour if physical activity is the perceived purpose of a questionnaire. This questionnaire was administered before the toilet use survey.

Toilet use survey: A questionnaire was developed to include standard measures on toilet use being reported by all teams working under the TW14 window, including questions on

exposure to the intervention and norms around toilet use. An earlier version of this tool was developed and tested during the formative research phase and baseline survey. We used the standard questions suggested by 3ie to measure key indicators being reported by all TW14 teams (SQUAT 2018; 3ie 2017).

Qualitative interviews: A qualitative data collection tool with a semi-structured questionnaire was developed in English. It was then translated into Gujarati and field tested before finalisation. The data was collected with support from two interpreters (one male and one female) who translated the questions into Gujarati and Hindi for the benefit of participants and the researcher. Data collection was interspersed with the intervention delivery.

3.7 Quality control

Survey tool: The quantitative survey was done through an Android application using the software-as-a-service programme on a tablet or mobile phone and built on the Survey CTO® platform. SurveyCTO® is based on open data kit technology. The user subscription is hosted on fixed, stable Linux® servers that are maintained by the company itself.

Selection of agency: An open call for proposals invited agencies to undertake the endline survey. All proposals were reviewed by a procurement committee at CSPC with representation from LSHTM and IIPHG. The final proposal was selected after detailed review of technical and financial proposals and an in-person meeting. Two separate agencies were recruited to administer the survey questionnaires. This was done to ensure that the physical activity survey team is kept blind to the real purpose of the survey and completes the survey within the project timelines.

Training of enumerators: Two separate classroom-based training sessions were organised for enumerators from the two teams at the IIPHG campus. In this training, enumerators were informed about the process of seeking consent and a detailed briefing was provided on the questionnaire, followed by training on operating the tablets, administering the questionnaire using the tablets and mock interviews.

This was followed by a field training in Gandhinagar. Each team of enumerators was assigned the task of interviewing two individuals per village. Supervisors accompanied each enumerator to observe the data collection process. This was followed by a debriefing session in IIPHG, where the experiences of enumerators were shared and key problems in administering the tool were addressed. A second round of field training was organised in a non-intervention village in Bhavnagar. Both teams asked enumerators to fill out 2–3 questionnaires each. This was followed by a debriefing session and troubleshooting related to the application being used for data collection.

Field supervision: During the survey, regular debriefing sessions were conducted in the field. The signed consent forms were reviewed and arranged according to clusters. The GPS location of each household was taken to monitor data collection. LSHTM and IIPHG teams were provided with login credentials for real-time monitoring of data. To ensure data security, a separate instance was created at the server dedicated for the project. The data collection agency reviewed the data at back end and sent feedback to field supervisors or team leaders in case discrepancies were observed.

Data collection: Enumerators and households included in the study were not aware of the status of the clusters, namely the intervention and control groups. Trained supervisors were available in the field, and during baseline data collection 10 per cent of the forms were field validated. All data collectors received training at IIPHG, mock data collection exercises were conducted and field-testing was done. During the supervision process, errors in adhering to the criteria were further corrected in the field during the daily debriefing meetings with the data collectors.

The survey was simultaneously administered in intervention and control clusters. Intervention clusters where the campaign roll-out was completed first were included first in the survey, and a gap of six weeks was maintained between campaign roll-out and endline data collection. This was based on the available budget, project timeframe, logistical feasibility and LSHTM's past experience with similar trials.

The physical activity survey took place from 1 to 26 February and the toilet use survey took place from 6 February to 8 March 2019 (approximately 5–7 days after the physical activity tool in any given village). Qualitative data was collected between October 2018 and early January 2019.

4. Findings

4.1 Process evaluation

We first look into how much of the sample population was exposed to the intervention, and how they responded. In this section, we present findings from the endline survey and qualitative interviews and discussions held with participants, non-recipients, campaign staff and the design team.

4.1.1 Intervention implementation fidelity

Key variables for measuring the 5 Star Toilet Campaign's implementation include assessment of participant recruitment, fidelity, reach and participant response.

Recruitment strategies for engaging participants may affect the implementation of an intervention (as a moderating factor). Based on field observations (n = 6); review meetings with the Upward Spiral design team, CSPC staff and intervention facilitators (n = 2); and focus group discussion with facilitators (n = 1), we found that recruitment of participants was a key challenge that took longer than anticipated.

Through our discussions with the facilitators, we found that in more than half of the intervention clusters, volunteers assisted the team of three facilitators in identifying toilets that met the 5 star toilet criteria and enrolling households who committed to improve their existing government contractor-built toilets. However, their role remained weak as the implementation team could not recruit volunteers in each cluster, and in some clusters their engagement could not be sustained beyond the Day 1 event.

According to the implementers, the volunteers did not think this work was as remunerating as a full-time job. In some clusters, people volunteered to help the team on the day of intervention delivery; however, in almost 10 clusters the team could not recruit volunteers. Overall 37 volunteers were recruited. This affected the identification and

enrolment of households eligible for a 5 star toilet makeover and subsequent follow-up with the households who committed to improving their toilets:

Volunteer support was not adequate, and, in several clusters, we had to identify volunteer on the day of intervention delivery. — Campaign facilitator

It took significant time for the facilitators to make arrangements in the field, and the time available to conduct intervention activities was limited as a consequence. Furthermore, due to hot weather, people did not want to step out of their homes in the afternoon to participate in the street events. Through our interactions with participants and a village volunteer, we found that due to ongoing agricultural work or other livelihood activities, some people either lived on the farmland (*vadi vistaar*) or did not return home until around seven in the evening.

Women's participation was further limited due to household work; in fact, most were available only after eight in the evening when they finished cooking dinner for their families. Some sections of the community did not encourage women to participate in evening events:

Participation from Rajput community was less in the evening event as there is a *pardha* system.³ It is about honour and women are not encouraged to go out to village centre at night. — Village volunteer

Also, the time spent by the facilitators in each cluster was less than what was originally proposed (5–6 hours versus 9–10 hours). Further, the scattered population made it difficult to reach all households within the time available, as it was difficult to cover the entire cluster in one day. According to the creative design team, delivery over 2–3 days and more time for follow-up would have improved the coverage of the intervention in the clusters. However, this was limited due to the overall timeframe of the project and operational feasibility.

Implementation is monitored to understand the steps involved in intervention delivery and their consistency with the intervention protocol, known as fidelity and adherence (Breitenstein et al. 2012). Fidelity refers to the extent to which intervention components were implemented as per the intended plan. This measure is important to ensure impartial comparison of treatments (internal validity) and generalisability of results, as it provides information about the implementation of the different components of the intervention package (Mbuya et al. 2015).

Adherence is a dimension of fidelity, which is defined as the degree to which an intervention is conducted according to intervention protocol, or the extent to which the behaviour of individuals implementing the intervention conforms to the protocol. A standardised methodology for measuring this aspect in complex intervention trials is yet to be evolved (Craig et al. 2006), as past studies have used various indicators of adherence to the original, intended plan and the competence of implementers (Breitenstein et al. 2012; Hasson 2010; Mars et al. 2013; Carroll et al. 2007).

³ *Pardah* ('screen' or 'veil') is a social practice that involves the seclusion of women from public observation by means of concealing clothing (including the veil).

Fidelity helps to identify if any changes were made to the core components of the intervention delivery (Holliday 2014). The level of fidelity may be moderated by certain other variables, such as the complexity of an intervention, facilitation strategies, quality of intervention delivery and participant responsiveness (Carroll et al. 2007).

It is particularly difficult to measure fidelity in the present case, as modifications were made to the intervention plan even after the beginning of intervention delivery due to adaptive programming. For example, the original campaign design involved conducting activities in a tent located at a convenient place within the cluster, so that participants would be attracted to participate. However, during the initial delivery, setting up the tent took 2–4 hours, which resulted in lower footfall once the tent was set up, and there was limited time for the facilitators to interact with participants. This was rectified by moving to street events (without a tent) to expand exposure to the campaign and increase the number of participants.

Other factors also limited fidelity. All facilitators were trained in the field and in a workshop setting. However, soon after the roll-out began, two facilitators left the project. This situation was redressed by the implementing partner recruiting another facilitator who was trained on the job. According to the implementers, recruitment of facilitators was also a challenge as the implementing partner did not have sufficient human resources in-house, and it was difficult to find trained personnel for the short duration of the project. All these factors may have also impacted the reach of the intervention:

It was difficult to recruit experienced people for projects of shorter duration. Preference is given to long-term projects. — Project manager

A more intensive training was required to get them [facilitators] to the level that we wanted. Also, going forward, there is a need to look at incentive structures for sustaining their interest. — Creative design team

As verified through field observations (n = 6), the facilitators delivered the intervention largely as per the final plan. Intervention components were interactive and innovative; therefore, the facilitators found it easy to convey key messages to the participants, who found these activities novel, appealing, surprising and entertaining:

Initially we were sceptical about talking to the community about toilet use. However, we received good response. Some people told us that we should have done [it] earlier. Concept of cross ventilation and twin pit was new to many. — Campaign facilitator

The ‘mad scientist’ film [virtual reality] experience was popular as it was new technology. People called it goggles (*chashma*) for film. World of toilets and golden toilet was very popular, people had not seen such things before. — Campaign facilitator

The skit performance and the films were most popular during the campaign. It is the best medium to mobilise community. The effective part of it is the artists had dialogue with the community and involved them in the skit. Films effectively covered the messages through humour. There were elements of routine life of

the community. It helps to connect with the community. — CSPC, Project manager

The short skit was a key highlight of the evening event as messages which can't be explained in general conversations were discussed and presented in an entertaining manner. — Campaign facilitator

According to the observations made by the design team, occasionally the facilitators did not approach the street events in a consistent manner and revised the order of activities or skipped some activities that did not find sufficient audience or faced technical issues. These were reported to the programme manager at CSPC and on the WhatsApp® group. For example, the Wi-Fi network was discontinued due to technical issues, the three-dimensional poster of a toilet was discontinued, and sometimes the virtual reality film was not feasible as it could only be experienced by one person at a time.

