

LONDON
SCHOOL of
HYGIENE
& TROPICAL
MEDICINE



Latrine adoption and use in rural Odisha, India: Constraints and challenges

Parimita Routray

Thesis submitted in accordance with the requirements for the degree of
Doctor of Philosophy
University of London
October 2017

Environmental Health Group
Department of Disease Control
Faculty of Infectious and Tropical Diseases
London School of Hygiene & Tropical Medicine

Funded by the Sanitation Hygiene Applied Research for Equity (SHARE) Consortium

DECLARATION OF OWN WORK

I, Parimita Routray, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Parimita Routray

PARIMITA ROUTRAY

Date: 4th October, 2017

ABSTRACT

An estimated 2.4 billion people worldwide lack access to improved sanitation. This includes nearly 1 billion people practicing open defecation, of which 60 percent reside in India. Open defecation is especially common among rural populations, and has been linked to health problems like the occurrence of diarrheal disease and malnutrition. Despite decades of efforts by the Indian government to improve sanitation, open defecation continues to be a common practice even in households possessing a functional latrine.

The main aims of this research were 1) to understand the reasons for poor adoption (uptake) and use of government subsidized latrines, and 2) to identify the constraints causing latrine non adoption and use. From the constraints identified in the literature review, three constraints were selected for in-depth investigation in this dissertation :1) socio-cultural beliefs and customs around handling adult human faeces, 2) programmatic challenges in mobilising communities for latrine promotion, and 3) household level challenges with sanitation decision making, especially exploring inability of women to take decisions on sanitation installation. The study was conducted in rural areas of Odisha through a mixed methods approach.

The research revealed that in this study population, latrine adoption and use by all family members is influenced by socio-cultural and behavioural rituals and restrictions on handling and containing adult human faeces close to the home. In some cases, study subjects expressed a preference for open defecation over latrine use and were able to articulate benefits and advantages. Diverse communities and lack of capacity and skill among implementers negatively impacted the implementation of sanitation campaigns. Power hierarchies, inter-generational and household dynamics prevented female family members from participating in household decisions, including latrine installation decision-making.

ACKNOWLEDGEMENTS

I would like to thank first Dr. Sophie Boisson, who fuelled my long time desire to do this studies - the PhD. Her timely sharing about the announcement of SHARE's scholarship inviting application for PhD and constant motivation to submit synopsis and apply for the scholarship, has led to this research presented in this dissertation. I feel blessed, for my synopsis getting shortlisted and then for being selected as one of the 6 students that received this scholarship. That is when this PhD journey started in the year 2012, and now culminates with me writing this acknowledgement.

Next, I offer my sincere thanks to Dr. Wolf Peter Schmidt, who was my colleague then, volunteered to supervise me in the PhD. While working together as colleagues, he probably could foresee my strengths as a researcher and believed strongly in my abilities of persuing this PhD and guided me throughout this journey.

Thanks to my colleague cum friend cum co-supervisor - Dr. Belen Torondel, who supported me extensively in my life's tough decisions, including the decision to continue with this PhD. Her strong encouraging lines – 'Parimita, you are almost there', kept me motivated always and did not let me quit this PhD, which my mind had almost decided. Like Dr. Wolf, she strongly believed that I possessed all the qualities of a good and competent researcher and these traits would be helpful in doing this study. Thank you Belen for having so much confidence on me.

Special thanks to Dr. Thomas Clasen. As a colleague, he was always very supportive and cooperative in this journey. All my doubts about the PhD process were clarified instantly by him and he came up with solutions for all the problems that came on my way. He strongly motivated me for the publications and extended his time and expertise in reviewing all my manuscripts and this thesis and guided with feedback, that helped a lot improving the manuscripts and the write ups.

Many thanks to Dr. Marion W Jenkins (Mimi). All the qualitative work that was undertaken in this PhD, the analysis was learnt under Mimi's guidance. The art of writing a scientific qualitative paper could be possible with her constant guidance. She has been helpful in reviewing the manuscripts and enriching them.

Professor Sandy Cairncross, Dr. Adam Biran and Dr. Jeroen Ensink all deserve a special thanks for the support extended during this journey. Dr. Ensink, you will always be remembered for the encouragement and the approach to motivate students like me. Additionally, the admin staff at LSHTM especially Ms. Chantelle Thomas and Ms. Eileen Chappel, were very cooperative and they always ensured that we are free from other tensions like - timely payment of stipend, reimbursements for the field work and concentrate on our research work.

My time at LSHTM would not have been the same without these friends - Sheillah, Prince, Fiona and Marieke. Sheillah, I am blessed to have met you at LSHTM and have you as a friend. Your friendship is special to me. Despite being far away in South Africa, your emailing me every month to check on me about my progress with studies, is highly appreciated. Thank you, for all the encouragement and listening to my worries, and giving me practical solutions to overcome them.

The field team back in Odisha (at the study site) in Odisha, India comprising - Munmun Dasmohapatra, Indrajit Samal, Alfred Mohanty, Sonam Sahoo and all the enumerators, were wonderful and super souls. I will remain grateful to all of them, for taking charge of many of my responsibilities and keeping me away from work tensions, lessening my work burden and letting me focus on my studies. It's rare to get such sincere, honest and hardworking colleagues. Their support in terms of data collection would not have been possible, if they would not have collected them with interest and sincerity. I appreciate all their hard work and sincerity.

During this PhD journey, I had two great personal losses - my father at the start of my studies in 2012 and my only brother in 2015. These two losses in quick succession took a heavy toll on me and I had lost all energies to finish this research. But my support system comprising my family and friends did not let me give up. Special thanks goes to my Mother – Ms. Santilata Routray, who patiently handled me during the depression phases and tolerated my madness. My sisters equally supported me during this ups and down of this PhD journey. My niece – Amrita, had a stronger faith than me, to finish the PhD.

Many thanks to my special friends – Manaswini Rout, Debashree Sinha Chakraborty, Sukanya Mohapatra, Sucheta DasMohapatra, Subhashree Pattnaik, Ruby Sinha and Sawan Hembram who patiently heard to my anxieties and always sent positive energies to carry on with my mission. At the end, I thank another special friend Gustavo. He made me understand what is more important and not important in life. In addition, I thank all my near and far ones, who wished for my betterment.

TABLE OF CONTENTS

Declaration of own work	3
Abstract.....	4
Acknowledgements	5
Table of contents	8-10
Abbreviations	11
1. GENERAL INTRODUCTION	13
1.1 Background	13
1.2 Sanitation definition	14
1.3 Sanitation and its relation with diseases.....	14
1.4 Sanitation and the MDGs targets.....	16
1.5 Sanitation promotion: Approaches and successful initiatives worldwide	18
1.5.1 Sanitation promotion through ‘top-down’ approaches	18
1.5.2 ‘Bottom-up’ participatory approaches for sanitation promotion and behaviour change.....	18
1.6 Conclusion	21
2. LITERATURE REVIEW	26
2.1 Sanitation post-independence in India.....	26
2.2 Sanitation planning in India.....	27
2.3 Government of India’s countrywide sanitation programmes	31
2.4 Performance of India’s sanitation campaigns and related research and evaluations...	35
2.5 Database search	35
2.6 Research on sanitation interventions and campaigns in India.....	36
2.7 Research gaps and problem identification	45
2.8 Research aim	49
2.9 Research questions	49
2.10 Thesis components	49
3. RESEARCH METHODS, TOOLS, AND STUDY SITE DESCRIPTION.....	54
3.1 Background	54
3.2 Research tools	54
3.3 Ethics approval and consent.....	60
3.4 Description of study site.....	60

4. RESEARCH PAPER 1: <i>Socio-cultural and behavioural factors constraining latrine adoption in rural coastal Odisha: An exploratory qualitative study</i>	64
4.1 Coversheet for the research paper.....	64
4.2 Additional information.....	85
5. RESEARCH PAPER 2: <i>Processes and challenges of community mobilisation for latrine promotion under Nirmal Bharat Abhiyan in rural Odisha, India</i>	86
5.1 Coversheet for the research paper.....	86
6. RESEARCH PAPER 3: <i>Women’s role in sanitation decision making in rural Coastal Odisha, India</i>	103
6.1 Coversheet for the research paper.....	103
7. SUMMARY, REFLECTIONS, AND RECOMMENDATIONS	121
7.1 Summary.....	121
7.2 Reflections.....	123
7.3 Recommendations for increasing sanitation adoption and uptake.....	125
7.4 Future research.....	130

LIST OF FIGURES

Figure 1. The F - Diagram: Faecal - oral route of transmission of disease.....	16
Figure 2. Constraints of latrine adoption and use in rural India	48
Figure 3. Latrine built in Bamanal village under TSC.....	55
Figure 4. Incomplete latrine built under TSC in Paikasahi village	55
Figure 5. Firewood stored in a completed latrine in Madhyasahi village	55
Figure 6. An unused completed latrine in Sankhatira village	55
Figure 7. An abandoned latrine in Begunia village.....	56
Figure 8. Broken latrine pit in Kajisahi village	56
Figure 9. Badly built latrine in Bamanal Harijan Sahi	56
Figure 10. Map of Odisha	60
Figure 11. Map of Puri district with boundaries of blocks.....	61

LIST OF APPENDICES

Appendix 1. Media coverage on published paper 1 – Indian Express	133
Appendix 2. Blog by Dean Spears - RICE.....	135
Appendix 3. Article review by Aarti Kelkar – India Water Portal	137
Appendix 4. Discussion guide: FGD with NGO functionaries on village level implementation of NBA activities.....	140
Appendix 5. Discussion guide: IDI of community members on community mobilization for sanitation promotion.....	143

Appendix 6. Observation checklist: latrine observations	145
Appendix 7. Observation checklist: Sanitation promotion and community mobilisation activities by NGOs	146
Appendix 8. Discussion guide: FGD with community members on village motivations by NGOs for sanitation promotion	147
Appendix 9. Discussion guide: IDI on household sanitation decision making.....	148
Appendix 10. Discussion guide: FGD on household sanitation decision making.....	150
Appendix 11. Survey to assess household decision making	152
Appendix 12. Impact of Indian Total Sanitation Campaign on Latrine Coverage and Use: A Cross Sectional Study in Orissa, Three Years following Programme Implementation.....	167
Appendix 13. Effectiveness of a rural sanitation programme on diarrhea, soil transmitted helminth infections and child nutrition in Odisha, India: a cluster randomised trial.....	177

LIST OF ABBREVIATIONS

APL	-	Above the Poverty Line
BPL	-	Below Poverty Line
CATS	-	Community Approaches to Total Sanitation
CHC	-	Community Health Clubs
CLTS	-	Community Led Total Sanitation
CRSP	-	Central Rural Sanitation Programme
FGD	-	Focus Group Discussion
GoI	-	Government of India
GP	-	Gram Panchayat
IDI	-	In-depth Interviews
IEC	-	Information Education and Communication
IHL	-	Individual Household Latrine
JMP	-	Joint Monitoring Programme
MDGs	-	Millennium Development Goals
MGNREGS	-	Mahatma Gandhi National Rural Employment Guarantee Scheme
MoDWS	-	Ministry of Drinking Water and Sanitation
MoRD	-	Ministry of Rural Development
MoUD	-	Ministry of Urban Development
NBA	-	Nirmal Bharat Abhiyan
NGO	-	Non Government Organisation
NGP	-	Nirmal Gram Puraskar
OD	-	Open Defecation
ODF	-	Open Defecation Free

PHAST	-	Participatory Hygiene and Sanitation Transformation
PHED	-	Public Health & Engineering Department
PRA	-	Participatory Rural Appraisal
PRI	-	Panchayati Raj Institutions
RCT	-	Randomised Controlled Trial
RD	-	Rural Development
SBA	-	Swachh Bharat Abhiyan
SBM	-	Swachh Bharat Mission
SDG	-	Sustainable Development Goals
SC	-	Scheduled Castes
ST	-	Scheduled Tribes
TSC	-	Total Sanitation Campaign
WASH	-	Water, Sanitation and Hygiene
WHO	-	World Health Organization

1. GENERAL INTRODUCTION

1.1 Background

Young children form a population group that is particularly susceptible to infections and diseases. Of all deaths throughout the world, half of them are reported to be those of children under 5 years of age[1-3]. The World Health Organization (WHO) estimates some 1,400 young children die each day due to the consumption of unsafe water and poor hygiene practices[4]. Deficient water supplies, lack of sanitation, and poor hygiene practices together lead to diseases that are responsible for 7 percent of all deaths in developing countries[5]. These deficiencies are a leading cause of diarrhoeal deaths[5], which is the second major cause of deaths among young children worldwide, after pneumonia[6, 7]. Globally, around 526,000 children under age 5 die of diarrhoea every year[8]. 90 percent of these deaths occurs in low income or developing countries of Africa and South Asia and are more pronounced in the poorest regions and among the most disadvantaged children within those communities[9-11]. Poor access to sanitation and poor personal hygiene often associated with poor sanitation, have been linked to diarrhoea and under-nutrition. Two out of every five people globally lack access to sanitation[9].

Diarrhoeal diseases have long-term impacts on health, including malnutrition[7, 12,13]. These diarrhoeal diseases and malnutrition are linked to lower educational attainment, loss of work time and economic productivity, limited livelihood choices, food security, risks of premature deaths and ultimately aggravates poverty[5, 14]. Women and girls are disproportionately impacted by poor or no access to water and sanitation[15]. A survey from 40 countries in Africa and Asia found women within households being tasked with the collection of two thirds of the water requirement in the households[16]. Similarly, unavailability of proper sanitation facilities, lack of water in the school premises, and concern for privacy during menstruation among adolescent girls have been associated with school absenteeism or dropout[17-22]. The absence of sanitation facilities and the resulting lack of privacy, is also linked to issues of gender-based violence and harassment[23-25]. Access to safe water and sanitary means of excreta disposal are a universal need and fundamental to human well being[26].

Health, poverty, and human development are greatly inter-correlated, and have strong correlation with sanitation as well. Access to sanitation is vital for individuals and their social lives and thus widely regarded as a basic human right.

This chapter will describe the definition of 'sanitation', explain its importance and relation with disease(s) transmission, inclusion of sanitation targets in Millennium Development Goals (MDGs), and finally, a description of innovative approaches for sanitation promotion worldwide engaging people and ensuring their participation.

1.2 'Sanitation' definition

Sanitation is derived from a Latin word 'sanitas,' which means health or soundness of body[1]. Sanitation is defined in many ways such as use of measures designed to promote health and prevent disease, the development and establishment of conditions, proper cleanliness of the environment making it favourable for the health of the individual and the community. More narrowly, it is defined as the safe collection, storage, treatment and disposal of human faeces (excreta) and urine. Sanitation is also considered as including the reuse and recycling of faeces and the drainage, disposal, recycling, and reuse of waste water. The WHO defines sanitation as safe management of human excreta and includes the provision of latrines and services for safe disposal of human waste and the promotion of personal hygiene[27].

1.3 Sanitation and its relation with diseases

Disease or infection patterns reflect people's standard of living and way of life residing in a place, area, region, and the community. With population growth and increased population density, provision of sanitation and safe water supply becomes challenging, which often increases the risk of infectious disease[28]. Human faeces are a major source of various bacterial, viral, and parasitic infections and their presence in open spaces contaminates the environment[29]. Ingestion of water and food that are contaminated directly or indirectly with infected human faeces results in waterborne and water-washed diseases that include poliomyelitis, amoebiasis, salmonellosis, bacillary dysentery, cholera, and typhoid[1, 30, 31]. Worm infections follows the ingestion of the egg or larva of the parasite and causes ascariasis and trichuriasis[32].

Penetration of parasites through skin such as hookworm are another form of worm infections that is linked with exposure to human excreta[33]. Diseases like scabies and trachoma are the outcomes of poor household sanitation and personal hygiene[34]. Similarly, diseases such as filariasis and Japanese B encephalitis which are transmitted by mosquitoes, can be further compounded from a lack of sanitation[35]. The F-diagram as proposed by Wagner and Lanoix[34] in 1958 (Figure 1 below) is a framework that is still used to understand how faeces in the environment can lead to disease transmission via contaminated hand/fingers, flies, fields, fluids, and food.

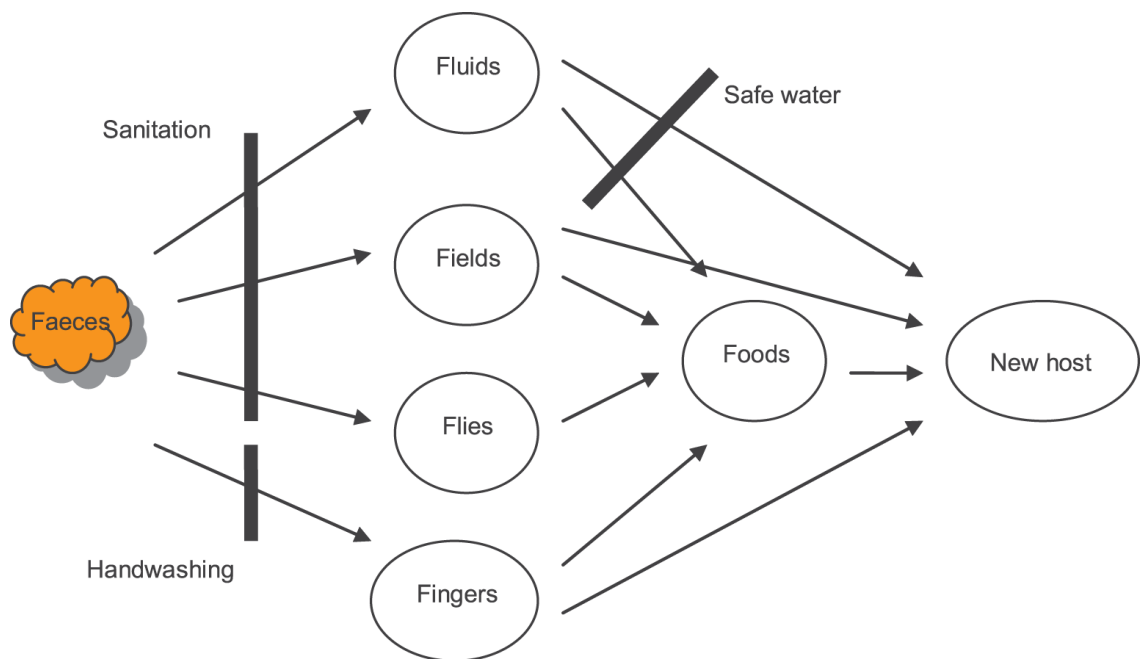


Figure 1. The F-Diagram: Faecal-oral route of transmission of disease. Image source [30]

Nutrition and infection are closely related, as infection or disease can bring malnutrition and correspondingly when food is scarce, malnutrition can be an aggravating factor and the undernourished are susceptible to infection[13]. Substantial ingestion of faecal bacteria may lead to environmental enteropathy, a sub-clinical condition caused by constant faecal-oral contamination[36]. Exposure to faecal pathogens causes inflammation and structural changes in the small intestines, which ultimately results in functional changes. Environmental enteropathy is marked by

impaired gut immune system, mal-absorption of nutrients, and impaired growth leading to under nutrition and stunting[37, 38].