4.1.2 Reach of the intervention

Table 6 reports on the reach of the intervention, i.e. the proportion of participants in the target population that were exposed to at least some components of the intervention. Compared to the control group, intervention households more often reported having heard of or attended community events on sanitation as well as nearly all of the campaign-specific elements, such as pit filling demonstrations, using a chair for assisting differently abled people in the toilet, or seeing a small model of a 5 star toilet. Perhaps as a consequence, a significantly higher proportion of respondents in the intervention arm reported making changes to their toilets.

As observed by district government officials, the participation of communities in the 5 Star Toilet Campaign was higher than that for behaviour change activities rolled out by the government. On an average, the evening events were attended by 100–150 people (women, men and children) (Online appendix 5).

However, overall campaign exposure was low. For example, only about 14% of intervention households had heard the term '5 star toilet' (3% in control). Just 4% could show a certificate (almost no one in the control arm). Only 18% of households in the intervention arm had seen the skit (5% in the control arm), and 13% had seen the toilet model (2% in the control arm). Exposure to most other campaign items showed an intervention-control difference of less than 10 percentage points.

Table 6: Exposure to intervention

Item	Control		Intervention		PD, %	95% CI	APD%	95% CI
	N	%	N	%				
Recently heard about toilets in any of these contexts (in last 6 months)								
Conversation with others	1,214	6.7	1,278	9.9	3.1	0.6/5.6	2.8	0.3/5.4
Visits to neighbours	1,214	3.1	1,278	4.5	1.3	-0.2/2.8	1.2	-0.3/2.8
WhatsApp® message	1,214	2.1	1,278	3.1	1.0	-0.7/2.7	0.4	-1.1/2.0
Village meeting	1,214	14.3	1,278	23.5	9.1	5.1/13.1	8.4	4.3/12.4
Event in community	1,214	13.1	1,278	30.0	16.7	11.4/22	16.3	11/21.6
Posters/stickers	1,214	6.9	1,278	13.2	6.5	3.6/9.5	6.2	3.2/9.2
Radio	1,214	0.4	1,278	0.6	0.1	-0.4/0.7	0.0	-0.1/0.1
TV	1,214	21.9	1,278	22.9	1.3	-3.3/5.8	0.0	-0.5/4.4
What did you hear								
One should construct a toilet if a household doesn't have one	1,214	14.4	1,278	19.9	5.6	2.0/9.2	5.2	1.6/8.9
One should improve one's toilet if it is poor quality	1,214	6.7	1,278	12.1	5.4	3.1/7.7	5.2	2.8/7.5
One should use toilet for defecation instead of going out in the open	1,214	18.5	1,278	25.0	6.3	2.5/10.1	5.8	2.1/9.5
After hearing this did you make changes to your toilet or do anything as a consequence								
Talked with someone	1,214	15.0	1,278	18.3	3.4	-0.1/7.5	3.1	-1.1/7.3
Made changes to my toilet	1,214	8.0	1,278	12.8	4.6	1.3/7.8	4.0	0.8/7.2
Saved money for a toilet	1,214	3.5	1,278	3.6	-0.1	-1.8/1.8	0.2	-1.6/2.0
Heard of any community event that talks about toilet in the past 6 months	1,214	18.5	1,278	39.1	20.7	15.4/26.0	19.7	14.3/25.1
Attended such an event	1,214	8.3	1,278	22.3	13.9	10.6/17.1	13.3	9.9/16.7
Promote toilet improvement	1,214	6.5	1,278	18.3	11.7	8.8/14.6	11.2	8.1/14.2
Commit to improve toilet	1,214	22.8	1,278	12.3	-12.3	-21.2/-3.5	-12.5	-21.4/-3.5
Heard the phrase '5 star toilet'	1,214	2.6	1,278	13.9	11.3	8.9/13.8	10.9	8.5/13.4
Where did you hear it								
TV	1,214	0.7	1,278	1.6	0.1	0.0/1.9	0.1	0.0/1.9
Village meeting	1,214	1.2	1,278	5.2	3.9	2.6/5.2	0.4	2.4/5.1
Community event	1,214	1.8	1,278	10.9	9.1	6.7/11.5	8.8	6.4/11.2
WhatsApp® message	1,214	0.3	1,278	0.5	0.1	-0.4/0.6	0.1	-0.4/0.1
Posters/stickers	1,214	0.7	1,278	4.1	3.4	1.9/5.0	3.2	1.8/4.7

Item	Control		Intervention		PD, %	95% CI	APD%	95% CI
	N	%	N	%				
Virtual reality film	1,214	0.4	1,278	0.9	0.5	-0.2/1.3	0.5	-0.3/1.3
Friend/relative	1,214	0.3	1,278	0.7	0.4	-0.3/1.1	0.3	-0.4/1.1
Certificate for a 5 star toilet	1,214	0.4	1,278	4.5	4.0	0.3/5.1	3.8	2.7/4.8
Picture of your family on the village 'toilet board' poster	1,214	0.2	1,278	4.8	4.5	3.3/5.7	4.3	3.2/5.5
Skit about toilet convenience	1,214	4.9	1,278	18.2	13.1	10.0/16.3	12.6	9.4/15.8
Seen small-sized 5 star toilet model	1,214	1.9	1,278	12.5	10.7	8.2/13.1	10.3	7.8/12.8
Certificate about your toilet, or know anyone who has	1,214	1.5	1,278	7.4	5.9	4.2/7.6	5.7	3.9/7.5
Seen a certificate give-away	1,214	2.0	1,278	11.2	9.2	0.7/11.4	9.0	6.7/11.3
Someone talking about or showing a movie about pit filling	1,214	2.4	1,278	10.1	7.6	5.5/9.7	7.4	5.2/9.7
Movie about using a chair in the toilet for differently abled/elderly people	1,214	2.9	1,278	11.0	8.0	6.0/10.1	7.8	5.6/10.1
Use any of the following								
Facebook®	1,214	18.2	1,278	23.6	5.2	1.3/9.1	2.1	-1.6/5.7
WhatsApp®	1,214	24.0	1,278	31.2	7.1	3.0/11.2	3.0	-0.6/6.7
Instagram®	1,214	6.0	1,278	8.7	2.6	0.0/5.2	0.8	-1.5/3.1
YouTube®	1,214	19.2	1,278	22.1	2.7	-1.4/6.8	-0.8	-4.5/2.9
Ever got or sent a message on WhatsApp® about toilets	1,214	2.3	1,278	2.8	0.6	-0.7/1.9	-0.1	-1.3/1.2
Heard about Swachh Sundar Shauchalaya campaign	1,214	40.6	1,278	45.8	5.3	0.6/10.1	3.7	-0.8/8.2
Swachh Sundar Shauchalaya campaign is about								
Painting your toilet walls	1,214	7.9	1,278	8.8	0.9	-1.5/3.3	0.7	-1.8/3.1
Decorating your toilets	1,214	28.1	1,278	32.6	4.5	0.2/8.7	3.4	-0.8/7.6

Note: PD = prevalence difference,⁴ calculated using linear regression (function: Gaussian, link: identity); Clustering at the village level was adjusted for by using generalised estimating equations and robust standard errors. CI = confidence interval; APD = adjusted prevalence difference; PD was adjusted for asset index⁵ (continuous variable) and maximum male education level (dichotomised into primary or less versus secondary or higher).

⁴ Prevalence difference is the difference between two proportions expressed as percentage points. For example, if one group has a prevalence of 20% for a given item, and another group has 25%, then the PD is 5%.

⁵ The asset index was constructed using physical capital owned by the households (i.e. land for farming in the same village or vicinity, animals [livestock], car or four wheeler, motorbike, bicycle, radio, television, satellite cable connection, mobile telephone or key pad phone, smartphone, refrigerator, computer, Internet, household water tap, electricity, gas stove and bore well). The only variables with an eigenvector greater than 0.25 were retained. These were land for farming in the same village or vicinity, owning animals (livestock), car, television, smartphone, refrigerator, gas stove and borehole. The index was collapsed into quartiles.

Table 7 shows the comparison of socio-economic variables among those in the treatment arm who have, or have not, heard about 5 star toilets. Those who heard about the campaign had slightly higher household sizes, higher male and female education, and were more often in higher asset quartiles. They also tended to more often live in *pukka* houses.