‘Sanitation’ is considered essentially a primary barrier (as shown in Figure 1 above), and an essential mechanism to curb the faecal-oral diseases transmission[34]. With human hosts of infections modifying the environment by the provision of sanitation facilities, adopting new behaviours and improved hygiene practices, infectious diseases are likely to decrease[39]. Similarly, practicing good hygiene such as hand-washing with soap after toilet use, before food preparation and consumption, and drinking ‘safe water’, are other barriers that can prevent faecal exposure. Further, evidence suggests increased water supplies result in high reduction of water-based diseases [29, 40] and also facilitate use of sanitation facilities, as this research will confirm.

1.4 Sanitation and the MDGs targets

In the year 2000, the world leaders from 189 United Nations member countries held the Millennium Summit and adopted the Millennium Declaration. From the Millennium Declaration emerged the MDGs - the eight international development goals with time bound targets. Goal 1 aimed to eradicate extreme poverty and hunger; Goal 2 aimed to achieve universal primary education; Goal 3 to promote gender equality and empower women; Goal 4 to reduce child mortality; Goal 5 to improve maternal health; Goal 6 to combat HIV/AIDS, malaria, and other diseases; Goal 7 to ensure environmental sustainability; and Goal 8 aimed to develop a global partnership for development. Though ‘sanitation’ was not included in the 7th MDG initially, following the World Summit for Sustainable Development in 2002, ‘basic sanitation’ was added to the target 10. This target aimed to reduce by half the proportion of people without access to drinking water, and upon inclusion of sanitation, halve the proportion of people without access to sanitation. This meant, increasing access to safe drinking water from 76 percent (1990 baseline year) to 88 percent, and basic sanitation from 54 percent to 77 percent. In fact, it can be argued that sanitation has the potential to contribute to all other MDGs, in particular those related to nutrition, education, and gender equality (see previous sections). The progress against these sanitation and drinking water targets was jointly monitored by

WHO and UNICEF through the Joint Monitoring Programme (JMP), which tracked and reported the progress towards the MDGs 7c at the regional and country levels.

Year 2015 marked the end of the target period for attaining the MDGs, and the JMP reported only 95 countries as having managed to meet the sanitation target. The improvement in sanitation facilities, which aimed to achieve a 77 percent target, only achieved a 68 percent improvement thus falling short of the target by 9 percentage points. As per the last 2015 JMP report, nearly 1 billion people globally practiced open defecation (OD), with a higher number concentrated in rural areas (of the 68 percent global population that used improved sanitation, 82 percent were urban, and 51 percent were rural populations), and 2.4 billion people lacked access to improved sanitation. Disparities were also noted in developing countries that had high rates of poverty, political instability, and rapid population growth.

A majority of the people not using or having access to improved sanitation were concentrated in three regions - Southern Asia, sub-Saharan Africa, and eastern Asia. Though the number of people practising OD moderately declined in Southern Asia from 771 million in 1990 to 610 million in 2015, this still remained the region with the highest number of individuals practicing OD. Countries like Bangladesh, Nepal, and Pakistan in this region made significant improvements. All achieved reductions of more than 30 percentage points since 1990. However, India topped the list of countries with the highest percentage (60 percent) of people practicing OD. This high percentage of OD in India alone significantly influences the regional and global estimates and is an ongoing concern for sanitation practitioners.

2015 also marked the launch of the Sustainable Development Goals (SDGs). They are a set of 17 goals (with an associated 169 targets) signed by 193 countries, covering a broad range of sustainable development issues like ending poverty, improving health and education, protecting the planet, and ensuring prosperity for all by 2030. Most of these goals and targets are an extension of the unaccomplished work of the MDGs. The sixth goal of the SDGs comprises targets to 'ensure access to water and sanitation for all'.

1.5 Sanitation promotion: Approaches and successful initiatives worldwide

In rural sanitation programmes entailing sanitary disposal of human faeces, a range of innovative approaches have been adopted worldwide. Several of these are focused particularly on encouraging participation of local communities. The following sections provide an overview of ‘top-down’ approaches for sanitation promotion and the ‘bottom -up’ approaches for sanitation demand generation, which encourage participation from individuals and communities.

1.5.1 Sanitation promotion through ‘top-down’ approaches

The early water and sanitation programmes before the MDGs period were predominantly driven by experts or planners lacking a direct link to the target communities and thus followed top-down approaches. The sanitation programmes implemented in India, namely, the Central Rural Sanitation Programme (CRSP) and Total Sanitation Campaign (TSC), are examples of top-down approaches that had mixed results. These programmes are described and analysed in detail in the second chapter.

1.5.2 ‘Bottom-up’ participatory approaches for sanitation promotion and behaviour change

In the past few decades, many development programmes in high and low income countries encouraged people and communities to participate based on the belief that their involvement and contribution in a programme’s planning, design, implementation, and operation improved its effectiveness and made it more sustainable. Global sector experiences and research have also established that services are better sustained when service delivery is done using approaches that seek to understand and respond to the demands of the potential users of the services. Development practitioners rely on participatory approaches and consider ‘community participation’ a vital requirement for their programme’s success[41]. Community participation took centre stage in the public health arena, especially in environmental sanitation programmes, as there was evidence suggesting that community members adopt and practice a changed behaviour when they understand the challenges they face, know how to address them, and recognise the logic guiding the adoption of the

new behaviour. When these are in place, community members participate and support in the promotion of initiatives and programmes[34]. The following sections detail successful examples of sanitation programmes that adopted participatory approaches and ensured community participation.

PHAST(Participatory Hygiene and Sanitation Transformation) [42]was an approach designed to promote improved hygiene practices, sanitation improvements, and community management of water and sanitation facilities using specifically developed participatory techniques. It aimed to empower communities to manage their water and to control sanitation-related diseases by promoting health awareness and understanding, which in turn led to environmental and behavioural improvements. Participatory activities were developed for community groups to recognise for themselves the faecal-oral contamination routes of diseases. Community facilitators then helped the community groups analyse their own hygiene practices to block the contamination routes. This initiative then led the communities to take the lead in formulating solutions. The groups planned ways to improve hygiene practices in the community, to build or improve facilities, and make plans for operation and maintenance of the facilities. The underlying principle of PHAST was that no lasting change in people’s behaviour will occur without health awareness and understanding. The objective of PHAST was not only to teach hygiene and sanitation concepts but more importantly to enable people to overcome constraints to change. It was done by involving all members of society across divides of age, gender, and economic status – in a participatory process. This involved assessing their own knowledge base, investing in their own environmental situation, visualising a future scenario, analysing constraints to change while planning for change, and finally, implementing the proposed changes. Although this was a successful approach, it had shortcomings that included a number of activities being labour intensive, time consuming, and dependent on the trainers or facilitators.

Community Health Clubs (CHCs) [43] formation is another innovative methodology designed primarily to develop community cohesion and a ‘culture of health’ within the target population, with the aim to create a demand for sanitation and improve hygiene practices within the home. Community cohesion was promoted by establishing CHCs,

which were voluntary in nature and open to all age groups. The methodology involved two stages. The first involved using health education as the entry point for galvanizing and forming a 'common unity' in the targeted population. The second stage involved the application of the knowledge to daily life, like ensuring good hygiene, safe water supply, and improved sanitation. The approach sought to first change norms and beliefs within a group. Through regular face to face interactions and training in CHCs, conventional norms and values are altered, resulting in sustained hygiene behaviour change and a demand for sanitation[44]. This intervention was first started in Zimbabwe, which significantly changed hygiene behaviour and built rural demand for sanitation. Its success led to its replication in many countries of Africa and Asia[45]. A recent cluster randomised trial conducted in Rwanda, which suggested a lack of short term health gains from the CHC approach, has led to some debate in the sector[46].

Community Approaches to Total Sanitation (CATS)[47] is an approach conceived by UNICEF aimed at eliminating OD in communities. They are demand-driven and community-led, and emphasise the sustainable use of safe, affordable, user-friendly sanitation facilities rather than the construction of infrastructure. This requires broader engagement with diverse members of the community, including households, schools, health centres, and traditional leadership structures. It relies on community mobilisation and behaviour change to improve sanitation and integrate hygiene practices. Communities lead the change process and play a central role in planning and implementing improved sanitation, taking into account the needs of diverse community members, including vulnerable groups, people with disabilities, and women and girls. CATS provided a framework for action and a set of shared values that could be easily adapted for programming in diverse contexts and was expanded to South Asian and African countries[48].

Community Led Total Sanitation (CLTS) is a revolutionary social motivation approach started in Bangladesh in 1999. It has proved to be the most effective and sustainable for rural sanitation. Community members were facilitated in conducting a self-appraisal and analysis of OD, and then take action to eradicate OD by using some

practical tools and techniques similar to that of Participatory Rural Appraisal¹ (PRA) methods. This approach is based on stimulating a collective sense of disgust by making community members realise that they will be ingesting one another's faeces if OD continues. It also encourages a desire among community members to change behaviours. For this, the facilitators use 'shame' or 'social stigma' as a tool for promoting those behaviours but it is left to the community members to decide and deal with the problem and look for their own alternatives to OD. Proper 'facilitation' and 'ignition' are claimed to be essential elements of this approach, as it triggers an immediate action by families and communities and aims at stopping OD entirely[49].

The success of this approach in communities across Bangladesh encouraged many countries in Africa and Asia, including India, to replicate the approach to achieve sanitation targets. However, the role of shame and the degree to which it can be effectively used to trigger behaviour change or to achieve OD free status is complex and dependent upon the cultural context[50]. Social mobilisation in general and CLTS in particular, have drastically and positively impacted sanitation, though recent publications on CLTS document a number of examples of practices which fail to meet basic ethical criteria and infringe upon human rights[51]. Further, it has been suggested that while coverage and use of basic latrines increases after CLTS, the hope that people will gradually improve latrines over time (termed the "sanitation ladder") is not materialising[52].

1.6 Conclusion

Both the top-down and bottom-up approaches to sanitation promotion have yielded mixed results. Top-down approaches do not necessarily always meet with failure, nor are bottom-up approaches always successful. The participatory bottom-up approach is most suited to small-scale, local community programmes where institutions like NGOs and civil society organisations take a lead in their implementation. Whereas top-down approaches may be suited to programmes that demand for complex technology and centralised decision making by governments[53].

¹PRA tools and methods are simple visual and practical ways of involving people in discussing and analyzing their situation, such as drawing maps or ranking different options.

CHAPTER REFERENCES

1. Sekhar KC. Securing Our Future. Proceedings of the Conference on Children--Our Future (Kuala Lumpur, Malaysia, November 19-21, 1991). Child Development Centre, Faculty of Education, University of Malaya, Lembah Pantai, 59100 Kuala Lumpur, Malaysia; 1993.
2. Rajaratnam JK, Marcus JR, Flaxman AD, Wang H, Levin-Rector A, Dwyer L, Costa M, Lopez AD, Murray CJ. Neonatal, post neonatal, childhood, and under-5 mortality for 187 countries, 1970–2010: A systematic analysis of progress towards Millennium Development Goal 4. *The Lancet*. 2010 Jun 11;375(9730):1988-2008.
3. Bryce J, Boschi-Pinto C, Shibuya K, Black RE, WHO Child Health Epidemiology Reference Group. WHO estimates of the causes of death in children. *The Lancet*. 2005 Apr 1;365(9465):1147-52.
4. UNICEF. Diarrhoea remains a leading killer of young children, despite the availability of a simple treatment solution. 2016.
5. Mara DD. Water, sanitation and hygiene for the health of developing nations. *Public Health*, 2003. 117(6): p. 452-456.
6. Murray CJ, Lopez AD, World Health Organization. The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020: summary. 1996.
7. WHO. Diarrhoeal disease Fact sheet 2015. WHO Media Centre. Available at: <http://www.who.int/mediacentre/factsheets/fs330/en/>(accessed 15 July 2017).
8. Thompson T, Khan S. Situation analysis and epidemiology of infectious disease transmission: A South-East Asian regional perspective. *International journal of environmental health research*. 2003 Jan 1;13(sup1):S29-36.
9. WHO and UNICEF. 25 Years Progress on Sanitation and Drinking Water (2015 update and MDG Assessment). World Health Organization; 2015 Oct 2.
10. WHO and UNICEF. Progress on drinking water and sanitation: update. New York: UNICEF and World Health Organization, 2012: p. 1-57.
11. WHO and UNICEF. Progress on Sanitation and Drinking-water, 2010 Update. 2010: World Health Organization.
12. Guerrant RL, Kosek M, Moore S, Lorntz B, Brantley R, Lima AA. Magnitude and Impact of Diarrheal Diseases. *Archives of Medical Research*. 2002 Aug 31;33(4):351-5.
13. Brown KH. Diarrhea and Malnutrition. *The Journal of Nutrition*, 2003. 133(1): p. 328S-332S.
14. White GF, Bradley DJ, White AU. Drawers of water. Domestic water use in East Africa. *Bulletin of the World Health Organisation*, 1972.

15. UNICEF. Eliminate open defecation. Geneva. 2014.<http://unicef.in/Whatwedo/11/Eliminate-Open-Defecation>. Accessed 15th September, 2016
16. Wijk-Sijbesma CV. Gender in water resources management, water supply and sanitation: Roles and realities revisited. the Netherlands: IRC International Water and Sanitation Center; 1998.
17. UNHRC, Women and girls and their right to sanitation. 2011. <http://www.ohchr.org/EN/NewsEvents/Pages/Womenandgirlsrightrighttosanitation.aspx>. Accessed on 31st July, 2013.
18. WaterAid, Gender aspects of water and sanitation. www.wateraid.org/~media/Publications/gender-aspects-water-sanitation.pdf. Accessed on 6th May, 2016
19. Eliasson J. We can't wait - A report on Sanitation and Hygiene for women and girls. Unilever Domestos, WaterAid and Water Supply & Sanitation Collaborative Council.
20. 1 in 3 women lack access to toilets - A briefing note by Wateraid. 2012. http://www.wateraid.org/~media/Publications/WaterAid_1_in_3_World_Toilet_Day_Briefing.pdf. Accessed 15th September, 2016.
21. Hennegan J. Montgomery P. Do Menstrual Hygiene Management Interventions Improve Education and Psychosocial Outcomes for Women and Girls in Low and Middle Income Countries? A Systematic Review. PLoS One, 2016. 11(2): p. e0146985.
22. Fisher J. For Her It's the Big Issue – Putting Women at the Centre of Water Supply, Sanitation and Hygiene – Evidence Report. WSSCC. 2008.
23. Srinivasan R. Lack of Toilets and Violence Against Indian Women: Empirical Evidence and Policy Implications. 2015.
24. Jadhav A, Weitzman A, Smith-Greenaway E. Household sanitation facilities and women's risk of non-partner sexual violence in India. BMC public health, 2016. 16(1): p. 1139.
25. Caruso BA, Sevilimedu V, Fung IC, Patkar A, Baker KK. Gender disparities in water, sanitation, and global health. The Lancet, 2015. Aug 15; 386(9994): p. 650-651.
26. United Nations General Assembly. Resolution A/RES/64/292. 2010. http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/64/292. Accessed 20th June, 2017
27. Planning Commission, Government of India. Evaluation Study of Total Sanitation Campaign. 2013. http://planningcommission.nic.in/reports/peoreport/peo/rep_tscv1_2205.pdf. Accessed on 21st June, 2014
28. Sherbinin AD, Carr D, Cassels S, Jiang L. Population and environment. Annu. Rev. Environ. Resour. 2007 Nov 21;32:345-73.

29. Cairncross S, Hunt C, Boisson S, Bostoen K, Curtis V, Fung IC, Schmidt WP. Water, sanitation and hygiene for the prevention of diarrhoea. *International Journal of Epidemiology*, 2010. 39(suppl_1): p. i193-i205.
30. Mara D, Lane J, Scott B, Trouba D. Sanitation and health. *PLoS medicine*. 2010 Nov 16;7(11):e1000363.
31. Gleick PH. *Dirty-water: estimated deaths from water-related diseases 2000-2020.*: Pacific Institute for Studies in Development, Environment, and Security. Oakland. 2002.
32. Esrey SA, Potash JB, Roberts L, Shiff C. Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma. *Bulletin of the World Health organization*, 1991. 69(5): p. 609.
33. Hotez P. Hookworm and poverty. *Annals of the New York Academy of Sciences*. 2008 Jun 1;1136(1):38-44.
34. Wagner EG, Lanoix JN, World Health Organization. *Excreta disposal for rural areas and small communities*. 1958.
35. Graczyk TK, Knight R, Tamang L. Mechanical Transmission of Human Protozoan Parasites by Insects. *Clinical Microbiology Reviews*, 2005. 18(1): p. 128-132.
36. KorpePS, Petri. Environmental Enteropathy: Critical implications of a poorly understood condition. *Trends in Molecular Medicine*, 2012. 18(6): p. 328-336.
37. Humphrey JH. Child undernutrition, tropical enteropathy, toilets, and handwashing. *Lancet*, 2009. 374(9694): p. 1032-5.
38. Ramakrishna BS, Venkataraman S, Mukhopadhyaya A. Tropical malabsorption. *Postgrad Med J*, 2006. 82(974): p. 779-87.
39. Curtis V, Cairncross S, Yonli R. Domestic hygiene and diarrhoea - pinpointing the problem. *Trop Med Int Health*, 2000. 5(1): p. 22-32.
40. Cairncross S. More water: better health. *People Planet*, 1997. 6(3): p. 10-1.
41. Rifkin SB. Paradigms lost: toward a new understanding of community participation in health programmes. *Acta Trop.*, 1996. 61(2): p. 79-92.
42. The PHAST Initiative : Participatory Hygiene and Sanitation Transformation - A new approach to working with communities. 1997, WHO,UNDP, World Bank
43. Waterkeyn J, Cairncross S. Creating demand for sanitation and hygiene through Community Health Clubs: A cost-effective intervention in two districts in Zimbabwe. *Social Science & Medicine*, 2005. 61(9): p. 1958-1970.
44. Whaley L. and Webster J. The effectiveness and sustainability of two demand-driven sanitation and hygiene approaches in Zimbabwe. *Journal of Water Sanitation and Hygiene for Development*, 2011. 1(1): p. 20-36.

45. Waterkeyn JA. Hygiene Behaviour Change Through the Community Health Club Approach: A Cost Effective Strategy to Achieve the Millennium Development Goals for Improved Sanitation in Africa. 2010: LAP LAMBERT Academic Pub.
46. Sinharoy SS, Schmidt WP, Wendt R, Mfura L, Crossett E, Grépin KA, Jack W, Rwabufigiri BN, Habyarimana J, Clasen T. Effect of community health clubs on child diarrhoea in western Rwanda: cluster-randomised controlled trial. *The Lancet Global Health*. 5(7): p. e699-e709.
47. Peal AJ, Evans BE, Van der Voorden C. Hygiene and sanitation software: an overview of approaches. 2010, Water Supply and Sanitation Collaborative Council.
48. Bevan J, Thomas A. Community Approaches to Total Sanitation—Triggering and sustaining sanitation behaviour change in West Africa. In *West Africa Regional Sanitation and Hygiene Symposium, Accra, Ghana*. 2009. Nov (pp. 3-5).
49. Kar K. Practical Guide to Triggering Community-Led Total Sanitation. 2005, Institute of Development Studies, University of Sussex, UK.
50. Perez E, Cardosi J, Coombes Y, Devine J, Grossman A, Kullmann C, Kumar CA, Mukherjee N, Prakash M, Robiarto A, Setiwan D. What Does It Take to Scale Up Rural Sanitation? 2012, Water and Sanitation Paper : Working paper, Washington DC. - The Worldbank.
51. Bartram J, Charles K, Evans B, O'hanlon L, Pedley S. Commentary on community-led total sanitation and human rights: should the right to community-wide health be won at the cost of individual rights?. *Journal of Water and Health*. 2012 Dec 1;10(4):499-503.
52. Crocker J, Saywell D, Bartram J. Sustainability of community-led total sanitation outcomes: Evidence from Ethiopia and Ghana. *Int J Hyg Environ Health*, 2017. 220(3): p. 551-557.
53. Panda B. Top Down or Bottom Up? A Study of Grassroots NGOs' Approach. *Journal of Health Management*, 2007. 9(2): p. 257-273.

2. LITERATURE REVIEW

This chapter is divided into three sections. The first section reviews the history of rural sanitation initiatives in India, particularly the different sanitation related initiatives of the Indian states in the form of programmes or campaigns since 1947. The following section reviews literature assessing non-governmental sanitation interventions in India. The final section describes how the findings from other research were used to identify the research aims of this study and develop the specific research questions.

2.1 Sanitation post-independence in India

Of all the water-borne diseases, diarrhoeal diseases are among the most highly prevalent in India, accounting for the highest proportion of child (under 5) deaths after pneumonia[1]. Diarrhoea deprives the child of nutrition and is a major cause of malnutrition and stunting of children[2, 3]. The prevalence of malnourished and underweight children is high in India[4]. India alone accounts for the highest number of people practicing OD both in South Asia (90 percent) and globally (60 percent)[5]. Though 160 million people living in the country have access to improved sanitation, only one in two people (i.e. 46 percent) have access to toilets, and the remaining approximately half of the population practice OD[5]. This practice of OD is not confined to any specific state, region, or location and is practiced in rural and urban areas, and among rich and poor households[6]. However, the coverage of toilets is highly inequitable between rich and poor. The wealthiest 40 percent are ten times more likely than the poorest 40 percent to access improved sanitation[7]. A similar disparity exists between urban populations where 50 to 75 percent have access to a toilet compared to less than 50 percent for rural populations[8, 9]. In the past two decades in particular, progress in terms of access to sanitation has been slower, with increasing numbers of people practicing OD being reported[5]. This may be a result of sanitation coverage not matching with population growth and density. Poor sanitation contributes to social inequity and impacts India's growth in terms of mortality, morbidity, health expenditures, and other socio-economic aspects[10, 11]. Therefore, sanitation promotion and ending OD in rural areas is a major priority for India.

Realising the adverse impacts of poor sanitation, numerous national and international efforts were made to enhance the coverage of sanitation in the country. The government took several initiatives following the country's independence, but concerted efforts to increase sanitation coverage and the scaling up of campaigns and programmes gained momentum only in the 1980's. Assuming "coverage" would reduce OD, emphasis was laid on toilet construction [12]. These efforts in the three decades since the 1980's, helped India achieve moderate progress in increasing the latrine coverage from 1 percent in 1981 to 9 percent in 1991[13]to 22 percent in 2001[14]. Though latrine coverage increased, the reduction in the percentage of people practicing OD did not happen - latrines often remained unused as people continued with their former practice of OD[15, 16]. Since the year 2000 (which is also the start of the MDGs period), major reforms in the water and sanitation sector, especially in rural areas, were made to address the sanitation crisis and overcome the shortcomings of the previous sanitation interventions. A change in approach was noted, with interventions adopting a more participatory or community-led approach [13, 16-18]. These increased toilet coverage to 39 percent in 2015 and OD possibly reduced - one study estimated 31 percent reduction in the practice of OD[5]. All states in the initial years of interventions though showed a decline in the fraction of households defecating in the open, but many states did not keep pace with population growth, which resulted in an increase in the number of people practicing OD. Thus, during the period 1990 to 2015 the absolute number of rural households defecating in the open was estimated to have increased by 3.3 million[5, 19].

2.2 Sanitation planning in India

A series of initiatives were undertaken in India for over half a century to address the country's sanitation needs. A summary of the initiatives follows:

- 1932: Mahatma Gandhi established the *Harijan Sevak Sangh* (forum for *harijans* – people belonging to lower castes) for the liberation of manual scavengers. This movement for liberation of manual scavengers significantly contributed to the launch of the rural sanitation movement[20].

- 1940: All India Institute of Hygiene and Public Health, an independent organization, initiated borehole latrines in rural areas which were improved and the installation of which intensified after independence [21].
- 1948-1949: The Government of India (GoI) formed the Environmental Hygiene Committee to undertake the assessment and planning of environmental sanitation. The committee recommended a 40-year plan to cover 90 percent of the population, for which a national programme was to be initiated. However, the plan was never operationalised[22].
- 1950: Water supply and sanitation were added to the national agenda in the first 5-year (1951-1956) planning period. The rural sanitation programme was introduced as part of the health sector. However, there was confusion and inconsistency in dealing with the sanitation component until the 1980s[23].
- 1954: The first National Water Supply Programme was launched as part of the government's health plan and sanitation was mentioned as a part of water supply[12, 23, 24].
- 1981: The International Drinking Water Supply and Sanitation Decade was launched with a target of 25 percent latrine coverage in the rural areas over the following ten years. Under this programme, latrines were built for rural households and by 1990 access to sanitation facilities increased to 2.45 percent compared to 0.5 percent at the beginning of the decade[22].
- 1985-1990: During the seventh 5-year plan, a decision was taken to start a new programme for constructing 250,000 latrines for village-level institutions such as health centres, schools, and Anganwadi(s)² and one million latrines in households belonging to the Scheduled Caste (SC) / Scheduled Tribe (ST) category[22].

²Anganwadi - Pre-school or crèche, is a part of the public health care set up in villages to provide basic health care and run preschool activities, an initiative promoted under the Integrated Child Development Scheme (ICDS) of the Government of India.

- 1986: Rural sanitation was shifted from the Central Public Health and Environmental Engineering Organisation of Health Ministry to the Rural Development (RD) Department of the Ministry of Rural Development (MoRD), which became the nodal ministry for planning, implementing, supervising, and coordinating the CRSP – the first large scale country-wide programme on sanitation[15, 23]. Rural households were provided economic incentives (subsidies for hardware) for setting up toilets under CRSP.
- 1986: Rural sanitation was also included as part of the 20-point programme of the government[22]. The Council for Advancement of People's Action and Rural Technology was formed to accelerate the implementation of rural sanitation programmes through local Non Governmental Organisations (NGO). Based on the recommendations of the World Bank/UNDP Technology Advisory Group, the double-pit, pour-flush latrine with superstructure became the single prescribed technology[21]. Households installing this latrine received a government subsidy between 80 and 100 percent of the construction costs.
- 1991: The criteria and norms under CRSP were modified. The prescribed unit cost of a household latrine was increased to 2,500 Indian rupees (38.5 USD). The new rules required families to contribute 5 to 20 percent of costs, depending on their socio-economic condition, and the local Panchayats³ to contribute 15 percent of costs[25].
- 1993: The Rajiv Gandhi National Drinking Water Mission published new policy guidelines for the CRSP. The new guidelines offered a broad sanitation technology choice of direct and indirect single-pit, double-pit, and sophisticated latrines according to local preferences and soil conditions. The subsidy for households above the poverty line (APL) was abolished, but households below

³Panchayat – Small administrative units consisting of groups of hamlets or villages with an elected president and elected representatives from each ward. It refers to the local government area having a population averaging 25,000.

the poverty line (BPL)⁴, continued to receive a flat subsidy rate of 80 percent[21].

- 1999: The CRSP was re-launched as the TSC, placing more emphasis on community mobilisation to make the sanitation promotion process ‘community led and community driven’ and change sanitation attitudes and behaviour[13]. The term ‘subsidies’ was replaced with a new word ‘incentives’ and was extended only to the BPL families.
- 2003: Nirmal Gram Puraskar (NGP- (clean village award)) was set up to further support the TSC. Under the NGP, Gram Panchayats (GP) that attained 100 percent sanitation coverage were financially rewarded.
- 2008: The Ministry of Urban Development (MoUD) launched the National Urban Sanitation Policy[26]. It laid out a vision for complete sanitation coverage and OD free cities. States were issued instructions to come up with their own detailed state-level urban sanitation strategies and city sanitation plans.
- 2012: The TSC was renamed the “Nirmal Bharat Abhiyan (NBA- (clean India campaign)), which envisaged the creation of Nirmal (clean) Gram Panchayats by facilitating the installation of sanitation units in BPL households, government institutions located in villages, and also at developing community managed environment sanitation systems for solid and liquid waste management[27].
- 2014: Start of Swachh Bharat Mission (SBM – (clean India mission)) with two sub-Missions, the Swachh Bharat Mission (Gramin) and the Swachh Bharat Mission (Urban). The campaigns mentioned here are described in paragraphs later[28].

These series reflect the thinking, planning, and programmes that were formulated by the Indian state, but they lacked proper execution resulting in slow progress in

⁴Above/Below Poverty Line: To measure poverty, it is usual to look at the level of personal expenditure or income required to satisfy a minimum consumption level. The Planning Commission of the Government of India uses a food adequacy norm of 2,400 to 2,100 kilo calories per capita per day to define state-specific poverty lines, separately for rural and urban areas. These poverty lines are then applied on India’s National Sample Survey Organisation’s household consumer expenditure distributions to estimate the proportion and number of poor at the state level.

improving access to sanitation. Literature providing more insights into the development of sanitation in the first decade of India's independence is lacking. Similarly, limited information is available from the following two decades on specific sanitation interventions. Only in the mid 1980's, i.e. in the year 1986, was a large scale programme named CRSP started to cater to the rural population's sanitation needs. It can be inferred that in the initial three decades following India's independence, sanitation was not a priority and did not gain attention and importance like other welfare and development programmes. This neglect of the sanitation sector over the decades, which posed a significant challenge, was highlighted when JMP reported on the poor performance by countries in achieving the MDG sanitation targets.

2.3 Government of India's countrywide sanitation programmes

The following section details the national programmes on sanitation that started in the mid 1980's by the Indian government.

Central Rural Sanitation Programme (CRSP; 1986–1999; 13 years): This was the first structured programme launched in 1986 for 'rural sanitation' by the MoRD. This period also happened to mark the International Decade for Water and Sanitation. It's primary objective was to improve the quality of life of rural households and provide privacy and dignity to women. The CRSP interpreted 'sanitation' as construction of household latrines[15]. As a result, it was supply driven and provided a subsidy (upto 80 percent) to BPL households for construction of sanitary latrines with an emphasis on a single construction model (double pit pour – flush latrines). CRSP's progress was slow and the latrine construction crept upward by 1 percent with limited achievements through the 1990s[13, 16]. Further, latrines built under CRSP had lower rates of adoption and use, and the programme was a failure. Lack of awareness, poor construction standards, and the lack of participation by beneficiaries were considered to have contributed to lower adoption of these latrines and the programme's failure[14, 15]. However, the key learnings from this failed programme were – 1) toilet construction does not automatically translate into usage, 2) people must be motivated to stop defecating in fields, and 3) adoption of safe sanitation by the entire community is necessary to protect them from the consequences of a lack of sanitation [15].

By then, it was realised that for the entire community to adopt the practice of using the latrine, it was important to generate demand for latrines first. Around this time there was a growing consensus internationally, around an emphasis on ‘community education, training and communication’ as approaches to secure need and demand, which were later incorporated in subsequent sanitation programmes of the Indian government.

The Total Sanitation Campaign(TSC; 1999 – 2011; 12 years) marked a change in the India’s sanitation policy [13]. TSC replaced CRSP and was extended to hundreds of millions of people across India, with the objective of achieving universal rural sanitation coverage by 2012. Considered as the largest rural sanitation programme in the world, TSC was perceived to be a major step in ending OD in rural areas. It had a changed strategy and approach, compared to the preceding CRSP. The approach aimed to phase out from full to reduced subsidy, emphasised the need for behaviour change investments and intensive engagement with communities through social mobilisations, people’s participation and encouraging the adoption and use of latrines through Information Education and Communication (IEC) activities. A special fund of 15 percent of the total budget, was set aside for IEC awareness activities, community mobilisation and for effecting a change in sanitation practices and people’s attitude towards sanitation. School sanitation (as entry points to the community) and involvement of Panchayati Raj Institutions⁵ (PRIs) and local NGOs, were newly introduced and improved components of the TSC[13]. The financial assistance for Individual Household Latrine (IHL) construction continued, but the term ‘subsidy’ in CRSP was replaced by ‘incentives’ under the TSC. This incentive was extended to only the BPL households, and households that were relatively better off (termed as APL) were not eligible for the financial incentive. It was expected that APL households after witnessing and experiencing the latrine promotion activities would be sufficiently

⁵Panchayati Raj Institutions (PRI): The term ‘Panchayat’ literally means ‘council of five (wise and respected leaders)’ and ‘Raj’ means governance. Traditionally, these councils settled disputes between individuals and villages. Modern Indian government has adopted this traditional term as a name for its initiative to decentralise certain administrative functions to elected local bodies at village, block and district levels. It is called Gram Panchayat at the village level, Panchayat Samiti at the block level and Zila Parishad at the district level.

sensitised and motivated to undertake latrine construction with personal funds. In the 12 years of the TSC, the incentive (funding for one IHL construction) offered was changed a few times, from 625 rupees (9.6 US dollars) at the start, to 2500 rupees (38.5 US dollars) [15] rupees, later raised to 3200 rupees (49.2 US dollars) and then to 3700 rupees (57 US dollars).

To enhance the TSC, the GoI in 2003 launched the *NGP* awards, offering cash reward for achievements and efforts made in ensuring full sanitation coverage and open defecation free (ODF) GPs. The award gained immense popularity, which created the opportunity for a rapid scale up of the TSC[29]. Significant increase in latrine coverage in rural areas from 22 percent in 2001 to more than 65 percent in 2010 was reported in TSC's online monitoring system [15]. But independent evaluations later and the Indian census of 2011, revealed the online coverage figures to be inconsistent and overstated[14, 30]. It became evident, when the Union Ministry of Drinking Water and Sanitation (MoDWS) that reported IHL coverage as 68 percent in 2010, later revised the figure to 40.35 percent in 2012. These inconsistencies in reported figures indicated IHLs to be missing, meaning IHLs were shown as having been built as per official records but were not actually constructed. Issues also persisted with the sustainability in ODF awarded GPs[28]. Like CRSP, TSC was later officially confirmed to be a failure[31]. Studies conducted on this campaign are described in the next section.

Nirmal Bharat Abhiyan (NBA, 2012 – 2014, 1.5 years): Encouraged by the success of NGP, in April 2012 TSC was rechristened as NBA. The overall objective was to improve the quality of life, accelerate the pace of sanitation coverage in rural areas through renewed strategies and attain the vision of Nirmal Bharat (clean India) by 2022[27]. This campaign covered all rural families and the provision of financial incentive was extended not only to all BPL households but also to APL households. It was however restricted to households belonging to Scheduled Castes/Scheduled Tribes⁶ (SCs/STs), small and marginal farmers, landless labourers with homestead, physically handicapped and women headed households.

⁶ Scheduled Caste - lowest caste, considered 'untouchable' and Scheduled Tribe (socially disadvantaged indigenous people)

In this campaign, the financial incentive for IHL was enhanced to 10,000 Indian rupees (154 US dollars). Part of the funds were received from Public Health & Engineering Department (PHED) and additional financial support was obtained through convergence with a rural livelihood programme of the RD department; namely the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). The precise manner by which the funds could be mobilised from the two departments was not detailed, so it remained unclear among implementers. Implementing this campaign was a challenge, as sanitation falls under the PHED, while MGNREGS was under the purview of the RD department [32, 33]. With the change of leadership at the national level, the NBA was modified and restarted as the Swachh Bharat Abhiyan (SBA) in 2014. Thus, the NBA was operational only for 1.5 years and short lived. Evaluations of the performance of the NBA and its impacts were limited, probably due to the short duration of its operation.

Swachh Bharat Abhiyan[28] (SBA; 2014 – 2019) : The SBA is conceptually similar to NBA and aims to accelerate the efforts to achieve universal sanitation coverage, improve health, improve the levels of sanitation, hygiene and cleanliness in rural areas, make Panchayats ODF, and achieve *Swachh Bharat* (clean India) in four years. The Indian Prime Minister pledged during his address to the nation during the 2014 Independence Day celebrations, to make India ODF, and advanced the target year from 2022 (as set in NBA) to 2019 and urged immediate action. Previous campaign's focussed on rural sanitation, but this campaign has two verticals- *Swachh Bharat Mission* (SBM) for urban areas and cities and the *Swachh Bharat Mission–Gramin* for rural areas. The urban SBM programme is overseen by the MoUD, while the rural programme is overseen by the MoDWS. At the State level, the Urban Development Department / Urban local bodies (Municipal Corporations) manage urban sanitation; while the rural sanitation is handled by either the PHED or the Panchayati Raj/RD Department. SBA also focuses on behaviour change, based on the assumption that demand generation for toilets would lead to their construction and sustained use by all household members[34]. A key focus of the SBA is the flexibility provided in implementation, where States could adopt strategies considered most appropriate, depending on their

socio-economic-cultural milieu. Like the previous campaigns, this as well incentivizes 12000 Indian rupees (185 US dollars) for IHL construction.

2.4 Performance of India's sanitation campaigns and related research and evaluations

In the previous section, four sanitation campaigns executed across India were described. The first three -CRSP, TSC and NBA were aimed at catering to the sanitation needs of the rural population, whereas SBA is aimed at both rural and urban populations. The most commonly reported outcomes of these campaigns are the percentages of IHL coverage achieved. However, these figures, as previously mentioned, were unreliable, exaggerated and had discrepancies which were revised by the concerned government department. In this context, there emerges a need to understand the other impacts these sanitation campaigns had on people and their lives. Thus, a literature review of studies on these campaigns, and specifically addressing these aspects was carried out.