Table 7: Comparison of socio-economic variables among those in the treatment arm who have, or have not, heard about 5 star toilets

Item	Didn't hear about 5 star		Heard about 5 star		p-value
	N	%	N	%	
Total	1,100	86.1	178	13.9	
Household size					
1-3	241	21.9	26	14.0	0.007
4-5	377	34.3	59	33.2	
6-7	276	25.1	48	26.9	
8+	206	18.7	45	25.9	
Caste					
SC/ST	36	3.3	03	1.7	0.166
OBC	672	61.1	120	67.4	
General	308	28.0	49	27.5	
Prefer not to disclose	84	7.6	06	3.4	
Religion					
Hindu	1,089	99	175	98.3	0.415
Muslim	11	1	3	1.7	
Highest female education level (n = 1,270)					
No formal schooling	236	21.6	23	12.9	0.001
Primary	161	14.7	20	11.2	
Secondary	603	55.2	113	63.5	
Diploma	07	0.6	03	1.7	
Graduate	85	7.9	19	10.7	
Highest male education level (n = 1,261)					
No formal schooling	78	7.2	04	2.3	0.037
Primary	138	12.7	22	12.4	
Secondary	625	57.8	102	57.3	
Diploma	15	1.4	08	4.4	
Graduate	227	20.9	42	23.6	
Asset index quartile					
Lowest	258	23.5	36	20.2	0.034
Low intermediate	252	22.9	36	20.2	
High intermediate	299	27.1	41	23.1	
Highest	291	26.5	65	36.5	
House structure					
Kutchha	144	13.1	21	11.8	0.189
Semi-pukka	550	50.0	81	45.5	
Pukka	406	36.9	76	42.7	

Note: SC = scheduled caste; ST = scheduled tribe; OBC = other backward class.

The district government officials met the project team in December 2019 and found the intervention material interesting and different from what was being delivered through the government channel. The government asked the team for campaign materials and expressed interest to roll it out in another block of Bhavnagar. In January 2019, the Indian government launched the *Swachh Sundar Shauchalaya* (clean and beautiful toilet) contest, which included a month-long campaign to mobilise rural households to beautify their toilets by painting them, designing local art and placing SBM logos on the walls.

This message was communicated in all blocks of Bhavnagar in December 2018, including the study and control clusters, both of which reported high levels of exposure to it. This overlapped with the 5 Star Toilet Campaign theme and was an unanticipated event just before the endline evaluation survey. Further, during this time, a local NGO with support from Pidilite industries accelerated the pace of toilet improvements in the Mahuva block of Bhavnagar. Another NGO in that block provided water tank and construction supplies to households for the construction of toilets. This may have been a confounding factor and may explain some of the exposures in the control arm.

4.1.3 Reception of the intervention

As shown in Table 8, the intervention had practically no effect on the likelihood that a respondent perceived toilet ownership or use as conferring increased social status in the community. There was a six percentage point higher agreement with the statement that if a household has a toilet, people will regard this household as modern or 'smart'. However, given the large number of comparisons, this could be due to chance. (Note that this does not mean individuals exposed to the intervention were not psychologically influenced, only that there were not enough of such individuals in the sample population to reach statistical significance, perhaps due to the low level of reach.)

Table 8: Perceptions around toilet ownership in the community

Item	Control		Intervention		PD, %	95% CI	APD %	95% CI	
	N	%	N	%					
If a household in this community does not have a toilet what would others think of them?									
Nothing	1,214	10.3	1,278	11.7	1.6	-1.6/4.8	2.0	-1.3/5.2	
People may gossip about them	1,214	47.6	1,278	50.2	2.5	-1.9/6.9	2.3	-2.1/6.8	
They may be ridiculed to their faces	1,214	10.0	1,278	9.9	-0.1	-3.2/3.0	-0.5	-3.6/2.6	
They may be publicly identified as having a bad toilet	1,214	8.3	1,278	7.7	-0.1	-0.4/2.3	-1.1	-4.1/2.0	
They are not literate	1,214	20.4	1,278	23.1	2.7	-1.7/7.1	2.6	-1.7/7.0	
People may think they are poor	1,214	4.5	1,278	5.2	0.1	-1.6/3.0	0.1	-1.7/3.0	
If a household in this community does have a toilet what would others think of them?									
Nothing	1,214	12.2	1,278	12.6	0.4	-2.6/0.3	0.1	-0.2/4.0	
People will think of them as modern/smart	1,214	36.4	1,278	42.2	5.9	1.4/10.5	5.3	0.9/9.6	
They are considered as educated people of the community	1,214	24.7	1,278	25.1	0.3	-3.9/4.5	0.0	-4.2/4.3	
People may think they have lived in cities	1,214	5.6	1,278	7.4	1.6	-0.1/4.4	1.2	-1.6/4.0	
People may think they are rich	1,214	31.7	1,278	31.3	-0.2	-5.5/5.1	-0.4	-5.6/4.9	
They may be publicly identified as having a good toilet	1,214	22.0	1,278	21.0	-1.0	-5.0/3.1	-1.0	-5.2/3.2	

Note: PD = prevalence difference, calculated using linear regression (function: Gaussian, link: identity); Clustering at the village level was adjusted for by using generalised estimating equations and robust standard errors. CI = confidence interval; APD = adjusted prevalence difference; PD was adjusted for asset index (continuous variable) and maximum male education level (dichotomised into primary or less versus secondary or higher).

Similarly, as shown in Table 9, the intervention had no major effects on sanitation-related perceptions among respondents. There was little difference between intervention and control regarding agreement with statements reflecting important campaign messages such as, 'toilets are not just for women; men should use them too'; 'a smart person is one who uses a toilet'; or 'toilet pits fill quickly if too many people in the household use them' (negative statement of campaign message). Consistent with the above finding that intervention arm respondents reported improving their toilets, they also more often reported a perception that those around them were improving their toilets.

Table 9: Agreement with sanitation-related statements among respondents

Item	Control		Intervention		PD, %	95% CI	APD%	95% CI
	N	%	N	%				
Most people around here use a toilet regularly	1,214	83.6	1,278	89.5	5.2	1.0/9.4	4.6	0.5/8.7
Everyone in my household uses a toilet	1,214	87.0	1,278	90.9	3.8	-1.0/ 8.6	2.8	-1.9/7.5
Many people around here are improving their toilets	1,214	71.6	1,278	77.2	5.5	1.1/ 9.9	5.6	1.2/10.1
Using a toilet saves time and effort compared to OD	1,214	97.9	1,278	98.2	0.3	-1.0/1.6	0.3	-1.0/1.6
Using a toilet builds your reputation in the community	1,214	97.6	1,278	97.9	0.2	-1.2/1.7	0.0	-1.5/1.5
A smart person is one who uses a toilet	1,214	53.0	1,278	51.6	-1.2	-6.5/4.2	-1.1	-6.4/4.3
It is possible to feel proud of one's toilet	1,214	94.9	1,278	96.6	1.7	-0.2/3.5	1.4	-0.4/3.2
Most people around here think it's good to use a toilet	1,214	96.1	1,278	96.9	0.7	-1.3/2.8	0.5	-1.6/2.6
Using a latrine gives me a 'packed' (claustrophobic) feeling	1,214	6.7	1,278	5.5	-1.3	-3.3/0.7	-0.8	-2.8/1.1
Toilets are not just for women; men should use them too	1,214	81.0	1,278	79.4	-1.2	-6.3/4.0	-1.0	-6.2/4.2
It is appropriate to have a toilet as good as your house	1,214	98.4	1,278	98.6	0.1	-0.9/1.2	0.0	-1.0/1.1
It is ok for poor people to practice OD	1,214	21.6	1,278	17.7	-4.0	-7.1/-1.0	-3.3	-6.2/-0.4
Toilet pits fill quickly if too many people in the household use them	1,214	66.1	1,278	65.7	0.1	-4.7/5.0	0.5	-4.2/5.3
Most of the people I care about think I should use a toilet	1,214	96.0	1,278	95.9	-0.1	-1.9/1.7	-0.2	-1.9/1.4
People around here think a household should have a good toilet	1,214	97.9	1,278	98.0	0.1	-1.1/1.3	0.1	-1.1/1.3
Even if no one else around here had a good toilet, I would still make sure I had one	1,214	91.4	1,278	94.1	2.7	-0.4/5.8	2.1	-0.9/5.2
During farming season, most people around here defecate in the field/open	1,214	68.7	1,278	62.5	-5.9	-11.0/0.8	-4.9	-9.8/0.1
Defecating in the field is more convenient than using a toilet	1,214	18.4	1,278	17.8	-0.5	-4.1/3.2	0.4	-3.3/4.1
Having a good toilet at home is a mark of better status in the village	1,214	98.1	1,278	98.1	-0.1	-1.3/1.2	-0.1	-1.3/1.1

Note: PD = prevalence difference, calculated using linear regression (function: Gaussian, link: identity). Clustering at the village level was adjusted for by using generalised estimating equations and robust standard errors. CI = confidence interval; APD = adjusted prevalence difference; PD was adjusted for asset index (continuous variable) and maximum male education level (dichotomised into primary or less versus secondary or higher).

We explored perceptions related to the campaign theme, 'the world is getting smarter', through qualitative interviews and discussions with participants in the intervention arm and non-recipients in the control arm. Respondents associated the theme with progressive thinking, advancement in science and technology, smart cities, smart political leaders, improvement in agricultural tools and equipment, smartphones, cooking gas, electric motors, grinding machines, educational opportunities for children, smaller family size, motorbikes and smart *shauchalaya* (toilets).

During interaction with community members in both intervention and control clusters, participants linked 'smart' with words such as *saru/haru* (good), *saras* (excellent), *sundar* (beautiful) and *samajhdaar* (sensible and intelligent). However, more participants in the intervention cluster had heard this word compared to non-recipients. The 5 star toilet concept resonated with the intervention recipients. Through our discussions with participants, almost all respondents agreed that it is possible to have a 5 star toilet.