2.5 Database search

The search strategy was designed to identify all the documents (e.g. –published and non published articles of the trials and studies, and grey literature). Using the terms, “sanitation”, “trials”, “WASH”, “latrine use”, “sanitation campaigns”, “open defecation”, “latrine decisions”, “latrine promotion”, “rural sanitation” in combination with “India”, literature search was carried out in PubMed and Google Scholar, limiting the search to publications in the English language. The reference lists of articles and reports were also searched for additional literature. Published articles and reports prior to June 2014, were considered for the literature review. Data and reports available on the websites of institutions working on WASH like WaterAid and WSP of World Bank and the GoI's water and sanitation department, were searched and documents relevant to the search terms were included. As SBA was not launched at the start of this research and field work, the literature review did not include any studies on SBA.

2.6 Research on sanitation interventions and campaigns in India

This section describes the findings of the different research that evaluated the government campaigns namely the CRSP, TSC and NBA, and sanitation interventions by NGOs.

The Department of Drinking Water Supply of the MoRD in the year 2005 commissioned the Agricultural Finance Corporation of GoI to conduct a mid-term evaluation of TSC in 20 districts across 14 states[12], to assess TSC's efficiency and effectiveness. Districts that implemented TSC for 36 months or more, were included in this evaluation with 2407 sampled households. The evaluation was based on two data sources – the primary data collected on IHL construction and the secondary data on the discussions with concerned officials and stakeholders from the state level downwards till the village level. It found a 61.5 percent adoption rate of toilets, implying that a third of the rural population lacked sanitation facilities. BPL households had better coverage rates (64.1 percent) than the APL households (56.5 percent coverage), which was possibly due to the financial incentive made available to the BPL families for IHL construction. Financial constraint was the most frequently stated reason for non-adoption of a sanitation facility, as eligible households (80 percent of the cases at aggregate level) were unable to mobilize the necessary finance. Toilets had limited use often only in the rainy season, with people preferring OD during other seasons. Clogging of toilets, inadequate toilet size and water scarcity were the challenges cited by the toilet owners as reasons for not using a latrine. Shortage of space within the homestead and a lack of consensus among family members regarding construction, were other cited reasons that prevented households from building toilets. Programmatic implementation challenges included – a lack of clarity between Central and State governments about the pattern of sharing the costs of the incentive and the incentive amount for the super structure being inadequate for completing latrine construction, a concern voiced by both beneficiaries as well the staff of the implementing agency. Besides, the implementation of the TSC was not the sole task assigned to staff, rather being one among many.

In 2007, a knowledge, attitudes and practices survey of water handling and usage, sanitation and defecation in a village (with people of higher and lower caste) of Tamil Nadu [35] was conducted to understand the socio-cultural factors impacting water safety. Of the total households interviewed, it found 31 percent had toilets and in 17 percent households that had toilets, at least one family member continued defecating in the open and 74 percent respondents defecated in fields. The study inferred traditional defecation practices were a significant challenge to toilet usage and better sanitation.

Eight years after the start of TSC i.e. in 2008, WaterAid conducted a study to understand the principles of what worked and did not in the TSC[14]. It painted a varied but mostly grim picture of the status of implementation of the TSC. They found a top-down implementation approach prevailed, and was largely state-led and target driven instead of the community - led and people-centred approach as emphasised in the TSC guidelines. Coverage varied significantly across states and districts, technology innovation was not given the desired push and a 'one size fits all' approach was adopted, irrespective of geographical and climatic conditions, bypassing customer preference[14, 29].The NGP awards though having accelerated the pace of latrine coverage in general, was successful only in a minority of Indian states that had dedicated leadership, good quality facilitation to engage communities, and where households were provided with sanitation choices appropriate to their environment and customs[19, 29]. There were issues of sustainability in some awardee GPs[28], as scrutiny found undeserving GPs that had not achieved complete sanitation coverage but merely claimed to having done so were awarded the NGP. The study indicated that the TSC was poorly implemented, as the 'intention' at the policy level failed to translate into 'action' at the field level. The local government representatives or PRI functionaries, who were supposed to play a primary role in TSC implementation, were unaware of the TSC and their roles until the institution of NGP awards[36].

In the same year 2008, another study carried out in Yavatmal district of Maharashtra [37] to assess the strengths, weaknesses, opportunities and threats of the TSC, found positives like innovations in IEC, motivation through incentives, a competitive spirit, active participation and partnerships, and the involvement of women. The weaknesses

identified were the absence of rural sanitary marts or production centres, poor maintenance of women's sanitary complexes, a lack of facilities for monitoring and follow-up, and the temporary focus of a campaign based approach.

In 2008, an impact assessment of the NGP awarded Panchayats[29] was done to understand, if the principles and quality of NGP were maintained during the scale up of the TSC. The assessment also examined, if the principles were followed in the existing awarded PRIs including the ODF environment, if the process had been socially inclusive, and how these NGP awards influenced other sanitation related activities. Carried out in 162 NGP awarded GPs across six states covering 7100 households, the assessment found a marginal increase in usage of household toilets and a marginal decrease in OD practices. The impact assessment reported that 81 percent households (out of 85 percent) having access to either an individual, community or shared toilets were estimated to be in use but not regularly, that children's faeces were disposed along with solid waste or were dumped in open spaces. The assessment found that only 64 percent of people (a figure that is self-reported) used the toilet, of which 6 percent of households reported only seasonal use, while in only 4 percent of NGP awarded villages, was there no OD. This suggested that people in the rest of the NGPs continued defecating in the open, which contradicts the NGP reward principles. Major impediments for low toilet usage were - poor or unfinished installations (example - no door), lack of water (reported in 12 percent households), the lack of a super structure, blockage or clogging of pan and pipes, and reluctance to change the old behaviour. For irregular or seasonal use, the concerning factor was the distance of the toilet from the house. The unused or unfinished toilets were used as storage space or cattlesheds (4 percent households) and in 2 percent households the facility was used as bathing or washing space or urinals. Other lacunae in the implementation of the TSC and the NGP, reported by the assessment were the non-existence of a fool proof mechanism to monitor the NGP status (before and after the awards) or any rigorous efforts by PRIs to maintain or sustain the ODF status (except during the process of inspection and selection of villages for the NGP awards).

A study with a cluster randomized design[38] was conducted in rural Bhadrak district of Odisha state in 2009, to determine the effectiveness of a sanitation campaign. The sanitation intervention was an intensified IEC campaign on latrine adoption that drew on the CLTS model of Bangladesh and combined “shaming” (i.e. emotional motivators) with subsidies for poor households. Of the 1086 households surveyed, it found the latrine ownership increased by 26 percent in treatment villages but not in the control village. It also found that the IEC campaign succeeded in motivating people to switch from OD to latrine use, thus a substantial and significant effect on latrine adoption and use was found. This study contributed to the debate between ‘shaming’ and ‘subsidy’, and found that ‘shame and subsidies’ caused a third of the treatment effect, while “shame only” caused about two-thirds. However, it did not comment on why the remaining 74 percent of households continued defecating in the open. The study suggested ‘social mobilisation’ could improve overall sanitation.

A study by the Asian Development Bank in 2009 investigated the status of sanitation in India, the trends, socio-economic differentials, and correlation between household access to latrines with the family’s wealth during 1992 to 2006[4]. It found the need for sanitation to be huge, and concluded that a number of social, cultural, geographic, and economic differentials hindered access to universal sanitation. Significant caste-based differences persisted in sanitation coverage, with ST households having the lowest ownership of toilets, increasing from only 12.4 percent in 1992–1993 to 17.8 percent in 2005–2006. Wealth-based differentials were found. The wealthiest quintile had very high coverage of toilets - up to 97 percent, while the poorest quintile had a very low coverage in 1992–1993 (1 percent) and improved only marginally to 4.5 percent by 2005–2006. Achievement of TSC toilets were higher in BPL households compared to APLs. State-level differentials in toilet coverage were found. Few states had more than 85 percent households having some sanitation facility and fewer than 35 percent of households were reported having a toilet in the states of Odisha, Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh. It was anticipated that particular social and cultural characteristics may have facilitated quicker adoption of toilets in states with higher coverage rates. Households headed by the more highly educated, had a higher probability of having access to toilets than households where the head of

household was illiterate. Muslim, Christian, and Sikh households had higher probability of access to toilets than Hindu households. Further analysis found socio-cultural differentials, meaning certain areas and population groups had greater resistance to adopting household sanitation facilities than others.

A decade after the TSC's inception i.e. in 2010, the World Bank's WSP conducted an assessment[15] to ascertain the status, the process, outcomes, and the successes the TSC had achieved. It also aimed at understanding the challenges faced, and tracked the efficiency of the states in terms of time taken to achieve total sanitation. This assessment had two data sources - primary surveys on the processes and their outcomes in the selected 22 sample districts across 21 states, and the TSC's online monitoring data as the secondary source. The assessment found TSC principles were not adopted in the right spirit in more than half of the sample districts. The understanding of the TSC principles and the programme framework was limited to the core team and a vision was not uniformly shared at sub-district implementation levels - right up to the village level. Inadequate staff were found at the block and sub block level, and staff were found to be lacking capacity for effective implementation especially the social mobilisation that had a more time consuming approach. In addition, weak inter-departmental coordination, where the principles did not percolate down to the village level and the absence of a strategy to translate the plans and ideas into practice were also noted. Other issues included challenges in accommodating the diversity in India in terms of geographical areas, populations, as well as resources and location specific problems like water scarcity and space issues. The assessment found that the same target driven approach and unrealistic goals persisted among the implementing agencies, which probably compelled the implementers to bypass TSC principles. The monitoring was confined to toilet construction indicators, and did not track either the IHL usage or if the GPs sustained the NGP status, indicating the weak monitoring mechanism of the TSC. The assessment found that the toilet model promoted in the TSC could not be adapted to fit within the cost norms for construction of toilets for BPL families.

A Randomised Controlled Trial (RCT) in the state of Madhya Pradesh (between 2009 - 2012) measured the effect of the TSC on availability of IHLs, defecation behaviours,

and child health in terms of diarrhoea, gastrointestinal illness, parasitic infections, anaemia and growth indicators across 80 villages. It found that 19 percent of villages reported an increased percentage of households with improved sanitation facilities, and an average of 10 percent decrease in OD among adults in the treatment arm that received the intervention. However, the intervention did not improve child's health measured in terms of multiple health outcomes (diarrhoea, helminth infections, anaemia and growth indicators). 41 percent of men and 38 percent of women in the treatment group that had improved sanitation continued practicing OD daily. It inferred that the treatment and intervention were insufficient to improve child health outcomes though there were modest increases in the number of IHLs[39].

A cross-sectional study conducted in Puri district in the state of Odisha in 2012, investigated latrine coverage and use among 20 villages, where the TSC had been implemented at least three years prior. It found the campaign achieved substantial gains in latrine coverage and the mean latrine coverage was 72 percent, but failed to secure use by household members as more than 39 percent of households with latrines were not being used by any member, over a third (37 percent) of the members of households with latrines reported never defecating in their latrines and less than half (47 percent) of the members of such households reported using their latrines at all times for defecation. Combined with the 28 percent of households that did not have latrines, it appeared most cases of defecation in the communities under study took place in the open. Reasons for the non-usage of latrines included their preference for OD, latrine use being deemed inconvenient, the latrine building being incomplete and used for storage. These were similar to the findings of the other studies mentioned above. Other reasons for non-use were that the latrines lacked privacy, were broken or blocked. This reflected poor design and construction of the latrines in the communities.

Another independent evaluation[16] of the TSC by the Planning Commission of the GoI was conducted in 2013 across 122 districts spread over 27 sample states. It aimed at assessing the TSC's impact on quality of life (socio economic, health and environmental) - particularly on the rural poor, assessing the durability of sanitation facilities, analysing factors responsible for successes and constraints in the TSC's

implementation at the policy and Central level, and the impact of the NGP on latrine coverage and their sustainability in villages that had attained ODF status. It found an estimated 72.63 percent households practiced OD irrespective of whether or not they had sanitation facilities and in 13.8 percent of NGP awarded GPs, family members continued to practice OD. The predominant reasons cited for OD practice were lack of awareness, established age old practices and the non-availability of adequate water for toilet use. A suitable awareness campaign was lacking and the IEC activities were unable to increase awareness about the public health impact of a lack of sanitation and subsequently failed to create demand for sanitation. This evaluation reported some positive outcomes of the TSC programme like - 69 percent households reporting having incurred reduced medical expenses and increased time for earning and lower incidence of illness or diseases reported in GPs that received NGP awards. The findings of this evaluation are consistent with the findings of WSP's evaluation[15] that were - that staff of the implementing agency were not adequately trained, and that engineers in charge of the campaign lacked knowledge and clarity of the provisions of the scheme, apart from structural deficiencies in the toilets constructed by the government instructions, and motivators at village level being incentivised for motivating to construct latrines and not usage. Additionally, resentment was noticed about the use of low cost latrines sponsored by the GoI. Households were dissatisfied because of the lack of incentives, especially the policy on funding and the incentive amount. Lack of funds for renovation and maintenance of existing toilets was another important reason for discontent among the households benefitting from government sponsored toilets.

A survey known as SQUAT (Sanitation Quality, Use, Access, and Trends) [6] was conducted in the rural areas of five north India states - Bihar, Haryana, Madhya Pradesh, Rajasthan, and Uttar Pradesh spread over 13 districts between 2012 - 2013, to find answers to a number of questions. These included why people in rural India defecated in the open in such large numbers. It found that 74 percent of people surveyed had preference for OD, over 40 percent of households with latrine access had at least one member defecating in the open, more than half of people in households which owned a government sponsored latrine defecated in the open in four larger

states out of five and one-third of such latrines were not usually used by anyone at all. It found that over 60 percent of households which received latrine materials from the government had at least one household member who defecated in the open, that people living in households with a latrine built with government incentives entirely were more than twice as likely to defecate in the open compared to households with a self-financed latrines. This appeared to imply that latrines provided by the government were unlikely to be used, privately built latrines were more likely to be used, and that more men practiced OD than women. This survey finds evidence of non-usage of latrines, especially the ones built with government assistance and reveals people's preference for OD. It further predicted that if the government kept building latrines without changing people's preferences, then the latrines were more likely to remain unused. Though people preferred OD, the study did not further outline the underlying causes for people's preferences.

Another study conducted in 2013 aimed at exploring the causes of the gap between the TSC policy and its practice. It drew evidence from two coordinated studies conducted in four Indian states – Uttar Pradesh, Madhya Pradesh, Haryana and Himachal Pradesh. It found the TSC's implementation was unaligned with the programme's guiding principles, which is consistent with the study carried out by WSP[15]. It concluded that the TSC was government-led, infrastructure-centred, subsidy-based and supply-led which is again consistent with earlier evaluations of the TSC[14-16], that reported poor outcomes. The government officials in-charge of TSC implementation were often over worked, underpaid, had minimal motivation for achieving true sanitation access and usage. Officers preferred working and investing efforts in programmes that had career incentives like programmes with larger budgets instead of the TSC, which was challenging to implement and time consuming. Further, the staff was under-trained in awareness-based participatory development methods and behaviour change, for which they failed to implement the community-led campaign and mobilise people to adopt improved sanitation practices. These factors led the staff to give low priority to the TSC[29]. It found that despite the replacement of 'subsidy' with 'incentive', which was to be given to the eligible household only after toilet construction and usage, in contrast, the same was disbursed upfront in most of

the states in the form of cash or materials without demand generation. The study found rare instances of household motivation and their involvement in latrine construction. Corruption in the government system and low political priority further contributed to the gap between policy and practice. Pressure on officers to increase coverage, progress and flawed monitoring were additional shortcomings of the TSC, which other studies also found[15].

Another RCT in 2014 within the context of the TSC in Puri district[40], was conducted in 100 villages to assess the effectiveness of rural sanitation interventions in preventing diarrhoea, soil-transmitted helminth infection, and child malnutrition. The results were consistent with the findings of the RCT in Madhya Pradesh [39]. It found the intervention increased mean village-level latrine coverage from 9 percent of households to 63 percent, but no evidence that this intervention reduced exposure to faecal contamination or prevented diarrhoea, soil-transmitted helminth infection, or child malnutrition. This trial also found sub-optimal use of latrines, particularly by men and children but reasons for such low use of latrines by the communities were not explored. The study concluded improvements in household sanitation alone are insufficient to mitigate exposure to faecal–oral pathogens.

In the above review, most of the studies were internal evaluations by government or NGOs or agencies on their WASH programs. These publications were largely in-house, and from the study findings it can be inferred that measurement of toilet coverage was emphasised and not the toilet usage or reduction in OD rates after toilet installations. These studies inform that the interventions certainly resulted in increasing the latrine coverage but the inconsistencies in the reported figures of IHLs indicate a weak monitoring system of these sanitation programmes, and also raises doubt about the real coverage of latrines. Further, the studies found the toilets especially the ones build by NGOs (or contractors) remained unused, or occasionally used in emergencies and a large number of them were found used to store firewood, indicating that toilet construction cannot guarantee its use by the household[4, 14, 19]. Poor construction quality of the latrines was stated as one of the primary reasons for resentment among the beneficiaries, which probably led to the rejection and non-use of these latrines.

The main objective of IEC and awareness activities was to raise people's awareness for changing their former OD practices, which subsequently would have resulted in people demanding latrines. However, none of the literature reviewed, reported people demanding latrines, as an outcome of raised awareness and behaviour change promotions. This finding is in contrast to the thinking behind these campaigns, as the number of latrines increased without people demanding latrines, meaning latrines are supplied without any demand for them. This could be due to the execution of activities within the same time frame without following any sequence or process, absence of proper planning and sequencing of activities, lack of capacities and untrained staff implementing these campaigns, as reported in the above mentioned studies. Additionally, the latrine construction targets possibly compelled the implementers to focus on achieving the targets at the expense of the IEC, awareness activities and social mobilisation components.

Latrine promotion through behaviour change and targeting the community as a whole is largely prescribed in the recent campaigns- the TSC and the NBA. However, as latrine use is an individual choice, it could be argued that these activities would be better targeted at individuals or households rather than communities at large. The research studies also find that these interventions are 'subsidy' and 'construction' focussed, and behaviour change activities for sanitation promotion were rare. Though importance of interpersonal communication for behaviour change was felt and prescribed in the communication and advocacy strategy for the implementation of the NBA, the same was rarely executed[17]. This approach could have possibly changed the sanitation landscape of India.

2.7 Research gaps and problem identification

The literature cited above, recorded the increase in latrine coverage percentages, and additionally highlights possible reasons for non-adoption of latrines that includes not 'building' the structure and not 'using' despite having a latrine. These findings (reasons) have been segregated into three broad categories. These are - the physical, household and programmatic constraints (refer Fig.2) that lead to low latrine adoption and use.

The “physical constraints” of low adoption includes all those factors that are external in nature and possible changes or interventions are beyond the scope of these sanitation campaigns like - water scarcity or unavailability in a region. It is an environmental issue, that needs higher level intervention and which may be beyond an individual’s or a group’s interventions. Similarly, factors such as unavailability of space near the homestead, is a result of unplanned settlement patterns of villages or unequal distribution of land, which has existed for generations. Disparities and discrimination caused by unequal distribution of wealth and caste based differences have existed in Indian society for centuries, and effecting some kind of change probably needs deeper thinking and advocacy at policy level, a longer time frame and a well-planned strategy. The second category “household constraints” includes all the reasons that are personal and internal in nature, that exist in the households with the individuals comprising them and which influences the household level choices for constructing a latrine. These include the family dynamics, power relations, hierarchy and the traditionally gendered roles of men and women. Financial incapacity, low awareness among people and lower levels of education among family members are included in this category. The third category is that of “programme related constraints”, which includes the deficiencies in the programming and implementation of the sanitation campaigns.

Few studies were confined to investigating or measuring the health outcomes these sanitation campaigns had. The two prominent studies that did so, were the RCTs in Odisha and Madhya Pradesh, that measured the TSC intervention’s impact on diarrhoea incidence among children[39, 40]. Extensive evidence has been found, about households that received latrines under the government’s sanitation campaigns but subsequently abandoned them[14-16, 39]and that did not or only occasionally used it for its intended purpose[16, 19].However, none of these studies except the SQUAT survey[6], went deeper to scientifically study the underlying factors that made people abandon these government sponsored latrines, their inclination towards practicing OD, conditions that facilitated and encouraged them for OD, the impacts of sanitation campaigns on the lives of rural people, and reasons for low use of subsidised toilets. Though the SQUAT survey provides some insights into the reason behind people

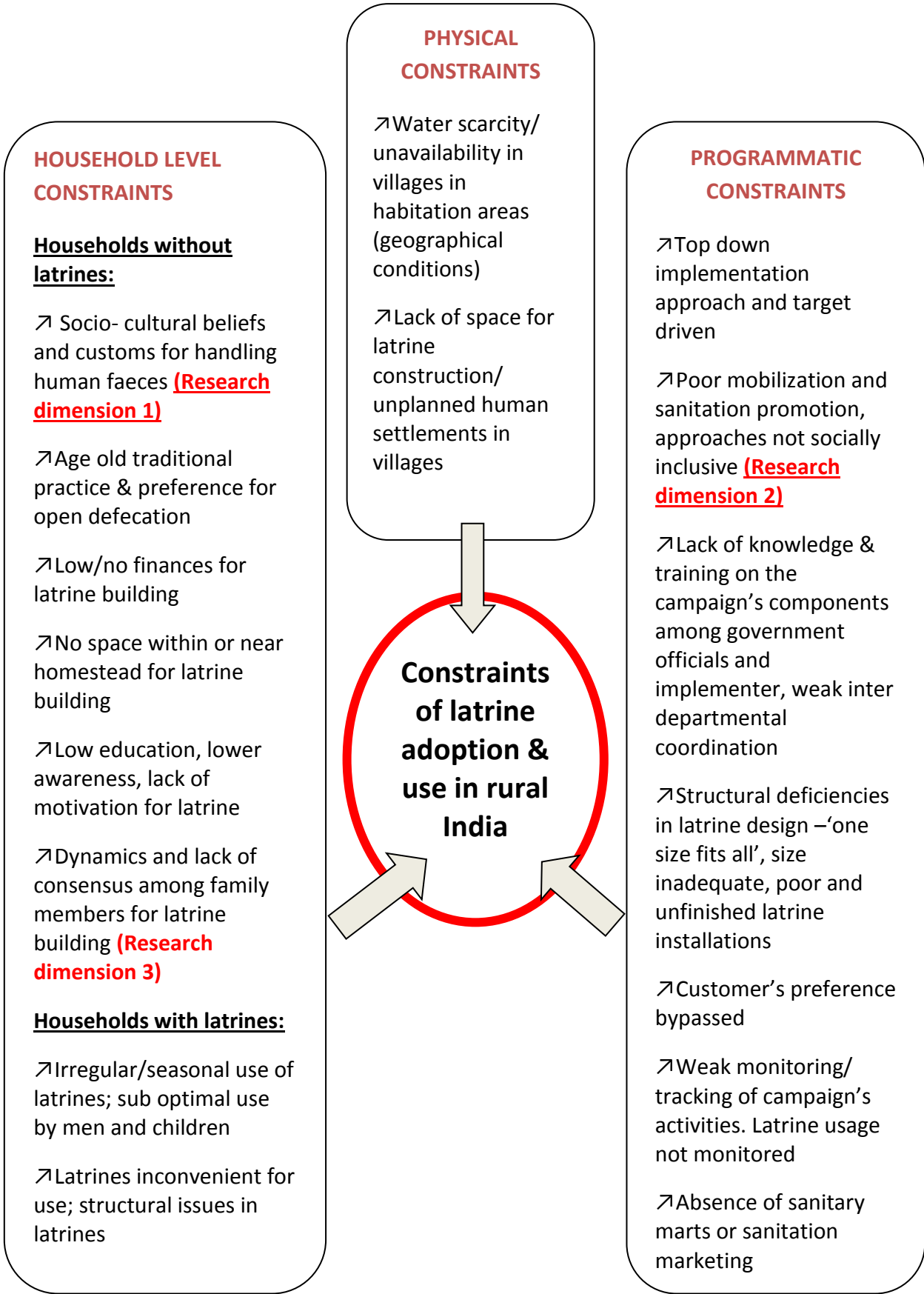
preferring defecating in the open, this study being confined to 5 northern states of India, did not provide a picture of what happened to the toilets in other Indian states.

Given the significant amount of diversity that exists across India, understanding the location and setting-specific challenges of low uptake and use of toilets, is a gap and needs to be studied extensively. Most of these studies report the deficiencies existing with implementers. These include factors such as them lacking in capacity, knowledge and experience. However very limited information on the challenges and problems that are part of the village setting or environment and that constrain sanitation promotion is available. Very rare evaluations tried finding the large sanitation campaign's performance in the villages and GPs, their roll out and management of activities, strength and weaknesses, whether these toilets were locally acceptable, the status of these latrines following construction, and their usage. Similarly, the household level interventions that could possibly influence latrine related decision making and which could subsequently lead to its adoption, have rarely been researched.

This categorisation of latrine adoption and use constraints in Figure 2, informs the possible gaps, and the need for further research. This also helped identifying the broad research themes, narrow these themes to more specific research topics, and the formulation of the research questions for further investigation. From the above listed constraints, three were chosen (Figure 2) for further investigation in this dissertation. These are:

- Socio- cultural beliefs and customs for handling human faeces, which is a constraint existing at the household level
- Approaches to community mobilisation for sanitation promotion is a programmatic constraint
- Dynamics and lack of consensus among family members for latrine building, which is again a household level constraint

Figure2. Constraints of latrine adoption and use in rural India



2.8 Research aim

The main research aim was to understand the reasons for non-use of the government's subsidised latrines, the lower adoption (uptake and use) and to identify the constraints causing latrine non adoption. This research was carried out in the context of the TSC and the NBA. The deeper understanding of the constraints would inform the policy makers, planners and designers of future sanitation campaigns, help revise the campaigns and interventions on sanitation being executed currently and also guide NGOs in ways to improve their approaches to field programme implementation. This research was embedded with the RCT in Odisha[40] and also the reason for selecting Puri district of Odisha as the research site.

2.9 Research questions

The specific questions this research seeks to answer are:

1. Why is there low demand for latrines and a high preference for open defecation among the rural population of Odisha?
2. What are the social and cultural constraints that have restrained rural households from acquiring latrines or adopting better safe sanitation facilities and using them, despite the government's sanitation campaigns and financial support for latrine construction?
3. What are the programmatic constraints that challenged the effective implementation of sanitation promotions and latrine demand generation activities in rural villages?
4. What are the constraints existing at the household level, that prevent them from acquiring a latrine? Specifically, does the inability of women to take household decisions, constrain sanitation uptake in rural areas?

2.10 Thesis components

This thesis is presented using a paper-style format and consists of 7 chapters. They are as follows:

Chapter 1: General Introduction

Chapter 2: Literature review, research gaps, research aims and questions

Chapter 3: Methods, data collection and analysis, description of study site

Chapter 4: Paper 1: Socio cultural and behavioural constraints. It includes a published paper titled: Socio-cultural and behavioural factors constraining latrine adoption in rural coastal Odisha: an exploratory qualitative study

Chapter 5: Paper 2: Programmatic constraints of latrine adoption. It includes a published paper titled: Processes and challenges of community mobilisation for latrine promotion under Nirmal Bharat Abhiyan in rural Odisha, India

Chapter 6: Paper 3: Household level constraints, it includes a published paper titled: Women's role in sanitation decision making in rural coastal Odisha, India

Chapter 7: General discussion, summary of results, conclusions and future research

CHAPTER REFERENCES

1. Central Bureau of Health Intelligence. Government of India. National Health Profile - 2005 onwards. . 2012. <http://www.cbhidghs.nic.in/>
2. Sekhar KC. Securing Our Future. Proceedings of the Conference on Children--Our Future (Kuala Lumpur, Malaysia, November 19-21, 1991). Child Development Centre, Faculty of Education, University of Malaya, Lembah Pantai, 59100 Kuala Lumpur, Malaysia; 1993.
3. Spears D, Ghosh A, Cumming O. Open defecation and childhood stunting in India: an ecological analysis of new data from 112 districts. PLoS One. 2013 Sep 16;8(9):e73784.
4. Bonu S. Sanitation in India: Progress, differences, correlates, and challenges. Asian Development Bank; 2009 Oct 1.
5. WHO and UNICEF. 25 Years Progress on Sanitation and Drinking Water (2015 update and MDG Assessment). World Health Organization; 2015 Oct 2.
6. Coffey D, Gupta A, Hathi P, Khurana N, Spears D, Srivastav N, Vyas S. Revealed preference for open defecation. Economic & Political Weekly. 2014 Sep 20;49(38):43.
7. Narayanan R, van Norden H, Gosling L, Patkar A. Equity and inclusion in sanitation and hygiene in South Asia: a regional synthesis. IDS Bulletin. 2012 Mar 1;43(2):101-11.
8. WHO and UNICEF. Progress on drinking water and sanitation: update. New York: UNICEF and World Health Organization, 2012: p. 1-57.
9. Government of India, Census Data. Toilet Coverage and Sanitation Performance in India By States (2001-2011). 2011. <http://www.communityledtotalsanitation.org/resource/toilet-coverage-and-sanitation-performance-india-states-2001-2011-0>
10. Manisha M. Multidimensional impact of Inadequate sanitation in India: Situation analysis International Research Journal of Social Sciences, 2015. Vol. 4(6), 21-30.
11. Cronin AA, Ohikata M, Kumar M. Social and economic cost-benefit analysis of sanitation in Odisha State, India. Journal of Water Sanitation and Hygiene for Development, 2014. 4(3): p. 521-531.
12. Government of India, Agriculture Finance Corporation Ltd. Mid term evaluation of Total Sanitation Campaign (TSC) Programme . 2005. <https://www.ircwash.org/resources/mid-term-evaluation-total-sanitation-campaign-tsc-programme>. Accessed 12th January, 2017
13. Government of India. Guidelines - Total Sanitation Campaign in India. 2010. <http://rural.nic.in/sites/TSC.asp>. Accessed 15th september, 2015.
14. WaterAid India. Feeling the Pulse - A study of the Total Sanitation Campaign in five states of India. 2008.

file:///C:/Users/tsu2/Downloads/study%20total%20sanitation%20campaign%20india%20(3).pdf

15. Water and Sanitation Program - World Bank. A Decade of the Total Sanitation Campaign: Rapid Assessment of Processes and Outcomes. 2010.
16. Planning Commission, Government of India. Evaluation Study of Total Sanitation Campaign. 2013.
http://planningcommission.nic.in/reports/peoreport/peo/rep_tscv1_2205.pdf.
Accessed on 21st June, 2014
17. Government of India, UNICEF. Sanitation and Hygiene Advocacy and Communication Strategy Framework 2012-2017. 2012.
<http://www.indiaenvironmentportal.org.in/files/file/DRAFTNationalWASHAdvocacyCommunicationStrategy.pdf>
18. Sanan D. The Community-Led Total Sanitation (CLTS) Story in India: The Sanitation Story of the Millennium PRACTICAL ACTION, 2013.
<http://www.developmentbookshelf.com/doi/pdf/10.3362/9781780440347.006>
19. Huesoa A, Bellb B. An untold story of policy failure: The Total Sanitation Campaign in India. Water Policy 2013. 15(6).
20. Pathak B. Road to freedom: A sociological study on the abolition of scavenging in India. 1999: Motilal Banarsidass Publisher.
21. Report of the National Expert Committee on Technological Options for Implementation of Rural Sanitation Programme in India Rajiv Gandhi National Drinking Water Mission, Ministry of Rural Areas & Employment, Government of India. p. 104.
22. Chaudhury R. Rural Sanitation in India.
<http://www.sociologydiscussion.com/india/rural-sanitation/rural-sanitation-in-india/2750>
23. Planning Commission, Government of India. India Assessment Report (2002) Water Supply and Sanitation, a WHO-UNICEF sponsored study. 2002.
<http://planningcommission.gov.in/reports/genrep/wtrsani.pdf>. Accessed on 21st July, 2017
24. Majra J, GurA. India needs a great sanitary awakening. Indian J Occup Environ Med, 2008. 12(3): p. 143.
25. Central Rural Sanitation Programme - Guidelines. 2007, Ministry of Rural Development: Department of Drinking Water Supply.
26. Government of India. National Urban Sanitation Policy, M.o.U. Development, Editor. 2008.
27. Government of India. Nirmal Bharat Abhiyan - Guidelines 2012.
<http://tsc.gov.in/tsc/NBA/NBAHome.aspx>

28. Government of India. Swachh Bharat Mission(Gramin). 2014.
http://sbm.gov.in/sbm_new/
29. TARU/UNICEF, Impact assessment of Nirmal Gram Puraskar (NGP) awarded panchayats. 2008.
http://www.indiawaterportal.org/sites/indiawaterportal.org/files/Impact%20Assessment%20of%20Nirmal%20Gram%20Puraskar%20awarded%20panchayats_TARU_2008.pdf
30. Enhanced Quality of Life through Sustained Sanitation - India Country Paper, in SACOSAN IV. 2011: Srilanka.
<http://www.mdws.gov.in/sites/default/files/IndiaCountryPaper2011.pdf>
31. Tandon A. Sanitation campaign has come a cropper: Jairam.
URL: <http://www.tribuneindia.com/2011/20111022/nation.htm>. 2011;6.
32. Government of India. Nirmal Bharat Abhiyan - Guidelines. 2012.
<http://tsc.gov.in/tsc/NBA/NBAHome.aspx>. Accessed 21st September, 2015
33. Chattopadhyay S. Nirmal Bharat Abhiyan: beyond the hype. Live Mint, the Wall Street Journal. 2012. <http://www.livemint.com/Opinion/zsgjnHrnKCSBJ7ccMd2y7M/Nirmal-Bharat-Abhiyan-beyond-the-hype.html>
34. SACOSAN Country Paper. SACOSAN VI. 2016: Srilanka.
http://www.sacosanvi.gov.bd/data/frontImages/India_Country_Paper.pdf
35. Banda K, Sarkar R, Gopal S, Govindarajan J, Harijan BB, Jeyakumar MB, Mitta P, Sadanala ME, Selwyn T, Suresh CR, Thomas VA. Water handling, sanitation and defecation practices in rural southern India: a knowledge, attitudes and practices study. Transactions of the royal society of tropical medicine and hygiene. 2007 Nov 1;101(11):1124-30.
36. Geetha J. People centric approach in sanitation - a successful initiative in Tiruchirappali. http://www.gramalaya.in/pdf/Rural_Sanitation.pdf
37. Pardeshi G, Shirke A, M Jagtap. SWOT Analysis of Total Sanitation Campaign in Yavatmal District of Maharashtra. Indian J Community Med, 2008. 33(4): p. 255-9.
38. Pattanayak SK, Yang JC, Dickinson KL, Poulos C, Patil SR, Mallick RK, Blitstein JL, Praharaj P. Shame or subsidy revisited: social mobilization for sanitation in Orissa, India. Bulletin of the World Health Organization. 2009 Aug;87(8):580-7.
39. Patil SR, Arnold BF, Salvatore AL, Briceno B, Ganguly S, Colford Jr JM, Gertler PJ. The effect of India's total sanitation campaign on defecation behaviors and child health in rural Madhya Pradesh: a cluster randomized controlled trial. PLoS medicine. 2014 Aug 26;11(8):e1001709..
40. Clasen T, Boisson S, Routray P, Torondel B, Bell M, Cumming O, Ensink J, Freeman M, Jenkins M, Odagiri M, Ray S. Effectiveness of a rural sanitation programme on diarrhoea, soil-transmitted helminth infection, and child malnutrition in Odisha, India: a cluster-randomised trial. The Lancet Global Health. 2014 Nov 30;2(11):e645-53.

3. RESEARCH METHODS, TOOLS AND STUDY SITE DESCRIPTION

This chapter is divided into two sections. The first section describes the methods used to answer the research questions spelled out in Chapter 2. The data collection and the analysis for each of the research dimensions are described in their respective sections in the following chapters. The second section describes the study site.

3.1 Background

This chapter describes the general justification of the methods and tools used in this research. The specific details of how the tools were used to investigate the research dimensions 1, 2 and 3 are described in their respective chapters – 4, 5 and 6. As the research aimed at exploring and investigating the underlying causes of people's resistance to adopt sanitation facilities and gain a deeper understanding of these causes, mix methods approach of investigation was applied. And the tools - observations (of built latrines and mobilization activities for latrine promotion, focus group discussions (FGD), in-depth interviews (IDI), and documents review were used for the qualitative aspects of the study, and cross sectional survey was done to measure the extent of the problem in dimension 3.