People were surprised to hear 5 star toilet as until now they had only heard of a five-star hotel. This created curiosity and excitement among people. — Volunteer

5 star toilet was popularly called as *savidha wala sauchalaya* (toilet with convenience). — Campaign facilitator

A 5 star toilet is long lasting, good looking, comfortable, cost effective and saves time. — Respondent

[The] film on toilet makeover from *Ratol* village made people believe that it is possible to improve their existing toilets. — Campaign facilitator

For the community, the definition of a 5 star toilet could include having water inside the toilet, tiles, a water tank on the roof, ventilation, a good smell, a geyser to heat the water, a wash basin and toilet cleaning supplies. Almost all respondents in the intervention clusters and some respondents in the control clusters (on probing) listed key attributes that are promoted by the 5 Star Toilet Campaign.

However, the majority of respondents felt that a 5 star toilet is expensive compared to government-subsidised toilets and costs between INR20,000–80,000 depending on the preferred toilet features. Few people in the control cluster had heard of a 5 star toilet. However, all agreed that it is possible to make a 5 star toilet if one has desire, resources and the space to construct one. Some respondents felt that the government subsidy has made people dependent on external help for making a toilet:

[The] government does not always provide benefits for constructing a house. Then why do people save money to construct a home? People have become dependent on government for toilets. — Respondent

Community norms and people's perceptions related to OD were explored with intervention recipients and non-recipients in the control arm through discussions. The commonly cited reasons for people to defecate in the open include: poverty; waiting for subsidies from the government or a payment of the subsidy is pending; lack of resources to construct a toilet; lack of space to construct a toilet within the household; laziness; 'old mentality'; old habits; low aspirations in life; convenience during work on agricultural

land; the need to keep a toilet clean; the belief that having a toilet at home may contaminate drinking water; and having a temple at home.

Perceptions related to the kinds of people who use a toilet include: educated people use a toilet; they care about family status; they invest their own resources; they have had exposure to toilets or city life; and they have the space and resources available to construct a toilet. The benefits perceived for using a toilet include: it saves time and effort; it is convenient for all including elders and women; it prevents diseases; it is convenient for children to use and elders don't need to accompany them to OD spots; and it protects the honour of women. Everyone reported that people who have a toilet at home use it; however, they also admitted to going out to defecate in the field during farming season (especially men) or when water is scarce.

During field observations (n = 6) and exit interviews (n = 6) with participants after the Day 1 and Day 2 events, we found that participants had largely understood the campaign messages. The messages most frequently mentioned after the Day 1 event were related to the *suvridha* (comfort and convenience) of using a toilet at home. However, some participants also complained about not being able to access the subsidy and about pending payments. Not all participants in the evening events were exposed to the campaign materials such as the toilet model, world of toilets and virtual reality film showcased during the street events.

In the evening event where certificates were awarded to those with 5 star toilets, participants in large numbers expressed the desire to get their toilets five-star certified (affiliation). The skit was the most recalled event of Day 1. Participants' recollections of Day 2 event activities included the process of how faeces converts into compost, the mad scientist video on reducing pit filling anxiety, and the board with pictures of families with a 5 star toilet. Several participants mentioned that their toilet pit size was much bigger than the government-promoted pit size. Therefore, they felt less anxious about pit filling.

Through discussions with participants, the most commonly reported motives for toilet improvement included comfort, convenience, affiliation, status and honour related to women's safety. The reasons stated by respondents for making toilet improvements included: saving time; not worrying about scheduling OD visits; safety of women at night and during odd hours; status in front of guests and during the search for a groom for daughters; and convenience for older parents and differently abled people. These reasons or behavioural motives associated with toilet use relate to the intervention's theory of change and key motives addressed by the intervention (i.e. enhanced status, affiliation, comfort and convenience related to toilet use).

People would not marry into your family if you do not have a toilet. So, engagement of children becomes problematic. — Respondent

Having a toilet at home adds to the family's standing in the community. — Respondent

Guests praise you if you have a toilet at home. Guests from Ahmadabad [city] feel ashamed and find it difficult to go for OD. — Respondent

A toilet adds to the reputation. Everyone in the village has a toilet. More than money, manners [toilet use] add to the status of a family. — Respondent

The most commonly stated reason for *not* constructing a toilet at home included lack of space. Households in Gujarat have large courtyards and toilets are often constructed in one corner of the courtyard. In many households, especially those of the socio-economically poorer sections of the community, space is limited. Therefore, although there is technically sufficient space to construct a toilet, families do not prioritise the need to utilise that available space for constructing a toilet. Instead they use it to keep cattle and/or farm equipment, to dry utensils after washing and to dry grains and farm harvest in the sun. Although water is available every alternate day for up to one hour in each cluster, some households have constructed underground reserve tanks in addition to overhead tanks.

Through our discussions with the facilitators, we explored their experiences and overall response to the campaign delivery in the clusters. While they reported that initially they were sceptical, with regular support from the team and positive response from the community, they found the delivery of the intervention exciting:

Through this project we learned to interact with different age groups of people and also to manage situation/crisis in community setting. Sometimes we felt like celebrities as community members would recognise us in public places and mention that they participated in the evening events. This was a huge motivation. — Campaign facilitator

A final area of investigation observed modifications or upgrades of household facilities. As shown in Table 10, the intervention had only a limited effect on observed toilet characteristics. Minor effects were found, including a 6.4 percentage point increase in the availability of a water container, slippers and cleaning materials, as well as in four of the five star elements (painted walls, cleanliness, light bulb and water). However, the confidence intervals were wide, while the effect sizes were reduced after adjusting for asset index and male education. There were slightly more toilets found to be in apparent use in the intervention arm than in the control arm.

Table 10: Effect of intervention on observed toilet characteristics

Item	Control		Intervention		PD, %	95% CI	APD%	95% CI
	N	%	N	%				
Latrine use for other purpose	1,214	9.6	1,278	6.3	-3.3	-6.4/-0.2	-2.6	-5.6/ -0.4
Clogging of squatting pan	1,214	15.0	1,278	10.6	-4.2	-8.4/0.0	-3.2	-7.4/ 1.0
Availability of water container	1,214	84.9	1,278	89.1	4.2	-0.7/9.0	3.3	-1.6/ 8.1
Availability of slippers	1,214	19.8	1,278	24.9	4.8	0.1/ 9.4	3.0	-1.8/ 7.7
Availability of cleaning materials	1,214	77.6	1,278	84.3	6.4	0.8/ 12.0	5.0	-0.7/ 10.6
Toilet is in apparent use	1,214	86.1	1,278	90.4	4.3	-0.6/ 9.2	3.1	-1.8/ 8.0

Item	Control		Intervention		PD, %	95% CI	APD%	95% CI
	N	%	N	%				
Made any changes in last 6 months	1,214	6.3	1,278	6.0	-0.2	-2.4/ 1.9	-0.3	-2.5/ 1.9
Plan to make any changes	1,214	27.6	1,278	22.9	-4.7	-9.3/ 0	-3.6	-8.3/ 1.2
Five-star items								
Painted walls	1,214	44.9	1,278	52.9	8.1	1.9/14.2	5.3	-0.8/11.5
Clean	1,214	68.5	1,278	76.0	7.4	1.3/13.4	5.7	-0.4/11.7
Light bulb	1,214	53.4	1,278	62.4	9.3	1.8/16.8	6.9	-0.3/14.1
Ventilation	1,214	18.0	1,278	18.8	0.8	-3.0/4.7	0.4	-3.6/4.3
Water	1,214	39.0	1,278	47.6	8.9	2.2/15.6	5.3	-1.0/11.7

Note: PD = prevalence difference, calculated using linear regression (function: Gaussian, link: identity); Clustering at the village level was adjusted for by using generalised estimating equations and robust standard errors. CI = confidence interval; APD = adjusted prevalence difference; PD was adjusted for asset index (continuous variable) and maximum male education level (dichotomised into primary or less versus secondary or higher).

Although during the Day 1 event a large number of people had enrolled to upgrade their toilet into a 5 star toilet (Online appendix 5 details enrolment figures), only a small number of households were able to report makeovers. Through interviews with participants, we found that people felt the need to improve their existing toilets, and although they were interested in converting them into 5 star toilets, some could not find time to engage a mason or buy material in the busy farming season. Some respondents felt that people save and spend money on mobile phones but not toilets. So, while there may be financial constraints to making improvements to existing toilets, some people do not think it important to make these changes.

Yes I am proud of my toilet, but people will not say it publicly. Others talk about it. If home is not good it's ok, but toilet and bath is important. People copy each other. — Respondent

Every person aspires for a good-looking toilet with light, water so that it is comfortable to use. People make improvements based on their needs and available resources. — Respondent

4.2 Impact analysis

We now move on to findings related to the outcome variables.

4.2.1 Primary outcomes

The primary outcome (endline questionnaire) was assessed in 2,483 households (1,208 in control and 1,278 in intervention). In the control arm, primary outcome data were unavailable in six households for which other data were available. The mean number of households enrolled for the primary outcome per cluster was 26.4 (minimum of 2, maximum of 31, standard deviation of 6.7). In addition, toilet use was estimated by the physical activity tool in 1,295 control households (2,253 participants) and 1,401 intervention households (2,483 participants). The mean number of households enrolled in the physical activity survey per cluster was 28.7 (minimum of 4, maximum of 40, standard deviation of 8.2). The study flow diagram is shown in Figure 3.