3.2 Research tools

Observations is a research tool, defined as "the systematic description of events, and behaviors in the social setting chosen for study"[1]. Observations was chosen for collecting data for the research dimensions 1 & 2, considering its advantages like the opportunity to gather live data while the event is occurring. And in this research, it was the community mobilization and sanitation promotions activities that were observed. These community mobilizations and promotional activities while it was being rolled out in the villages were observed live, by attending and documenting the different aspects of the promotions. The observations were recorded in the form of photographs and audio recording in a prescribed format following the checklist. This enabled me and the research team to get familiar with the village community, gain a better understanding of the context, helped develop a holistic understanding of what



Figure 3. Latrine built in Bamanal village under TSC

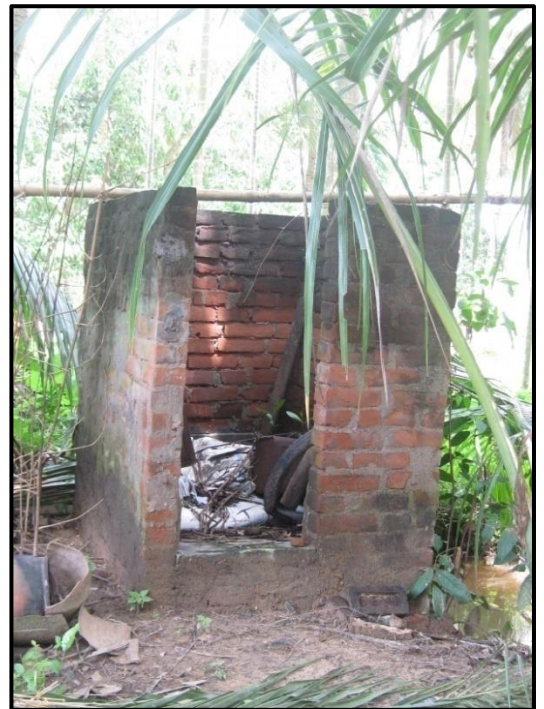


Figure 4. Incomplete latrine built under TSC in Paikasahi village



Figure 5. Firewood stored in a completed latrine in Madhyasahi village



Figure 6. An unused completed latrine in Sankhatira village



Figure 7. Abandoned latrine in Begunia village



Figure 8. Broken latrine pit in Kajisahi village



Figure 9. Badly built latrine in Bamanal village (Harijan sahi)

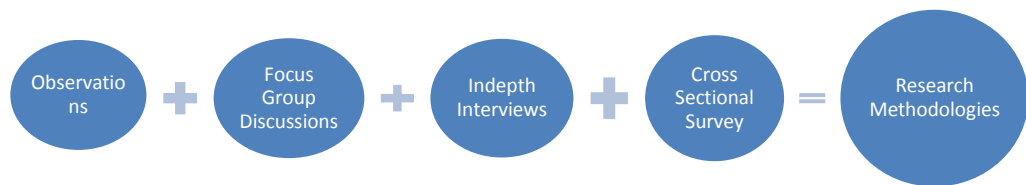
is happening in the latrine promotion activities by the NGOs engaged by government, the time spent on the different activities, learn about people and their behaviors in their natural setting, the community dynamics like who interacts with whom and who dominates whom, grasp how NGO communicate with villagers and different lead actors in the community, and how the community dynamics interfere in the latrine promotion and uptake activities. Similarly, spot checks of the toilets that were built with government's subsidy or incentives under the TSC and NBA campaigns were made and the completeness and the functionality of the toilets were observed and recorded in the form of photographs and descriptive field notes. These observations served as a context for development of discussion guides for FGDs and interviews.

Focus group discussion (FGD) is a qualitative research tool, used for an interactive discussion on a specific topic of interest among a group of people. It is a process where 8-10 pre-selected participants (or the group) with similar or democratically diverse backgrounds and experiences, are guided by a trained facilitator to live discuss the specific set of topic or issues and express their belief, opinions, perceptions, experiences and practices [2]. This discussion (which is also a medium of data collection) allows the simultaneous collection of a wide range of personal as well as group data on the topic being discussed within the same time. Additionally, it provides opportunity for triangulation of data like the inconsistencies and variations existing within the particular community in terms of beliefs, experiences and practices, while the discussion is continuing. There are disadvantages of FGDs, like few participants may be more vocal, dominate the discussion and lead the discussion in a different direction; member who are shy may hesitate and not express their honest and personal opinion. But, FGD as a tool is useful for exploratory, explanatory and evaluative research, especially exploring the meaning and depths of problems that cannot be statistically determined and explained. As this research aimed to investigate the underlying factors of low sanitation adoption and uptake in rural areas and understand the perspectives of different people involved at various stages of latrine installation and adoption, FGD as a tool was considered to be appropriate, considering the exploratory and explanatory nature of investigation.

FGD protocols and discussion guides were developed for each research dimension based on the insights gained from literature review and field observations, and accordingly participants were selected separately for each research dimension. Initial few FGDs were held to test the applicability of the questions, refining them, and dropping the unwanted ones. The most crucial and important element of a FGD is the facilitation, therefore the correctness of the questions as structured and the manner in which it is to be discussed was also checked in the field testing process, and the facilitator carried out mock FGDs to get acquainted with the questions and the flow of the discussion. For better understanding of the participants, the questions were simplified to the extent possible, keeping intact the meaning of the questions. Alternative (substitute) questions were also framed and included in the discussion guide, to help the facilitator to effectively facilitate the FGD. The discussion guide was flexible and had scope for modifications. If any particular information attained saturation, it was not explored further, and was dropped. If a new theme related to the topic emerged in the FGDs, then the new theme was added to the discussion guide and explored. The FGDs were conducted by a pair of facilitators, but most FGDs were facilitated by me with the assistance of a second facilitator. FGDs were held in their natural settings, at some common and peaceful place inside the village; club room or temple, where the participants felt more relaxed and comfortable to participate. Timings of the FGDs were decided based on the participant's convenience and availability. Identification of participants was done with the help of the field staff of the local NGOs and government representatives and key persons of the village. They were explained the topics of the FGDs and were requested to recommend names of the villagers, who could participate and contribute maximum to the discussion. Based on their recommendations, these villagers were approached to participate in the FGDs. The FGDs were both audio recorded and notes were taken, where the note taker would write down the discussions and responses of the participants, their body language, and the new emerging themes. Later, for analysis, the audios were transcribed verbatim and then translated to English. FGD was used as a data collection tool in all the research dimensions investigated in this research. The research questions for each dimension are explained in their respective chapters.

In-depth interview is a one-to-one method of qualitative data collection that involves an interviewer and an interviewee discussing specific topics in depth. It is also described as 'conversation with a purpose' to seek information on individual's perceptions, opinions and experiences[3]. IDI as a tool was purposely chosen to investigate and collect data for the research dimensions of this study, as latrine use is an individual's preference, which may be guided and determined by the individual's exposure, education, economic condition, behaviours, attitudes and the culture of the area and the household. IDIs allow the respondent to express in their own way, as the interviews were held in an isolated and a peaceful environment, to avoid interferences by other family members during the interview and the interviewee got opportunity to share freely without any pressure. They were found to be more comfortable to open up, discuss and reveal things in IDIs rather than in a group especially the young married females who had a lower position in the hierarchy ladder within the families and were bound by social restrictions, for which they expressed reluctance to participate in FGDs and preferred IDIs. So in such situations, where FGDs were unsuitable, IDIs were very helpful in data collection. IDIs gave insights into individual's defecation practices and behaviours associated, their personal preferences, and reasons behind the preferences. Interview guide was prepared comprising the core question and associated questions related to the research themes, which was improved through pilot testing of the interview guide. The interviews were tape recorded, and later transcribed and translated to English for analysis.

Cross sectional studies as a research method are useful to determine prevalence and identifying associations as an indicator of causal effects[4]. The third dimension of this research that aimed investigating the latrine adoption and use and its association with women inability to take decision on latrine installation, so cross sectional survey technique was thought to be appropriate for investigation. The benefit of cross-sectional study design is that it allows comparing many different variables at the same time, so this feature was used to study the different associations between female family member's education and income with latrine installations decision making. The tools and methods used for the investigation in this research are illustrated below.



3.3 Ethics approval and consent

The study was approved by the Ethics committee of the London School of Hygiene and Tropical Medicine (number – 5561) and the ethics committee of Xavier Institute of Management, Bhubaneswar. After a complete description of the study (using information sheets) participants were invited to participate in the study. Oral or written consents were obtained from all individuals that agreed to participate in the study. In all instances, respondents were able to withdraw their consent and participation at any time.

3.4 Description of study site

This field work in Odisha was facilitated under the large cluster RCT in Odisha that assessed the impact of household sanitation preventing diarrhea of children under 5 in Puri district within the context of TSC. The RCT was done in 100 rural villages, with 50 villages as intervention and 50 as controlled arm [5, 6].



Figure 10. Map of Odisha (source: Maps of India)

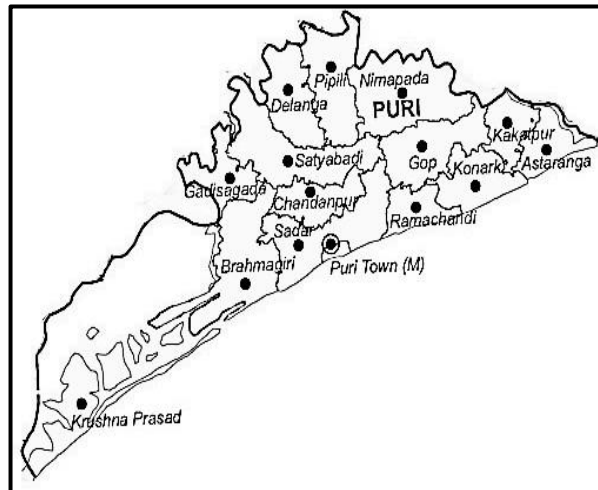


Figure 11. Map of Puri district with boundaries of blocks

Odisha is a coastal state in the eastern part of India. It comprises of 30 districts, 314 blocks, and 6234 GPs and 51583 villages. Bhubaneswar is the state capital of the state. The 2011 census reports the state's population to be 41.9 million and is the 11th most populated state of India. Majority lived in rural areas (83.3 percent) and agriculture is the major occupation[7]. The climate is tropical with a monsoon season from July to September.

It is one of the poorest states of India with some of the lowest social and human development indicators[8]. In 1991, the proportion of rural households having access to toilets was 3.58 percent and in 2001 the figure raised to 7.7 percent. The 2011 census reported the overall latrine facility within the household premises as 22 percent, with 14.1 percent in rural areas and 64.8 percent in urban areas[9]. The annual growth in the total toilet coverage in Odisha was less than 1.5 percent, and was ranked as the poorest performer in terms of sanitation coverage[10]. These toilet coverage figures indicate majority of people of Odisha defecated in the open.

The TSC programme was initiated in the state in the year 2000 and was spread across all 30 districts. Prior to it, latrines were build as part of CRSP. In the state, the RD department was responsible for the sanitation campaign's implementation, monitoring, and coordinating between central, state and district level authorities. At the district level, the implementation is coordinated by District Water and Sanitation

Mission. At the GP level, the elected PRI members are assigned the responsibility to facilitate and implement the sanitation campaign, as they are the local representative and are considered to have a wider reach, better knowledge and understanding of the socio-cultural and economic status of the general public. The NGOs are commissioned by government to act as facilitators and support the PRIs in the campaign's implementation. At the village level, the village water and sanitation committees are to be formed and they were expected to act as link/facilitator between Panchayat and the beneficiary in taking up TSC related activities and address the emerging issues.

Puri is a coastal district of the Odisha state. The district derives its name from the heritage city of Puri (one of the four pilgrimage centres of India) and is also considered as cultural capital of Odisha. The district comprises of 1709 villages, 230 GPs, and 15 blocks namely Nimapada, Puri, Satyabadi, Pipili, Brahmagiri, Gop, Delanga, Sadar, Kakatpur, Chandanpur, Gadisagada, Astaranga, Krushnaprasad, Konarak and Ramachandi. According to the 2011 census Puri district has a population of 1,697,983, of which 14.5 million are rural and 2.5 million are urban. 19.14 percent of it's population are SC and 0.36 percent to ST. It is the 21st district in terms of size and 9th in terms of population. It has a sex ratio of 963 females for every 1000 males, and a literacy rate of 85.37 percent[11]. Being in close proximity to the Bay of Bengal, the district has tropical climate. During the months of July to September, the district witnesses south west monsoons, and with excess rainfall during this period, low laying areas often get flooded. Additional information about the district and the sanitation coverage is presented in the background section of chapter 4.

CHAPTER REFERENCES

1. Kawulich BB. Participant observation as a data collection method. In Forum Qualitative Sozialforschung /Forum: Qualitative Social Research 2005 May 31 (Vol. 6, No. 2).
2. Silverman D. Doing qualitative research: A practical handbook. SAGE Publications Limited; 2013 Apr 22.
3. Hennink M, Hutter I, Bailey A. Qualitative research methods. Sage; 2010 Dec 8.
4. Mann CJ. Observational research methods. Research design II: cohort, cross sectional, and case-control studies. Emergency medicine journal. 2003 Jan 1;20(1):54-60.
5. Clasen T, Boisson S, Routray P, Torondel B, Bell M, Cumming O, Ensink J, Freeman M, Jenkins M, Odagiri M, Ray S. Effectiveness of a rural sanitation programme on diarrhoea, soil-transmitted helminth infection, and child malnutrition in Odisha, India: a cluster-randomised trial. The Lancet Global Health. 2014 Nov 30;2(11):e645-53.
6. Clasen T, Boisson S, Routray P, Cumming O, Jenkins M, Ensink JH, Bell M, Freeman MC, Peppin S, Schmidt WP. The effect of improved rural sanitation on diarrhoea and helminth infection: design of a cluster-randomized trial in Orissa, India. Emerging themes in epidemiology. 2012 Nov 13;9(1):7.
7. Government of India - Census 2011: Provisional population totals-India data sheet. Indian Census Bureau. 2011.<http://www.censusindia.gov.in/>
8. UNDP. Odisha - Economic and Human Development Indicators. 2011. http://www.in.undp.org/content/dam/india/docs/orissa_factsheet.pdf
9. Government of India, Census Data. Toilet Coverage and Sanitation Performance in India By States (2001-2011). 2011. <http://www.communityledtotalsanitation.org/resource/toilet-coverage-and-sanitation-performance-india-states-2001-2011-0>
10. Bonu S. Sanitation in India: Progress, differences, correlates, and challenges. Asian Development Bank; 2009 Oct 1.
11. Government of India : Puri District Census. 2014. http://www.censusindia.gov.in/2011census/dchb/2118_PART_B_DCHB_PURI.pdf

4. RESEARCH PAPER 1:

Socio-cultural and behavioural factors constraining latrine adoption in rural coastal Odisha: An exploratory qualitative study

London School of Hygiene & Tropical Medicine
Keppel Street, London WC1E 7HT
www.lshtm.ac.uk



Registry
T: +44(0)20 7299 4646
F: +44(0)20 7299 4656
E: registry@lshtm.ac.uk

RESEARCH PAPER COVER SHEET

PLEASE NOTE THAT A COVER SHEET MUST BE COMPLETED FOR EACH RESEARCH PAPER INCLUDED IN A THESIS.

SECTION A – Student Details

Student	Parimita Routray
Principal Supervisor	Wolf Peter Schmidt
Thesis Title	Latrine adoption and use in rural Odisha, India : Constraints and challenges

If the Research Paper has previously been published please complete Section B, if not please move to Section C

SECTION B – Paper already published

Where was the work published?	BMC Public Health		
When was the work published?	10 September, 2015		
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion	No.		
Have you retained the copyright for the work?*	Yes	Was the work subject to academic peer review?	Yes

**If yes, please attach evidence of retention. If no, or if the work is being included in its published format, please attach evidence of permission from the copyright holder (publisher or other author) to include this work.*

SECTION C – Prepared for publication, but not yet published

Where is the work intended to be published?	
Please list the paper's authors in the intended authorship order:	
Stage of publication	Choose an item.

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I developed the research idea with inputs from one of the co-authors. Tools selection was done in consultation with Supervisor and advisory committee members. Conducted the field work and drafted the manuscript with inputs from co-authors. Partially responded to the peer review comments.
--	--

Student Signature: Pavinita Rautray

Date: 03/09/2017

Supervisor Signature: [Handwritten Signature]

Date: 3-9-17

RESEARCH ARTICLE

Open Access



Socio-cultural and behavioural factors constraining latrine adoption in rural coastal Odisha: an exploratory qualitative study

Parimita Routray^{1*}, Wolf-Peter Schmidt¹, Sophie Boisson¹, Thomas Clasen^{1,2} and Marion W. Jenkins^{3,1*}

Abstract

Background: Open defecation is widely practiced in India. To improve sanitation and promote better health, the Government of India (GOI) has instituted large scale sanitation programmes supporting construction of public and institutional toilets and extending financial subsidies for poor families in rural areas for building individual household latrines. Nevertheless, many household latrines in rural India, built with government subsidies and the facilitation and support of non-government organizations (NGO), remain unused. Literature on social, cultural and behavioural aspects that constrain latrine adoption and use in rural India is limited. This paper examines defecation patterns of different groups of people in rural areas of Odisha state in India to identify causes and determinants of latrine non-use, with a special focus on government-subsidized latrine owners, and shortcomings in household sanitation infrastructure built with government subsidies.

Methods: An exploratory study using qualitative methods was conducted in rural communities in Odisha state. Methods used were focus group discussions (FGDs), and observations of latrines and interviews with their owners. FGDs were held with frontline NGO sanitation program staff, and with community members, separately by caste, gender, latrine type, and age group. Data were analysed using a thematic framework and approach.

Results: Government subsidized latrines were mostly found unfinished. Many counted as complete per government standards for disbursement of financial subsidies to contracted NGOs were not accepted by their owners and termed as 'incomplete'. These latrines lacked a roof, door, adequate walls and any provision for water supply in or near the cabin, whereas rural people had elaborate processes of cleansing with water post defecation, making presence of a nearby water source important. Habits, socialising, sanitation rituals and daily routines varying with caste, gender, marital status, age and lifestyle, also hindered the adoption of latrines. Interest in constructing latrines was observed among male heads for their female members especially a newlywed daughter-in-law, reflecting concerns for their privacy, security, and convenience. This paper elaborates on these different factors.

Conclusions: Findings show that providing infrastructure does not ensure use when there are significant and culturally engrained behavioural barriers to using latrines. Future sanitation programmes in rural India need to focus on understanding and addressing these behavioural barriers.

* Correspondence: parimita.routray@lshtm.ac.uk; mwjenkins@ucdavis.edu

¹Environmental Health Group, Faculty of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK

³Department of Civil and Environmental Engineering, University of California Davis, One Shields Ave, Davis, CA 95616, USA

Full list of author information is available at the end of the article



© 2015 Routray et al. **Open Access** This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.

Background

In 2011 sanitation coverage globally was 64 %. While open defecation is declining across the globe, 15 % (one billion) of the global population still defecate outdoors [1]. While some countries have reduced open defecation to only a few percent, India and 26 other countries remain with more than a quarter of their populations practicing open defecation. Among the one billion defecating in the open globally, 66 % of them live in India. Nearly all (92 %) of these Indians live in rural areas [1].