Table 11 shows the association between the proportion of households with reported toilet use among all members over five years of age and important socio-economic characteristics. Higher toilet use was associated with a decreasing household size, higher education level (male and female) and higher asset index. Toilet use was also higher among Muslims, general caste members and those with *pukka* houses. As there were zero non-users among Muslims, the model did not converge. Ignoring clustering, Fisher's exact test shows a p-value of 0.025.

Table 11: Socio-economic characteristics and toilet use

Item	N	% of households with complete use	Prevalence difference, %	95% CI	
				Lower	Upper
Total	2,483	87.0	-	-	-
Household size					
1-3	517	91.7	ref		
4-5	832	86.9	-4.8	-8.1	-1.5
6-7	686	84.7	-7.0	-10.6	-3.4
8+	448	85.3	-6.4	-10.5	-2.4
Caste					
SC/ST	95	88.4	3.3	-3.3	10.0
OBC	1,515	85.1	ref		
General	670	92.1	7.0	4.3	9.7
Prefer not to disclose	203	83.7	-1.3	-6.7	4.0
Religion					
Hindu	2,455	86.8	ref	-	-
Muslim	28	100	13.2	-	-
Highest female education level (n = 2,467)					
No formal schooling	534	85.4	ref		
Primary	342	85.4	-0.04	-4.8	4.8
Secondary	1,391	87.0	1.6	-1.9	5.1
Diploma	19	100.0	-	-	-
Graduate	181	93.4	7.9	3.3	12.7
Highest male education level (n = 2,449)					
No formal schooling	163	84.8	ref		
Primary	314	84.7	0.0	-6.8	6.7
Secondary	1,496	85.9	1.1	-4.6	7.0
Diploma	52	92.3	7.6	-1.5	16.6
Graduate	424	92.9	8.2	2.2	14.2
Asset index quartile					
Lowest	637	81.0	ref		
Low intermediate	605	83.1	2.1	-2.1	6.4
High intermediate	633	89.4	8.4	4.5	12.3
Highest	608	94.6	13.6	10.0	17.1
House structure					
Kutcha	317	82.7	ref		
Semi-pukka	1,247	84.5	1.9	-2.8	6.5
Pukka	919	91.8	9.2	4.7	13.7

Note: SC = scheduled caste; ST = scheduled tribe; OBC = other backward class; CI = confidence interval.

Table 12 shows the socio-economic characteristics of control and intervention sample populations by intervention arm. We chose confounding variables based on the size of the difference and the association between a variable and the outcome (de Boer et al. 2015; Hayes and Moulton 2017). Good balance was achieved with respect to household size, caste, religion, female education and house structure. Some imbalances were observed in male education, with graduate level education more common in the intervention arm. There was also some imbalance in the distribution of the asset index, with intervention households more commonly found in higher asset quartiles. As these two variables were also associated with toilet use by all household members, it was decided to adjust for these characteristics in secondary analyses of all outcomes.

Table 12: Balance table

Item	Control		Intervention		Prevalence difference, %
	N	%	N	%	
Total	1,214		1,278		
Household size					
1–3	252	20.8	267	20.9	0.1
4–5	398	32.8	436	34.1	1.2
6–7	365	30.1	324	25.4	-4.5
8+	199	16.4	251	19.6	3.1
Caste					
SC/ST	56	4.6	39	3.1	-2.3
OBC	730	60.1	792	62.0	1.7
General	315	26.0	357	27.9	2.9
Prefer not to disclose	113	9.3	90	7.0	-1.8
Religion					
Hindu	1,200	98.9	1,264	98.9	0.1
Muslim	14	1.2	14	1.1	-0.1
Highest female education level (n = 2,467)					
No formal schooling	277	23.0	259	20.4	-2.5
Primary	161	13.4	181	14.3	1.1
Secondary	682	56.6	716	56.4	-0.3
Diploma	9	0.8	10	0.8	0.1
Graduate	77	6.4	104	8.2	1.7
Highest male education level (n = 2,449)					
No formal schooling	83	6.9	82	6.5	-0.3
Primary	156	13.0	160	12.7	0.1
Secondary	774	64.7	727	57.7	-7.0
Diploma	29	2.4	23	1.8	-0.5
Graduate	156	13.0	269	21.3	8.6
Asset index quartile					
Lowest	348	28.7	294	23.0	-5.6
Low intermediate	319	26.3	288	22.5	-4.1
High intermediate	295	24.3	340	26.6	2.6
Highest	252	20.8	356	27.9	7.4
House structure					
Kutcha	158	13.0	165	12.9	-0.1
Semi-pukka	619	51.0	631	49.4	-1.5
Pukka	437	36.0	482	37.7	1.7

Note: SC = scheduled caste; ST = scheduled tribe; OBC = other backward class.

Table 13 shows the effect of the intervention on primary study outcomes. At baseline, toilet use by all household members was 87% in the control arm and 83.4% in the intervention arm. If counting only households with a perceived functional latrine in the outcome, then 70.2% of control and 73% of intervention households were complete users (modified primary outcome).

At endline, the use of a toilet by all household members – in households where the latrine is in apparent use – was seven percentage points higher in the intervention arm than the control arm (modified primary outcome). Of the 2,160 households that reported complete use, 66 (3.1%) had a toilet observed to not be in use by the field team. A similar effect size (6%) was observed in the use of the toilet by all household members irrespective of apparent toilet use and in reported individual toilet use (not collapsed at the household level). These effect sizes were slightly attenuated after adjusting for asset index (as continuous variable) and highest male education in a household (dichotomised into illiterate to primary versus secondary or higher).

Overall, toilet use by all household members at baseline (85%) was similar to toilet use by all household members observed in the control arm at follow-up (84%). This suggests an absence of a temporal trend from baseline to follow-up, or an absence of an effect of the trial procedures on reporting behaviour. However, field staff at endline observed more toilets in apparent use at baseline than at follow-up.

As a result, the prevalence primary outcome measure (use of toilet by all household members in households where a latrine is in apparent use) increased from 71 per cent at baseline (intervention and control) to 81 per cent in the control arm at endline. This is probably due to the much closer supervision of field staff at endline, and, as a result, the prevalence of the modified primary outcome is very close to the original primary outcome (use of a toilet by all household members, irrespective of apparent toilet use).

The physical activity tool produced an overall estimate of individual toilet use that is 4.4 percentage points lower than the endline tool (84.5% versus 88.9%). No major effects of the intervention on toilet use assessed using the physical activity tool were observed, with or without adjusting for asset index and male education.

The total number of physical activity questionnaires conducted was 4,736, of which 3,114 (66%) were from households also included in the main survey. The estimates were not greatly affected by including or excluding the 34 per cent of households not part of the main survey (Table 13).

Table 13: Study outcomes

Item	Control		Intervention		PD, %	95% CI	APD %	95% CI	ICC
	N	%	N	%					
Baseline									
Use of toilet by all household members in households where latrine is in apparent use	265	70.2	264	73.0	1.3	-			
Use of toilet by all household members (irrespective of apparent toilet use)	328	87.0	303	83.4	-4.9	-			
Endline									
<i>Primary outcome</i>									
Use of toilet by all household members in households where latrine is in apparent use	1,208	80.9	1,275	87.6	7.0	1.4 / 12.6	5.5	0.0 / 11.0	0.14
<i>Secondary outcomes</i>									
Use of toilet by all household members (irrespective of apparent toilet use)	1,208	83.8	1,275	90.0	6.3	1.1 / 11.4	5.0	-0.1 / 10.1	0.14
Individually reported toilet use (reported use not collapsed at household level)	6,174	85.1	6,679	91.2	6.1	1.1 / 11.2	4.6	-0.5 / 9.7	0.17
Individually reported toilet use (physical activity tool)	2,253	80.7	2,483	82.2	1.5	-3.4 / 6.4	-	-	0.12
Individually reported toilet use (physical activity tool) restricted to households also taking part in endline survey	1,636	82.8	1,736	85.9	3.3	-1.7 / 8.3	1.7	-3.2 / 6.7	0.11

Note: PD = prevalence difference, calculated using linear regression (function: Gaussian, link: identity); clustering at the village level was adjusted for by using generalised estimating equations and robust standard errors; CI = confidence interval; ICC = interclass correlation coefficient; APD = adjusted prevalence difference; PD was adjusted for asset index (continuous variable) and maximum male education level (dichotomised into primary or less versus secondary or higher).

The subgroup analysis is shown in Table 14. The intervention had no effect on households with poor education levels. Only those with a higher education level appeared to benefit from the intervention (test for interaction between intervention and highest education level $p = 0.215$). Other than that, few differences were observed among various subgroups.

When focusing only on households in the intervention arm, toilet use by all household members was 96.1 per cent among those having heard of the 5 Star Toilet Campaign (Table 6), and 89.1 per cent among those that had not heard of the campaign.

Table 14: Subgroup analysis

Item	Control		Intervention		PD, %	95% CI	
	N	%	N	%		lower	upper
By age							
6–18 yrs	1,404	82.9	1,504	88.7	5.7	-0.5	11.8
19–49 yrs	2,658	85.4	3,150	91.3	5.8	0.9	10.7
> 50 yrs	1,193	87.1	1,435	93.5	7.2	2.2	12.2
By gender							
Male	2,576	84.2	3,047	91.4	6.6	1.5	11.8
Female	2,679	86.1	3,042	90.9	5.5	0.3	10.6
By highest education level of any household member							
Primary or less	170	85.3	173	87.3	-0.1	-9.4	9.3
Secondary or more	867	83.5	997	90.5	6.9	1.7	12.1
By asset index							
Below median	529	79.9	490	84.5	4.0	-2.3	10.2
Above median	483	88.5	658	94.7	6.9	1.9	11.8

Note: PD = prevalence difference, calculated using linear regression (function: Gaussian, link: identity); Clustering at the village level was adjusted for by using generalised estimating equations and robust standard errors; CI = confidence interval.

As shown in Table 15, the intervention had no effect on defecation patterns among children less than five years of age; in particular, it did not affect the proportion of children defecating in the latrine and the proportion of child faeces disposal into the latrine. More people in the intervention arm reported taking their children inside the compound to defecate on the ground (25.6%) compared to the control arm (21.3%). This may indicate that the campaign led to some social pressure regarding child defecation norms. However, statistical support for this observation is not great, and unexpected findings such as this have a high chance of having occurred by chance.

Table 15: Child defecation pattern

Item	Control		Intervention		PD %	95% CI
	N	%	N	%		
Last defecation of child ≤ 5 years						
On ground outside compound	489	22.9	554	16.8	-6.1	-12.4/0.2
On ground inside compound	489	21.3	554	25.6	5.3	-1.1/11.8
On ground in latrine cubicle	489	4.1	554	4.3	0.7	-1.7/3.0
In potty	489	6.1	554	9.2	3.2	0.0/6.5
In cloth nappy/diaper	489	1.4	554	2.2	0.8	-0.9/2.5
In pants/clothing	489	2.5	554	2.4	0.04	-2.0/2.1
On bed	489	0.2	554	0	-0.2	-0.5/0.2
In bedpan	489	0.8	554	2.0	1.3	-0.1/2.7
In latrine	489	39.5	554	37	-3.3	-10.4/3.9
Stool disposal (if not using latrine)						
Put/rinsed into latrine	296	11.8	349	12.0	-1.8	-9.3/5.6
Put/rinsed into drain/ditch/open field	296	1.0	349	4.3	3.4	0.5/6.2

Item	Control		Intervention		PD %	95% CI
	N	%	N	%		
Thrown into garbage	296	64.5	349	65.9	2.2	-7.3/11.8
Buried	296	0	349	0.3	0.3	-0.2/ 0.8
Washed (water ends up somewhere else)	296	7.4	349	7.2	0.5	-4.6/5.5
Left in open	296	13.9	349	9.7	-3.4	-11.5/4.6
Other	296	1.4	349	0.6	-1.0	-2.5/0.6

Note: PD = prevalence difference, calculated using linear regression (function: Gaussian, link: identity); clustering at the village level was adjusted for by using generalised estimating equations and robust standard errors; CI = confidence interval.

Pit emptying practices are shown in Table 16. Only a small percentage of households in the control (3%) and intervention (3.2%) arms had ever experienced latrine pit filling. In the control arm, 66.7% only emptied the pit; however, 8.3% built a new pit, 2.8% switched to another pit, about 8.3% stopped using it and another 2.8% reduced their frequency of use.

In the intervention arm, 80.5% emptied the pit; however, 7.3% built a new one, 2.4% switched to another, 7.3% stopped using it and 2.4% reduced their frequency of use. Among those who emptied the pit in the control arm, 70.8% hired someone to manually empty it, 8.3% hired a tanker to empty it, and 12.5% of households reported that family members emptied it. Similarly, in the intervention arm, 75.8% hired someone to do it manually, whereas 9.1% hired a tanker and in 12.1% of households it was done by a family member.

Table 16: Toilet pit emptying

Item	Control (N = 1,214)		Intervention (N = 1,278)		p-value
	N	%	N	%	
Latrine pit ever filled up	36	3.0	41	3.2	0.723
What did they do with the pit after it filled up?					0.402
Emptied	36	66.7	41	80.6	
Built a new pit	36	8.3	41	7.3	
Switched to using second pit	36	2.8	41	2.4	
Everyone stopped using the latrine altogether	36	8.3	41	7.3	
Restricted use to a select few members	36	2.8	41	2.4	
Other	36	11.1	41	0	
How was it emptied?					0.850
Hired someone to manually empty	24	70.9	33	75.8	
Hired tanker to empty	24	8.3	33	9.1	
Someone in family manually emptied	24	12.5	33	12.1	
Other	24	8.3	33	3.0	

5. Cost analysis

Overall, we found the 5 Star Toilet Campaign would cost USD1,23,502 to reach 2,483 households. The cost per household covered over the study period was USD49.74 (at the 2018 conversion rate). Intervention development accounted for 42 per cent of the overall cost, the rest being intervention roll-out cost (Table 17). Obviously, this proportion of cost would not be necessary for those adopting its use in other contexts.

During the study period, the intervention resulted in a 7 per cent increase (confidence interval: 1.4 to 12.6) in the use of toilets by household members where the latrine is in apparent use. The cost per unit increase in the use of toilets was USD17,643 and it ranges from USD9,802 (assuming a 12.6 percentage point increase in the use of toilets) to USD22,455 (assuming a 5.5 percentage point increase in the use of toilets) (Table 18).

Table 17: Programme cost

Item	USD in 2018 price
Development cost (one time)	
Personnel	40,057
Travel	6,657
Equipment	687
Indirect cost	4,604
Total intervention development cost	52,005
Roll-out cost (recurring)	
Personnel	29,590
Development of materials for campaign	23,713
Office expenses	1,867
Travel for staff	9,827
Overhead at 10%	6,500
Total roll-out cost	71,497
Total cost over the intervention period	1,23,502

Table 18: Cost-effectiveness analysis

Total HHs in the study area	2,483
Cost per HH coverage	49.74
Percent difference in use of toilet by all HH members where latrine is in apparent use (CI)	7 (1.4 – 12.6)
Cost (in USD) per percent unit increase in use of toilet at 7 PP	17,643
Cost (in USD) per percent unit increase in use of toilet at 5.5 PP	22,455
Cost (in USD) per percent unit increase in use of toilet at lower limit 5.5 PP	88,216
Cost (in USD) per percent unit increase in use of toilet at upper limit 12.6 PP	9,802

Note: HH = household; PP = percentage points; CI = confidence interval.

6. Discussion

6.1 Introduction

The results provide no clear evidence of a relevant effect of the intervention on toilet use in a rural Indian setting with high pre-existing toilet coverage and probable high levels of use. Gujarat was declared ODF by the government in October 2017. This meant that all clusters in Gujarat had 100 per cent toilet coverage. However, toilet coverage is far too low to judge Gujarat ODF (CAG 2018).

According to our discussions with district officials, no active behaviour change activities were being conducted in Bhavnagar. The government is working towards including households that were left out of the 2012 baseline survey as potential beneficiaries of a toilet construction subsidy. This means that not all households in Gujarat have access to a toilet, and the government continues to identify and disburse subsidies to eligible households.

The small increase in toilet use by all household members aged above five years was below the anticipated effect size for which the study was powered. It was also not confirmed by the physical activity data, which attempted to measure toilet use less intrusively. We observed a small increase in toilet use of 7 per cent, which was attenuated to 5.5 per cent after adjusting for imbalances.

The process evaluation suggested possible reasons for the failure of the intervention to meet its objectives. This is supported by the observation that among those intervention households able to remember the term '5 Star Toilet Campaign', reported toilet use by all household members was 96 per cent, as opposed to 89 per cent in those unable to remember. Although such per-protocol analyses are often subject to confounding, it is possible that the same intervention with better reach would have led to higher reported latrine use among all households.

Most notably, the exposure of the target population to the intervention was very low. Only about 10–15% of intervention households showed evidence of exposure to the intervention. A further analysis revealed that this small exposure was insufficient to change the population's perceptions around toilet ownership and other relevant sanitation-related factors.

Small positive changes in toilet features and proxy markers of current use were observed, but statistical support for these small changes was low and could have occurred by chance. The intervention also failed to change practices around child defecation. There also appeared to be interference from a similar sanitation promotion programme sponsored by the government in the same area at the same time.

The 5 star toilet concept was nested within the campaign theme of 'the world is getting smarter' and a lifestyle is not 'completely smart' until people have a toilet that matches the quality of their other 'smart' belongings, such as smartphones, laptops and gadgets. The campaign was delivered by trained facilitators and follow-up in communities was done through village volunteers.

The word 'smart' was translated as *saru*, *saras* by the facilitators while delivering the campaign. Younger people were also able to understand the word 'smart'. In this manner, the campaign mainstreamed the toilet concept by placing it in the context of all other desirable modern things. The tone and tenor of the campaign was light while keeping to the main points.

The surprising display of toilets to intervention recipients was not delivered through other government and non-governmental interventions. Exposure to different kinds of toilets in the world generated excitement and opened people's minds to what a toilet can be. The compost guessing game was able to initiate discussion and reduce disgust as some participants came forward to touch, feel and smell compost.

However, what clearly sticks out from the qualitative interviews with respondents is their response to the 5 star toilet concept, which was not only attractive but inspirational, making them believe that it is possible and desirable to improve one's toilet in order to be perceived as modern and high-status. This was demonstrated through the enrolment numbers of people wanting to improve their existing toilet and through interviews with intervention recipients. However, the reach of the intervention was clearly insufficient to produce changes at the population level. Therefore, a lesson for future scale-up is to make sure sufficient time is kept for follow-up and a suitable incentive and engagement plan for volunteers is developed.