Despite concerted government efforts for the last three decades to promote sanitation, India has barely managed to achieve its Millennium Development Goal sanitation target to halve the proportion of the world's population without access to safe drinking water and basic sanitation by 2015.

Efforts to increase rural sanitation coverage in India largely started with the Central Rural Sanitation Programme (CRSP) in 1986. This subsidy-based supply-driven approach to promote sanitation did not yield sustained impact, and the CRSP was replaced in 1999 with the Total Sanitation Campaign (TSC) [2–4]. Along with subsidies to help households below poverty line (BPL) build latrines, the new programme was improved to make it participatory and community driven. Sensitising and mobilising through information, education and communication (IEC) was the major new feature. The results were not particularly satisfactory despite the new emphasis [2]. Over 11 years of the TSC execution, households with a toilet in rural areas increased from 21 % in 2001 to 40.4 % in 2012, however, data suggest that 20 % of rural toilets were not working [5]. In 2012, with further modification to the strategy, goals, and funding reallocation, the GOI renamed the TSC as Nirmal Bharat Abhiyan (NBA). Under the NBA, BPL households as well as families considered poor but without BPL cards are being targeted with higher government financial subsidies for installing a sanitation facility with the goal of 100 % sanitised villages in which no one open defecates [6].

Odisha, in eastern India, is among the lowest performing states in terms of latrine coverage [7]. In 2011, 85 % of rural households (HHs) defecated in the open and latrine coverage increased marginally by seven percentage points between 2001 and 2011, reaching 22 % [8]. Those that own a latrine often do not use it regularly [3]. Usage of latrines all over India is not encouraging. A national survey in 2010 found that even in villages designated open defecation free (ODF), up to 50 % of newly constructed latrines were not used [3]. In some high coverage villages in Odisha, 83 % of households had toilets, but only 48 % reported using them [9]. Similarly, an evaluation of the TSC in Odisha in one district (Puri) found that 37 % of members of households with latrines reported never using them and less than half of household members who reported using their latrine did so always [10].

It can be concluded that in India, adoption and use of latrines is low despite potential health, economic and social benefits of sanitation [11]. This study was undertaken to obtain a better understanding of the reasons for low latrine uptake and to identify and understand factors that motivate and constrain latrine use particularly with regard to government subsidized facilities in Odisha from the perspective of households themselves.

Methods

Study setting

The study was carried out across rural villages in the Indian state of Odisha between July 2011 and September 2012, mainly in Puri District. The study was approved by the Ethics Committee at the London School of Hygiene and Tropical Medicine and the Independent Ethics Committee at the Xavier Institute of Management, Bhubaneswar, India. The study adheres to the RATS qualitative research guidelines.

Odisha with a high tribal minority population (see below) has historically witnessed a higher incidence of poverty. It is among India's states with consistently low achievement on both the HDI (human development index) and GDI (gender development index), and scored lowest in 2006 on the female-to-male ratio of power over economic resources [12]. Female literacy is also low relative to other states [13]. While Odisha has made gains faster than the average state in recent years, the disease burden remains high with infant mortality at 51/1000 births in 2013, maternal mortality at 303/10,000 in 2006, and above average prevalence of underweight children [12–14]. Odisha's performance with respect to provision of safe drinking water has been satisfactory with 75 % of households having access to an improved drinking water source (*i.e.*, community taps and tubewells) in 2011 [13].

Puri is a coastal district close to Bhubaneswar, the state capital, and is famous for its Hindu religious and cultural heritage. The vast majority (84 %) of Puri's population is rural. Agriculture is the major occupation and rice is the main crop. Most residents have lived in their village since birth, with the exception of married women who typically must leave their village to wed. Thus exposure to urban living is limited, however among men short-term migration mainly within the district or state for economic reasons is not uncommon [15]. Some residents commute weekly to one of Puri District's four towns to serve in local government or for private employment and some own small enterprises. While improved water supply access is quite high (79 % in 2014) in Puri District with households using mainly public deep and private shallow tube-wells, or sometimes public taps supplied by government rural piped and treated water schemes for drinking water, a large segment of households continue to use open water bodies for personal and domestic hygiene [16] and

sanitation coverage is lagging (estimated at 15 % in 2008, currently reported at 56 % as of March 2014 [17]). All study villages had some government infrastructure such as schools, pre-school nurseries (Anganwadi Centres), electric supply, improved deep tube-well or government piped water supply taps, and concrete road access, except for the one tribal study village located in Ganjam District, which had piped water supplies, high sanitation access, and a nursery, but few other government services. Tribal populations in India tend to live in geographic and economic isolation and have a distinctive culture, similar to ethnic minorities. This tribal village had benefited from a very successful integrated approach to water and sanitation development promoted by a long-standing and respected NGO in sanitation and was included for contrast.

In close proximity of most non-tribal villages are small towns and villagers (mainly men) visit the markets in these towns for daily needs. Visiting the state capital is uncommon even by men, with a visit to a large city perhaps at most once or twice in a lifetime. Married and adult women rarely move out of their village. Only in emergencies like medical treatment, institutional delivery, or to attend a wedding, would women travel out of their village. The case is different for adolescent girls. Those who study often leave the village for limited periods to attend college in a nearby town or more rarely, a city.

Villages are typically comprised of different castes. The caste feeling is said to be declining but casteism persists and social disparities continue in terms of improved water supply and sanitation access within and between villages, similar to other rural areas in India [18]. Higher and middle castes may stay together in the same hamlet, whereas low (scheduled) caste people always live in a different hamlet located at some distance from higher caste hamlets of the village.

Indian society is patriarchal and multiple generations of extended family traditionally live together in the same house under a male head and his spouse, including any married sons and their wives and children, along with unmarried son(s)/daughter(s) [19–21]. In Indian, the spouse of the male head of the household is commonly referred to as the ‘mother-in-law’ (assuming she has sons) while a spouse of her married son(s) is referred to as the ‘daughter-in-law’. When a son marries, his bride leaves her father’s home and village to live with her husband’s parents and siblings, and is typically under the command and control of her new mother-in-law and in-laws until she herself becomes the mother-in-law of the home [19, 21].

Sample selection

Because we were interested in understanding barriers to use of existing latrines, Puri District villages with some latrine coverage were first identified and a subset selected as

a convenience sample based on the dominant type of latrine facilities in the village:

- Type A : Self-financed latrines
- Type B : GOI subsidized latrines with improvements financed privately by the household
- Type C: GOI subsidized latrines constructed without further improvement

A local NGO with experience in the Total Sanitation Campaign (TSC) delivery was approached for a list of villages including ones where the TSC had been implemented between 3-5 years ago and information on the dominant types of latrine facilities and castes in each village. Villages on the list were visited to verify information regarding the dominant latrine type(s) and to identify a focal person to help recruit participants and liaise for other field arrangements. Participants who owned one of the three types of latrine facilities (A, B, or C) were purposively selected and grouped by facility type.

Focus group discussions

The purpose of the FGDs was to identify reasons for latrine use and non-use and low uptake of latrines, explore preferences for open defecation, understand different domains of latrine use, understand attitudes and cultural practices in the context of sanitation, and understand the role of ownership, design style, proximity of water and location of latrine structures, as they related to latrine use and non-use.

A discussion guide for the FGDs was developed for soliciting insights along the themes of latrine adoption and non-adoption and reasons behind it, including information needs, decision making, motivations and barriers for participation in subsidized latrine construction programs, latrine usage and usability, latrine improvements (operation, maintenance, and repairs), and reasons for preferring open defecation. FGD questions were first developed through a preliminary brainstorming session with a group of unmarried young women from villages in Puri. Their personal experiences of the sanitation situation in their villages and their own sanitation practices provided insights into sanitation behaviours and attitudes in rural areas and across different seasons which in turn informed topics and questions for the guide. Once the guide was developed, it was pretested with professionals and local practitioners with knowledge of rural realities and experience in participatory approaches to check the appropriateness of questions, the manner of questioning participants, and the flow of the discussion themes. The questions were simplified and sorted into main topics and sub-questions for probing to help participants further understand the focus. The guide was translated into Oriya (the local language) for the

convenience of personnel taking notes during the FGDs which were facilitated by the first author (PR), a native Oriya speaker. PR also conducted the latrine observations and interviews (see below) with assistance from the last author (MJ) who observing most of the FGDs.

Twelve FGDs were carried out (see Table 1). Of these, one was held with front-line field personnel from four different NGOs implementing the TSC in the study area and another with women self-help group (SHG) members who had assisted the NGOs with implementation in their respective villages. The remaining 10 FGDs were conducted in five villages, separately with male and female participants. Village FGD participants overall varied in age, gender, latrine ownership, marital status and caste but were segregated into separate homogenous groups to facilitate open discussions.

Six to twelve participants were included in each FGD (see Table 1). Discussions were held separately with married adult men and women, and with unmarried young women and men in their own natural setting at a common and quiet place in the village. FGD times were decided based on participants' convenience and availability. Government representatives in each village, such as the Accredited Social Health Activist and nursery workers, were consulted for recruitment of participants as per the latrine type criteria and caste. Seating was 'U' shaped or round so that participants, including the facilitator, could all see each other. Prior to the discussion, an information sheet containing the aim and objectives and other details of the study was read aloud, questions were

answered or clarified as needed, and verbal consent to participate in the study was obtained from each participant as well consent to audio record the discussion. As all participants were above the age of 16, no parental consent was needed. At the end of each FGD, the facilitator (cum interpreter) and observer along with the note takers reviewed the discussion and descriptive notes of expressions or statements were prepared. Full audio recordings of each FGD were translated and transcribed verbatim into English for analysis.

Field observation

Prior to and right after each FGD, several household visits were made to observe the functionality status, design, location and water access of GOI subsidized latrines as well as self-financed latrines and to interact with the owners to explore satisfaction, usage, and the design and situation behind constructing their latrine. From these observations, field notes were prepared for both village and home visits. Observation of each latrine's condition and important conversation with latrine owners about reasons (or circumstance or situations) for installing latrines were noted as bullet points during each field visit. At the end of the day, detailed descriptive notes were prepared, and put together with the FGD transcript for inclusion in the analyses. The data from observations was used to get a comprehensive and complete picture of the issues, in particular those related to latrine design, construction, and performance, understand the social situations, and gain a

Table 1 Overview of focus group discussions, participant characteristics and latrine ownership and type

Number	Focus group type	Latrine type owned	Gender	Number of participants	Village	FGD date
1	NGO field staff (4 NGOs)	-na-	Men	8	-na-	1 Jul 2011
2	SHG members (6 SHGs)	GOI subsidised, improved & not improved	Women	12	#1-5	2 Jul 2011
3	Married, high (Brahmin) caste	Self-financed	Women	9	#6	5 Jul 2011
4	Married, high (Brahmin) caste	Self-financed	Men	7	#6	5 Jul 2011
5	Newly married young, low (Scheduled) caste	GOI subsidised, not improved	Women	6	#7	3 Jul 2011
6	Married, Low (Scheduled) caste	GOI subsidised, not improved	Men	7	#7	3 Jul 2011
7	Married, general caste	GOI subsidised, improved	Women	8	#8	6 Jul 2011
8	Married, general caste	GOI subsidised, improved	Men	8	#8	6 Jul 2011
9	Married, tribal	GOI subsidised, improved	Women	6	#9 ^a	9 Jul 2011
10	Married, tribal	GOI subsidised, improved	Men	7	#9 ^a	9 Jul 2011
11	Unmarried adolescent ^b , lower castes	none	Women	7	#10	29 Sep 2012
12	Unmarried adolescent ^b , mixed castes	none	Men	7	#10	29 Sep 2012
Total				95	10	

^aThe sanitation programme in this village was implemented by Gram Vikas, a well-respected and long-standing NGO acclaimed for their contributions to the water and sanitation sector. They specialise in a unique and very successful integrated water and sanitation approach to promoting village-wide individual household latrines coupled with simultaneous delivery of a new piped water system comprising a yard, bathroom, and latrine tap for each household

^bAges were 17 to 21

different perspective of behaviour within a larger social and physical setting.

Data analysis

For each FGD transcript, each idea (or statement) was highlighted and initially coded as a 'motivation', a 'constraint', or a 'facilitator' for latrine use or for open defecation and tagged, where relevant with the category of person (*i.e.*, age category, gender, marital status, caste, type of latrine, *etc.*) to whom it referred. Each highlighted text item and its assigned code was then transferred to a row in an Excel table to collect all highlighted FGD items. Working in Excel, items describing a similar idea within each main theme were then grouped and further coded manually and sorted to capture common sub-themes. For each emerging sub-theme, a summary explaining the behaviour, attitude, experience, context and ritual around observed defecation practices and patterns was prepared, providing the basis for the results presented in this paper.

Results

Open defecation practices in different seasons and times of the day

The majority of the study population defecated outside in the periphery of their villages in open fields or bushy areas to hide themselves and avoid being seen by others. Vacant areas around local surface water bodies were the most preferred defecation places, as water was readily available for anal cleansing and body bathing and clothes rinsing, key elements of local sanitation rituals especially for defecation in the morning. Women and men had separate open defecation sites which varied with the season, time of the day, and need of the individual. It was uncommon to find men and women using the same site for defecation, except in exceptional circumstances like floods, when there is a shortage of open space due to inundation, or health emergencies, when people are too ill to walk long distances or their bowel movement is beyond control, and they have to defecate urgently.

OD sites differed with the season. "The most difficult time for defecating outside (in fields) is the *chaturmasia* (Oriya for the rainy season or monsoons from July to September) as land is inundated due to excess water in low-lying areas." (FGDs #2, 5, 11) In all FGDs this point was raised time and again by different participants. In such situations, they relied on raised land beside the road for defecation. Some stated that they defecated on a dried cow dung cake, and then threw it into the flood waters. "But after the floods are over and as water recedes, they resume defecating in fields." (FGDs #2, 5, 6, 11, 12) During the rice growing season (September to early January), people reported not defecating in the fields and gave numerous explanations for avoiding them. First, grains are considered *laxmi* (goddess of wealth) and participants

strongly believed defecating in crop fields was a 'sin' when standing crops were still there. Fear of snakes or insects was another reason for avoiding defecating in rice fields. They also found it inconvenient to squat in the midst of the rice plants. Also, owners did not allow anyone to defecate in their fields because if a person who harvests knows that someone has defecated there he will feel disgusted with the faeces around him while harvesting. In contrast, after the harvest, in the period that follows (January to March), people reported feeling very comfortable defecating in harvested fields since the crop has been removed and the breeze makes it pleasant. In winter season (October to February), as the nights are longer, and people rise comparatively late, they preferred defecating somewhere closer to their habitation. With the cold morning atmosphere there was an unwillingness to walk long distances for defecating.

Not every household has a private well or tube-well on their property and many villagers rely on local surface water bodies (typically ponds, irrigation canals and rivers) for hygiene activities like bathing, washing clothes and utensils, and even anal cleansing post-defecation. Older mothers-in-law often combined all the hygiene activities to be conducted outside home with going for OD. They would leave clothes and utensils to be washed near the pond, and go to defecate in nearby fields. After defecating, they would cleanse themselves in the pond and then finish their activities in the same place.

Similarly, OD sites changed with the availability of water in local water bodies, *i.e.* during the dry season (early March to June). Rural Indians require water for anal cleansing and post-defecation body washing and clothes rinsing, so when larger, flowing water bodies like irrigation canals and rivers dry up in the study area, villagers rely on ponds located nearer to the village, while those who feel shy and want to avoid being seen, walk long distances where they are invisible to others and water is available. During the late dry season, after the release of water into irrigation canals in the region, preferred sites for OD become the canal embankments. Table 2 summarises the seasonal variations in OD sites.

Women preferred defecating in a safe and convenient place where they could hide themselves from the sight of males as they did not like to be seen by others during the act. For this reason they did not mind walking long distances to reach fields away from their habitations to ensure that no one could recognise them. While defecating they hid themselves behind a bush or the cover of a tree. If someone passed by, they had to stand up even in the middle of the act until the person left. For men who were farmers, defecation sites were unused land somewhere close to their agricultural fields. Most farmers leave home early in the morning to work in their fields and defecate on their way to their lands. Many women

Table 2 Overview of open defecation (OD) practices by different age, gender and occupational groups

Age	Gender	Occupation	Defecation places	Preferred time of day, alone or group	Preferred OD sites
0-5 years	Both	NA	At home on ground or floor	None	Inside home, vacant places next door, road sides or village streets
5-16 years	Both	School students	Field, bush	None	Vacant fields preferably closer to house
17-20 years ^a	Girls	School/ college students	Field, bush	In group, preferably in evening hours	At sites close to house
17-20 years ^a	Girls	Non- students	Field, bush	In group	Go far from the village during the post-harvest and summer season
17-20 years ^a	Boys	School / college students	Field, bush	No preferred time, alone or in small group	River beds and canal embankments
Adult	Men	Farming	Field, bush	Morning, mostly alone	Canal or river embankments; open fields
Adult	Men	Non-farming	Field, bush	Morning, mostly alone	Road sides, canal embankments; fields next to water bodies
Adult	Women	Housewives	Field, bush	Mostly alone in the morning, but in groups in the evening	Bamboo bush or bushy areas
Adult	Women	Newly married daughter-in-law	Field, bush	Accompanied by female family member (chaperone) very early (4-5 am) before dawn; in small group with family chaperone in evening (5-6 pm)	Field closer to house in early morning; far from house in evening
Adult	Men and women	Elderly, disable or sick members	Field, or in house (on bed, cloth, paper)	Health condition determines the location of the OD site	Close to house; in backyard

^aReferred to as "adolescents" in main text

had the habit of defecating twice a day, in the morning and in the evening. Women's preferred early morning when it is still dark and at sunset before it is dark, to ensure they were less visible to others under the cover of darkness. Evening defecation is done as a precaution by many to avoid having to go in the night and cause inconvenience to other family members who would have to accompany them in the night to OD.

Routines of rural women

An overview of open defecation practices by different age groups is presented in Table 2. The general consensus among female FGD participants on the defecation practices of other females in their village is illustrated by the comment: "Going for defecation in the evening is the most awaited time by women. Women go in groups (mostly of 4–5) and in pairs (sometimes) to defecate in fields to chat with their friends/relatives about the ups and downs of their daily lives and to feel free from household chores." (FGD #5) These informal groups of women form on the basis of marital status in the family (position/hierarchy), bonding with other family members in the house or with relatives, and eventually, friendships with other women of a similar age in their hamlet. A newly married daughter-in-law would not be able to join a group immediately after her wedding, but as time passed (sometimes several years), she would establish rapport and join a pre-existing group. Similarly, unmarried college or

school girls went to defecate in groups of their own age or might accompany a newly married young sister-in-law. A newly married daughter-in-law could never go out to defecate without a female family member as there are restrictions on their movements and on leaving the house alone, being new to the place and for safety reasons; even being seen by men in the village is deemed problematic for her. To avoid any chance of being seen by other villagers while going for open defecation, newly married daughters-in-law had a different and very early time for defecation (*i.e.* 4:00 am). Very young girls did not have a separate group but accompanied their mothers, aunts and grandmothers.