The findings are difficult to compare with previous studies. Published randomised controlled trials on improving sanitation have often focused on the construction of toilets. A sanitation trial in Indonesia achieved an increase in household sanitation coverage from 60% to 64% (Cameron et al. 2013). A trial in Maharashtra, India, explored the effect of an intervention that increased coverage from perhaps 16% to 24% – an 8% difference (Hammer and Spears 2013).

Similarly, access to any form of latrine increased from just 57% to 65% in a trial in Tanzania (Briceno et al. 2015). A 19% increase in latrine ownership was achieved in a trial in Madhya Pradesh, India (from 22% to 41%) (Patil et al. 2014), a figure that was exceeded only by a trial in Orissa (from 9% to 63%) (Clasen et al. 2014). However, in the latter, nearly half of the constructed latrines were not functional one year after the intervention.

Further, there is evidence that in all three Indian sites the use of newly constructed latrines was low, and OD continued largely unabated. None of these earlier trials showed any impact on health, except for the trial in Maharashtra that suggested an improvement in child growth. Given the low sanitation coverage achieved, this finding is implausible and may have been due to chance. The Indian trials were conducted in the context of the Indian government's Total Sanitation Campaign, which included behaviour change components. In this sense, the present trial is in line with the earlier failures of the campaign to increase the use of previously constructed latrines.

A stronger behaviour change component than that of the Total Sanitation Campaign is usually implemented in interventions following the principles of CLTS. For example, Pickering and colleagues (2015) tested a CLTS intervention in Mali and found an increase in private latrine ownership from 35 to 65 per cent. Access to any latrine was

improved from about 66 to 90 per cent. OD may have decreased from 33 to about 10 per cent due to a combination of increased access to toilets and higher use.

Sanitation is likely to be most effective if the vast majority of a neighbourhood or village practices it. At low or intermediate coverage, OD by the remaining households may keep environmental exposure to pathogens fairly constant, even for those using a latrine. Increasing sanitation coverage from about 60 to 90 per cent, as in Mali, may therefore have a greater potential to improve health than increasing it from about 10 to 40 per cent, as in the Orissa and Madhya Pradesh trials.

The setting of our trial was reminiscent of the Mali trial, in that pre-existing toilet coverage and use was high. However, toilet quality was better in our setting, which meant that for the majority of households there was no need to improve them further. In contrast to Mali where toilet quality was generally poor, our challenge was to identify households that could benefit from the intervention. Therefore, community-level interventions such as ours or that of CLTS (in the Mali trial) may be harder to conduct and less cost-effective in our settings (Section 6.2).

More generally, the study findings are in line with other water, sanitation and hygiene-related behaviour change campaigns, especially those targeting handwashing behaviour. Intense small-scale hygiene interventions such as our earlier SuperAmma trial in Andhra Pradesh (Biran et al. 2014) have demonstrated changes to handwashing behaviour, but larger campaigns at scale have failed to produce relevant effects (Huda et al. 2012; Briceno et al. 2017; Lewis et al. 2018).

Limitations of the present study include the use of a self-reported behaviour to measure the primary outcome, imbalances in some socio-economic variables across study arms, and the short time frame between randomisation and outcome assessment.

The study relied on self- or proxy-reported toilet use as the primary outcome, which is likely to lead to over-reporting of socially desirable behaviours. In the setting of a randomised trial testing the effect of an intervention on socially desirable behaviours (here meaning toilet use), there is the additional risk of differential reporting behaviour between the intervention and control arms. Study participants in the intervention arm who have just been exposed to an intervention may be more prone to over-reporting toilet use than participants in the control arm, for whom the survey may simply appear as just another household survey, unlinked to an intervention.

Higher over-reporting of toilet use in the intervention would cause a spurious effect of the intervention on toilet use. We tried to explore the potential for differential over-reporting influencing the study results by employing a newly developed tool to measure toilet use and OD: the physical activity tool. In this tool, OD is one of many questionnaire items related to different physical activities performed throughout the day, alongside other questions related to chronic non-communicable diseases including dietary patterns. This tool found toilet use among study participants to be 4.4 percentage points lower, and there was no evidence for any increase in toilet use among the intervention households.

These findings are compatible with the presence of over-reporting in the primary outcome, and suggest that the observed effect of a five (adjusted) to seven (unadjusted) percentage point increase in toilet use may be due to differential over-reporting. In the

absence of a gold standard to measure toilet use, this interpretation needs to be treated with caution.

The samples for the main tool and the physical activity tool only partially overlapped. We wanted the physical activity questionnaire to be administered independently by a different team. The teams replaced households using the same list of households by employing the SurveyCTO® app. However, the physical activity tool did not re-assess the eligibility of a household as it did not require a toilet to be present.

With hindsight, we could have added the same eligibility criteria as in the main survey. We did not anticipate the fairly large number of households from the baseline census that proved unavailable or ineligible at endline. Further, the physical activity survey required 60 interviews per village. As many households only had one person available to interview, the team continued to enrol until 60 questionnaires were completed. Therefore, the number of households in the physical activity tool was higher than in the main tool and included some households that were probably ineligible.

Having observed unexpectedly high reported toilet use in the baseline survey, we decided to modify the primary outcome measure by adding the requirement of a toilet in apparent use to meet the primary outcome. However, the prevalence of toilets in apparent use was much higher at endline than at baseline in both arms, which most likely was due to better staff supervision in the endline survey. This meant that the results of the modified primary outcome (use of toilet by all household members in households where a latrine is in apparent use) were very similar to those obtained when using the original outcome (use of toilet by all household members irrespective of apparent toilet use as observed by field staff).

We further tried to reduce the potential for over-reporting by not repeating questions related to sanitation and toilet use in the same households at baseline and follow-up. Households undergoing these questions at baseline were discarded from further study. This strategy appears to have been successful. Toilet use by all household members at baseline (85%) was similar to toilet use by all household members observed in the control arm at follow-up (84%), suggesting that the trial procedures did not influence reporting behaviour.

These findings further suggest that administration of the physical activity tool, which was done about 10 to 14 days before the endline tool, did not influence responses to the endline tool, possibly by successfully camouflaging the purpose of the physical activity survey.

The lack of baseline toilet use data from households included in the endline survey meant that we could not adjust the effect estimates for any imbalances in the primary outcome or use the data for restricted randomisation to achieve balance. Randomisation was further compromised by the great time pressure to randomise before all census and baseline data were available. This was a consequence of unexpected delays in payments for the field surveys and the requirement for the r.i.c.e. measurement team to know the treatment allocation for their survey.

We further suspect that due to deficient staff supervision at baseline, the data used for randomisation was of poor quality. Some endline imbalances were observed in variables

associated with the primary outcome (asset index and male education). Adjusting for these variables attenuated the observed effect sizes but did not fundamentally change the interpretation of the results.

On the whole, we believe that minimising over-reporting and bias is more important than achieving a high degree of balance across arms. Bias is impossible to address analytically, whereas imbalances are due to a chance process that can be adjusted for (at least to some extent) and interpreted in the light of confidence intervals and the results of other studies (in meta-analysis).

The apparent poor quality of the baseline data may also be behind the high proportion of census households that were reportedly eligible for the endline survey but could either not be found at endline or were found to be ineligible. These were replaced by additional households from the list we provided, but this meant that the two teams working on the physical activity tool and the endline questionnaire enrolled somewhat different, though overlapping, study populations.

In our study design, the 10 households per village enrolled in the baseline toilet use questionnaire were sampled at random from the total list used for the endline survey. The results show very similar self-reported toilet use between baseline and endline in the control arm. Thus, despite the issues with the baseline data, this is a reassuring finding, suggesting that the baseline findings are reliable, while also lending support to our approach of not revisiting households at endline.

6.2 Challenges and lessons

The trial highlighted the need to identify a suitable target population for interventions aiming to increase the use of existing toilets. In our case, toilet use was already at a high level. Many households had high-quality toilets that were an integral part of the house. This is in striking contrast to many other Indian settings where toilets are often located away from the house, as if constructed as an afterthought and with the aim of keeping the toilet as far from the main building as possible.

The apparently high acceptance of toilets in the study population appears to have reduced the proportion of the population that could have benefitted from the intervention. If between 75 and 85 per cent of households are already complete toilet users, then the target population whose behaviour can be changed forms a small minority of households. From the programme perspective, this strongly reduces the efficiency of an intervention if it mainly consists of activities performed at the community level, such as public events and road shows. Intervention resources are then wasted on the majority of people attending such events, who have no need to change their behaviour.

Apart from choosing a suitable target population with a lower prevalence of toilet use, the findings suggest that better targeting of the intervention to households not currently using their toilet fully could be key to improving the effectiveness of the campaign and making it more efficient from a cost perspective. It may be assumed that community events are more cost-effective than individual household interventions. They can also serve to change community social norms by allowing the target population to experience behaviour change interventions jointly.

However, this assumption may change if only a small proportion of households are the true targets of an intervention (those 10–15% currently not using toilets). However, identifying such households within a given community is not easy. It seems difficult to target them without in-depth knowledge from inside the community and serial household visits meant to increase intervention exposure among those who could benefit most. Further research is needed to explore how this can be done. Approaches to identify households not using toilets need to be designed in a way that avoids stigmatising households based on income, caste and other status-related characteristics.

The intervention concept and components underwent significant, iterative modifications in response to in-field testing by the creative team, resulting in a final design that seemed to generate considerable interest among those encountering it. Many of the components do not need to be delivered in the context of community events, as demonstrated by their use in street-level events in the current implementation. They could be even more precisely targeted (though with an attendant increase in cost per household).

However, in light of the failure of large-scale behaviour change interventions in the water, sanitation and hygiene sector, one may also question whether relatively low-intensity, short-lived behaviour change campaigns (lasting for two or three visits, without follow-up or support from mass media and sustained efforts) can bring about lasting changes in sanitation-related behaviour. Recent demonstration campaigns in other countries suggest it might be possible (Tidwell et al. 2019), but replications at scale are required to ensure this possibility.

The Indian government's sanitation campaigns are frequently criticised for their emphasis on toilet construction rather than behaviour change (e.g. Routray et al. 2017). However, it has been argued that no one has developed a scalable approach to improve them (Schmidt 2015). The present study suggests that once people have built good-quality toilets, they are quite likely to use them consistently, at least in this setting in Gujarat.

According to general community perception, a good-quality toilet includes: more space where people feel less claustrophobic, and it is less malodorous; tiles on the wall that help keep the toilet clean and make it look beautiful; availability of water for cleaning and flushing; and light inside the toilet. The superiority of behaviour change campaigning as opposed to the toilet construction pursued, for example, in the CLTS approach, has not been proven in the case of India. Government subsidies to support the transition from a predominantly OD population to one that is using toilets seem appropriate in this light. Increases in toilet use appear to occur in India, and it seems possible that the driving factor behind this increase is the change in the behaviour setting or environment (i.e. availability of a toilet).

Our campaign emphasised and supported people in making their toilets easier to use and 'nicer', with the aim of making the behaviour setting more favourable for toilet use. The reach of these activities was insufficient and needed to target those who do not already own a high-quality toilet (households that were relatively rare). Gujarat was declared ODF in October 2017. This meant that all households in each village had access to a toilet. Although in reality this number was far smaller, the government continues to identify potential beneficiaries who were not able to access the toilet

subsidy earlier. This has improved coverage of toilets built using government subsidies or personal resources by households.

The extent to which behaviour change campaigns can contribute to changing norms and increasing the construction of toilets (not part of the campaign described here) and their subsequent use (the emphasis of this intervention) remains unclear. Through our experience, we noted that the creative design and development process is an important aspect of intervention delivery. However, it is often ignored or undermined as it requires focused and continuous engagement, as well as adequate funds for field testing, prototype development and the iterative production of creatives.

Similarly, for behaviour change to occur, there is a need for sustained government-supported efforts involving communities at district, block and *gram panchayat* levels. Our efforts to use village volunteers and social media to sustain behaviour change activities do not appear to have been successful.

Finally, a core challenge of the study was the unforeseen circumstances that delayed disbursement of funds and subsequently impacted the project timeline. This especially had an impact on the baseline study, which was conducted by the data collection agency though they had not received any funding by the time of the study. This may have compromised the quality of the baseline data, as fewer quality checks were put in place than would have been desirable.

6.3 Policy and programme relevance: evidence uptake and use

While it is currently too early to determine the ultimate degree of evidence uptake and programme use by policymakers, there is already some evidence that the research project has had an impact on other efforts to improve sanitation in the context of SBM. The campaign theme and contents resonated strongly with the participants and implementers. Further, the campaign was well received by district-level officials of the Gujarat government.

All campaign materials were reviewed by the district development officer; district coordinator for information, education and communication and the block development officer. The district government was excited about the campaign materials as they looked attractive and communicated messages related to reducing anxiety around pit filling and improving existing toilets. This, according to the district government, is important to explain to people who have built toilets but may not be using them.

The government is currently planning to scale up the campaign to other blocks of Bhavnagar. The 5 Star Toilet Campaign team assisted the Gujarat government in developing this scale-up plan. Messages related to solid and liquid waste management and clean villages were added to the existing package. However, since the general election code of conduct was announced, the scale-up was postponed to a later date by the district administration.

The government is looking for more effective strategies to encourage the use of toilets by all members in a household. In past years, government information, education and communication efforts have mainly focused on messages related to toilet use without addressing its core determinants. The government felt that door to door activities have

greater potential to reach people compared to triggering activities alone, which is in agreement with our conclusion from this research. In addition, it agreed that sustained efforts over time with improved implementation arrangements are needed, as one-time activities often have limited impact.

Members from Tata Trusts observed the intervention delivery and invited the study team to learn more about the BCD process and steps followed to design the 5 Star Toilet Campaign. Previously, the Trusts implemented a campaign based in BCD to improve toilet coverage, and they see value in the intense theory-driven approach to behaviour change for sanitation. The team shared study results with them. Tata Trusts have expressed interest in rolling out the campaign in 30–50 villages in Gujarat.

7. Conclusions and recommendations

This behaviour change intervention, aiming to increase the use of toilets in households owning a government-supported toilet, was delivered in the context of a cluster randomised trial. Only a small increase in self- or proxy-reported toilet use was observed in the intervention arm, compared to the control arm. Insufficient campaign intensity (Hargreaves et al. 2016) and exposure of the target population to the intervention are likely to have contributed to the low impact of the campaign.

Subgroup analyses suggested an even smaller effect of the intervention in households with a low level of education, while no differential effect was observed between men and women. The pre-existing high coverage of high-quality toilets that appeared to be used by at least 80 per cent of the target population meant that only a minority of households could be potential beneficiaries of the intervention. Overall, the limited exposure of the target population to the intervention points to implementation issues as the main cause for the lack of effect.

Despite the lack of evidence of effectiveness from this trial, the campaign concept and components have generated considerable interest, such that they have already been taken up for implementation by others, including the Indian government and Tata Trusts.

Based on our quantitative and qualitative findings we make the following recommendations:

1. Policymakers need to be aware that large-scale, one-off behaviour change campaigns have not been shown to achieve relevant changes in sanitation behaviour if they are not supported by sustained efforts on the ground;
2. Programme managers need to estimate the proportion of the target population that can benefit from an intervention prior to deciding how to design a campaign. Interventions only working at the community level without visits to individual households may be cheap and scalable; however, they may become inefficient if only a minority of the population are potential beneficiaries. Targeted household-level interventions may be more cost-efficient than community-level interventions if there is a straightforward way of identifying potential beneficiaries (in this case, households with access to a toilet but low use);
3. Researchers need to develop better tools for assessing toilet use that are not prone to over-reporting – in particular, differential over-reporting – between an

intervention and a control arm. Trials should not rely on explicitly self-reported toilet use as the only method for outcome assessment;

4. Changing sanitation behaviour and assessing the effect of interventions to test different approaches takes time. Donors should allow sufficient time to achieve changes and measure impacts if they wish to improve the evidence base of their decisions; and
5. Future research could be directed toward determining how to better target large-scale sanitation interventions to subpopulations in greatest need, without stigmatising economically and socially disadvantaged groups. Future research also needs to determine the minimum 'dose' an intervention must achieve in order to change behaviour. It must establish the ways in which large-scale sanitation campaigns can be incorporated into the overall sanitation strategy at the local, district, state and national levels. The use of volunteers was not successful in this intervention. Most activities were conducted by dedicated staff. Since volunteer groups such as girls' groups or self-help groups are often officially included in sanitation programmes under SBM, ways of making them more effective need to be explored.

Online appendixes

Online appendix A: Evidence from past trials

<https://www.3ieimpact.org/sites/default/files/2019-09/TW14.1002-Online-appendix-A-Evidence-from-past-trials.pdf>

Online appendix B: Findings of formative research

<https://www.3ieimpact.org/sites/default/files/2019-09/TW14.1002-Online-appendix-B-Findings-of-formative-research.pdf>

Online appendix C: The 5 Star Toilet Campaign's design process involved a double diamond concept

<https://www.3ieimpact.org/sites/default/files/2019-09/TW14.1002-Online-appendix-C-The-5-star-toilet-campaign%E2%80%99s-design-process-involved-a-double-diamond-concept.pdf>

Online appendix D: The Smart Toilet Campaign- theory of change

<https://www.3ieimpact.org/sites/default/files/2019-09/TW14.1002-Online-appendix-D-The-smart-toilet-campaign-theory-of-change.pdf>

Online appendix E: Monitoring data

<https://www.3ieimpact.org/sites/default/files/2019-09/TW14.1002-Online-appendix-E-Monitoring-data.pdf>

Online appendix F: Pre-analysis plan

<https://www.3ieimpact.org/sites/default/files/2019-09/TW14.1002-Online-appendix-F-Pre-analysis-plan.pdf>

Online appendix G: Survey tools

<https://www.3ieimpact.org/sites/default/files/2019-09/TW14.1002-Online-appendix-G-Survey-tools.pdf>

Online appendix H: Behaviour centred design

<https://www.3ieimpact.org/sites/default/files/2019-09/TW14.1002-Online-appendix-H-Behaviour-centred-design.pdf>

Online appendix I: Campaign photographs

<https://www.3ieimpact.org/sites/default/files/2019-09/TW14.1002-Online-appendix-I-Campaign-photographs.pdf>

Online appendix J: Study map

<https://www.3ieimpact.org/sites/default/files/2019-09/TW14.1002-Online-appendix-J-Study-map.pdf>

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