For safety and privacy reasons, going in groups for defecation was preferred by most women as they felt protected from the fear of theft and being harmed or attacked by mischievous men, and they felt less likely to be traced or seen by anyone while in a group. In other instances, especially early morning and after dark in the night, if an adolescent or young married woman needed to go for defecation, someone from the family was required to accompany her to the OD site to safeguard her as these members are considered the most vulnerable to such female attacks and threats. The mother-in-law or sister-in-law usually accompanied the new daughter-in-law to the OD site, but another family member could accompany an unmarried adolescent female member. The following quotes illustrate the kinds of threatening

situations that women, especially younger ones, faced when going for OD in rural villages, involving personal theft: "While the newlywed daughter-in-law went to the field to defecate in the evening, someone hiding in the bushes arrived suddenly and snatched away her gold necklace. The girl could not identify him and nobody found the thief." (FGD #7) One incident of sexual harassment was reported where a participant mentioned: "When my neighbour was defecating, a mischievous man came and held her hand, and misbehaved. She was alone and there was no one to rescue her. She went and complained to her husband. But they could not fight back." (FGD #11)

Participants expressed no problems for women with OD at night, since they could go close to the house which was often more convenient than using the latrine (for those who had one) at night as they could hide themselves in the darkness even close by the house.

Most women with subsidized latrines indicated they preferred going out for OD in the evening hours as they had comparatively less chores than in the morning. They would finish household chores in advance and set a time for departing to the OD fields with their women friends or relatives even if they did not need to defecate themselves. They said they used this time to chat with others and disconnect from household chores, relax, and socialise. Some said they used this time to share and release their stress from family problems and for venting out. For many women, especially a daughter-in-law, this could be their only chance to escape the confines of the house and the scrutiny and control of their mother-in-law.

Routines of rural men

Defecation outside is a common practice among most rural adult men. Being farmers, they need to visit their crop fields early in the morning. They generally do not go for OD in groups as women and girls do. They also do not wait for someone to accompany them or wait for the cover of darkness. Morning is the most preferred time for adult men. Unlike women and girls, they do not "schedule" defecation but rather defecate whenever the need arises, either on their way to or returning from their fields. Many are habituated to brush *gudakhu* (tobacco paste) on their teeth, smoke *bidi* (cigars), or drink tea before going for defecation.

Men who have a job or work outside the village prefer defecating at a site somewhere close to their houses so that they spend less time. The most preferred sites for these men are the sides of a nearby road, canal, or river embankment where open water bodies are available nearby for anal cleansing.

Practices among adolescent boys and unmarried men are different from those of adult men. On their way to the OD site, if they meet some other (male) friend, they

invite them to join for a chat. If they go in a group, the size is small compared to that of women. The most preferred sites for these boys are the river beds, or canal embankments, as these places have fewer people and have water available for post defecation cleansing and bathing rituals.

Routines of young children

Infants and very young children (toddlers) are made to defecate inside the house or compound on a paper or cloth, or directly on the ground, depending on the extent of their mobility. Their faeces are usually disposed either in the waste/garbage pit, or a vacant plot next to the house. When the faeces is watery and cannot be separated from the cloth, the same is rinsed and then washed in water bodies.

Mothers train the child to defecate at an early age, by being made to sit on the mother's feet and squat. Later as they become older, they are taught to squat on bricks instead of the feet. A few mothers used a potty (a plastic portable squatting pot, designed especially for children) and the stool collected was disposed of in a vacant site close or next to the house.

Routines of old, disabled and sick persons

Unlike younger people, old people defecated closer to their houses. They did not feel ashamed of being seen and they did not have a fixed schedule. Members with some kind of disability or elderly family members who are unable to walk on their own are made to defecate on a paper or cloth. Health condition determines the location of the OD site (usually in the backyard) and its distance from the house. Rules are relaxed for family members as to where they can defecate during critical times. Social norms for acceptable and unacceptable places are flexible for sick family members and they are permitted to defecate inside the house. The faeces are then disposed of in the garbage pit.

Sanitation rituals and practices of higher and lower caste people

Defecation practices in rural areas follow elaborate rituals. They often involved symbolic acts of purifying the body and clothes with water following defecation or contact with human faeces or even simply with the latrine itself (such as entering to clean or dispose of a young child's faeces), especially among the higher castes. In a physical sense, however, these may not necessarily result in real cleaning. Similarly, changing clothes is one of the most important parts of most defecation routines of both men and women among higher castes, but members of lower castes do not also follow this ritual as rigorously as higher castes. An overview of sanitation rituals by caste is presented in Table 3.

Table 3 Sanitation rituals among different castes

Caste	Men	Women	Children
Brahmins (the highest caste) and, other general castes (with better economic status)	Change of clothes pre- and post-defecation, and body cleansing with water after defecation is an important aspect of the defecation ritual practiced by rural people. The common belief is that clothes worn while defecating become impure, and by rinsing or washing with water, they are 'purified'. Therefore, they have a separate cloth (a <i>dhoti</i> or <i>lungi</i> ; meaning towel) to be worn while going for defecation. This cloth is usually kept outside the living area, away from the main house and away from the reach of children and adults, so that no one touches it. In case of urgency, where they fail to change their clothes, the clothes have to be rinsed with water after defecation. Wearing the same clothes without rinsing or washing is forbidden and they are restricted from entering the house. Full body bath is not necessary. The sacred thread (called <i>paita</i> ^a) is wrapped around the right ear twice while going to defecate and once when they urinate. After anal cleansing, followed by full body washing with water, the thread is taken off the ear and made wet and put back on the shoulder again. They are restricted from touching the water point after defecation (see details in next column on women's rituals).	As described for Brahmin men, body cleansing with water after defecation, is strictly practiced among females as well. Females of all age groups (excluding the very young) have to change their clothes, each time they go to defecate. Adhering to this ritual, the common practice is to keep aside an old unused gown, saree or dress, and change into it for defecation. For those with latrines, stepping over the squatting pan is considered <i>chuan</i> (i.e. getting impure) and both the body and clothes worn get impure. They are forbidden from entering the house wearing impure clothes. They can purify only by rinsing the dress/clothes they have worn or by changing them. For this reason, they prefer urinating outside the latrine mostly in the backyard and the latrine is used only to defecate. Similarly, they prefer to dispose of young children's faeces which are not considered impure, outside of the latrine, to avoid having to perform these lengthy rituals. They are restricted from touching or accessing water points (tube wells, or wells) at home with clothes worn while impure from defecation. Therefore, they have to collect and store enough water for not only anal cleansing and flushing, but also for bathing and washing their clothes before going for defecating when using the latrine. In case they did not fetch enough, someone else has to assist them to fetch the water they need to use the latrine.	Changing of dress or clothes is not mandatory for infants or young children. Children who can defecate on their own have to remove all garments when they need to defecate. Faeces of children above 3 years are considered impure as by that age, the child starts eating rice and the faeces smell. Mothers develop a disgusting feeling for it. For a baby who defecates on the ground or floor, the mother may pick up the faeces with straw or other old materials and dispose of it in the bush or the waste/garbage pile. Mothers are unaware of the need for safe disposal, or of methods to do so, and prefer to avoid changing their own clothes which would be necessary if they entered the latrine to dispose of children's faeces or help young children use the latrine. It is more convenient for them to throw these faeces on vacant land next to the house or in the backyard, and have young children defecate outside.
Other castes (poor)	Changing of clothes is a common practice, but many poor families do not have extra dresses for changing during defecation. So, they use the same clothes each time they go for defecation and wash their fully clothed body (both body and clothes together) with water.	Women do the same as men.	They don't strictly follow the rituals of changing clothes, each time they defecate. Mothers are not very strict or particular about the changing of clothes of children.
Lowest castes (Scheduled ^b) (poorest)	They mostly are the landless and work as labourers or share croppers. They usually defecate on their way to the fields and bathe before returning home. They don't have any strict practices of changing clothes. Those who are more hygiene conscious prefer to change their clothes.	Women also work as agricultural labourers, and their defecation practices are similar to those of men.	Children accompany their parents to the fields, and their practices are the same as their parents.

^a*Paita* is a thin consecrated cord composed of distinct cotton strands and worn by adolescent and adult male Brahmins. The thread is worn across the torso and over one shoulder, after the thread ceremony

conducted when a boy is seven years old, but this is changing with time

^b Scheduled castes are also referred to as "dalits" or "harijan"

Adherence to and practice of purification rituals and rules which are time and/or water consuming, as indicated in Table 3, discouraged use of the latrine for urination, by child, for faeces disposal and at night. Defecation times and rituals of changing clothes among higher and lower caste members remain almost the same. However practices vary across individuals and their type of occupation as seen in Table 2. As habitations in villages are clustered according to caste, and the hamlet of the lower castes (*i.e.* scheduled castes) is situated at some distance, defecation sites also differ. It is very rare to find people of lower castes going for defecation together with higher castes and using the same sites.

Open defecation due to no latrine

Lack of access to a latrine was stated as the primary reason why people who did not have a latrine practiced open defecation (OD) by participants, and lack of cash income on the part of economically poor families was the most stated reason for not opting to install a GOI subsidized latrine, despite the GOI subsidy (valued at Rs. 2,200 or 3,200 at the time the TSC program had been implemented in study villages) since participation in the TSC requires making a small contribution to toilet construction. Others thought sanitation costs were high and unaffordable.

Reasons for maintaining open defecation despite owning a latrine

Rural people had their justifications for practicing open defecation despite owning a latrine, especially those with a GOI subsidized latrine. One important reason related to gaps in the government TSC sanitation intervention delivered to them. Many did not use their subsidized latrine because they complained that the structures were not built properly, that they lacked a roof, a door, and any walls sometimes, or the pits were too small. Our observations confirmed these complaints regarding inadequate design and incomplete construction of subsidized latrines, and sometimes also deficiencies in the quality of construction, for example, pans were installed at or inches from ground level resulting in an insufficient slope between the pan 'S' outlet and off-set pit inlet. Participants also complained about the small design of the cubicle which made squatting difficult and uncomfortable and, where the latrine was unfinished and lacked a door or sufficient height walls (a frequent occurrence we observed), that visual privacy was not ensured. Women had a distinct need for visual privacy, in contrast to little or no need for men. Due to the shallow depth of many of the subsidized single pit latrine designs (often three rings, each 25 cm height, for total depth of 75 cm), some feared that if all members used the latrine all of the time, the small pit would quickly get filled. So, men preferred to defecate

outside in the dry season, leaving the latrine for women to use. In one case of a scheduled caste family who had never seen or used a latrine before, no instructions on how to use their GOI subsidized latrine (a pour-flush on-set model) were provided by the NGO who installed it, and so they broke the pan's water-seal because they could not understand how else to make the faeces go from the pan into the pit below.

In the study communities, people are washers (*i.e.*, using water for anal cleansing and post defecation ritual bathing) so that the absence of a water supply in or next to the toilet was another major reason for non-use of GOI subsidized latrines. Households we interviewed reported that their subsidized toilets required fetching about 12 L (one bucket) for anal cleansing and flushing the waste from the pan, and another 12 L (2nd bucket) for post-defecation washing of their body and clothes. This water had to be fetched or available at the latrine before entering to defecate, since a person who has defecated was contaminated (polluted) and therefore could not touch the water supply point without first ritually purifying themselves by bathing or changing clothes. Further, many poorer households only possessed one bucket, and a bucket, once carried into the latrine was considered contaminated and could no longer be used for other tasks.

Although in most villages there were multiple public water supply points (*i.e.* public tube-wells and government piped water taps) and points were located from 50–300 meters of most habitations (with exception of distant hamlets of the scheduled caste), we did not observe any habit of transporting and storing water at home for personal and domestic hygiene activities. Rather these activities were done at the public water point or in local surface water bodies for households that did not have a privately installed water supply at home, and only very small volumes of water were stored at home for the purpose of drinking only. Thus, water fetching for latrine use is perceived as an additional time consuming new task for them, whereas in going for open defecation they are spared from this workload, because OD sites are selected near open water bodies where they can easily and conveniently perform anal cleansing and bathing before returning.

For some, their occupation was a hindrance to latrine use which did not suit their daily routine. For farmers, who leave the house first thing in the morning for the fields, using the latrine was inconvenient and extra work and time. They did not feel the need to come back from the farm, only to defecate in the latrine and have to fetch water. Other than these reasons, people were not able to give up their old habits of OD. This seemed to be especially true for older members of the household. Some participants remarked: "They (elderly in the family) will continue going out (*i.e.*, not using the latrine). Motivation

to use may arise among other groups of people, but to bring in a change in old is extremely difficult.” (FGD #3)

Socialising was another important factor contributing to low latrine use, especially among the female population who remained confined to the four walls of the house. OD especially in the evening was a rare opportunity for them to leave their houses at least for some time and be free from household chores and responsibilities, and mix with others, as mentioned above. Reasons for people with latrines to defecate outside in open fields are detailed in Table 4.

Reasons for choosing to use a latrine

However, some households perceive latrines as beneficial and have adopted them. Working and living in hostels in towns and small cities or in government quarters with latrine facilities often gave them exposure to latrines. As open defecation is difficult in towns, they were initially compelled to use the facilities, but then became habituated to using latrines and came to prefer the practice. Upon return to their village after retirement, they were among the first to invest in and build latrines on their own. Other factors we found that motivate households to install and use latrines are presented next.

Convenience and privacy

A latrine facility in the house (or compound) was more convenient and saved time in walking long distances in search of a proper and clean site to defecate, especially in the monsoon season when the area is waterlogged. There is a shortage of open space during monsoon and also during rice growing seasons, and squatting in knee-deep water or in the rice fields is difficult. Most female SHG participants (FGD #2) and men and women from Brahmin households (FGDs #3, 4) who had a toilet were using it at the time of the study, but at some point in the past they had practiced open defecation. Participants with latrines from other FGDs, both men and some women, were not regular users of their latrine, using it mainly only during the rainy season, compelled by the lack of open space due to land inundation and rice cultivation (see above) which for women, especially, limited the number of alternative private places to use. They preferred going outside at other times of the year.

Interest in having a latrine was observed among people with some kind of disability. Due to difficulty walking long distances, they preferred using a latrine. For ailing family members, with diseases like arthritis, or leg fractures, mobility was a major issue and presence of latrines eased their daily lives. This was not, however, the general case for elder members who were not impaired and continent to open defecate nearby, and disinclined to changing their habits (see above).

Adolescent girls and adult women found latrines useful during menstruation, especially to clean their menstrual rags, since there was always movement of people at ponds and public water supply points which would make them ashamed to be seen cleaning them. The latrine's proximity to the house and availability of a water supply point at or next to the house were thus key reasons that attracted some people to use their latrine. Visual privacy for women also seemed to be a fundamental reason in favour of using latrines, especially during the rainy season when there is a lack of private places to defecate. Household heads with a new daughter-in-law also did not like her to be seen or traced by other men in the village while defecating in the open, and thus saw value in having a latrine for her. Latrines, when well designed, could also be more peaceful than open fields as women did not have to stand up each time someone passed by. With a good latrine and water available at home, they were also able to defecate on their own (*i.e.*, without waiting for a female family member to accompany them to an OD site) and whenever they wanted, even at night. One poor household in a village, despite their poverty condition, build a latrine because they felt that if they had a latrine, they would be able to defecate peacefully. (FGD #1)

Dignity and status

Male heads usually are in charge of safeguarding the privacy and safety of their daughters-in-law, so they are often the instigators who feel the need to build a latrine for the women in the household, particularly for the protection of their newlywed daughter-in-law, rather than women themselves demanding it. Some toilets were found to be built just before a wedding, specifically intended for use just by the new daughter-in-law. In other instances, for better off people who had developed the habit of using latrines while in urban areas and built their latrine upon returning to the village, a more modern status and dignity for both female and males were the factors behind toilet installation. In these cases, both men and women regularly used the latrine. The influence of women on other women in one's social network to build a latrine was also observed. If a few women members of one SHG obtained a latrine, this would impact other members in the group to want a latrine. Not wanting to fall behind status-wise with others in their social group, they would persuade their husbands to build a latrine.

Disgust

People expressed a feeling of disgust with the sight of faeces all around the OD site especially in the rainy season. Thought of a fly sitting on faeces and then on food, and of water in open fields contaminated with the faeces of different people drove some to build a latrine.

Table 4 Reasons for members of households with GOJ subsidised latrines to continue open defecation (OD)

	Men	Women
Socialising	After the day's work in the field, some men go to defecate in the fields with (a few) other friends. The male group size is small, 3-4 people at the most, comprising very close friends. Men use the moment for exchanging news and smoking cigarettes. For men, unlike women, going in groups is not a regular practice.	Females go for OD in groups, especially in the afternoon/evening time. Group size for OD varies between 6-10 women. Defecation in the open, in groups, twice a day is common, but OD in the evening hours is mostly used for socialising, sharing information and stress release, and they like to take more time at this time of day. Even though some women will not defecate at this time, they still accompany others to the defecation sites, which tend to be farther away from the village. For daughters-in-law, evening OD can be a rare opportunity for them to leave the house and the control/command of their in-laws, and relax from chores.
Purity and health	Containing faeces in the latrine pit inside the compound is perceived to be 'impure' and considered to be 'disrespectful' for the worship shrine at home. People feel latrine pits are the breeding grounds for mosquitoes ⁴ . With open defecation, they believe faeces (impurities) are left outside, away from homes and mosquitoes can't breed.	Perceptions regarding impurity are similar to those of men. During the day, women are often confined to the home and remain engaged in chores. They feel by going for open defecation, especially when they have more time in the evening, they can get fresh air and exercise, as this is the only time when women can walk for some distance. Thus, OD is seen as good for health, and walking long distances for defecation is not necessarily regarded as an inconvenience.
Convenience/extra work	Men (adults and aged members, mostly the head of the household) are accustomed to going to farms or agricultural land immediately in the morning, after they are awake. All body cleaning activities like defecation and brushing teeth are done outside the house/property. On the way back from agricultural fields, they bathe and wash their clothes; and return to the house for food in the afternoon. On account of these factors, using latrines for defecation in the morning does not suit their daily routines. Men are often concerned that the small pit (of subsidised latrines) will fill quickly if used by all family members regularly. They therefore preferred defecating in fields and letting women use the toilet. Emptying the pit was considered by some a constraint for latrine use, as only people belonging to lower caste groups can be engaged to do it.	Fetching water for family members for latrine flushing is difficult. Often, the typical source used for personal hygiene is different from that used for drinking water, and is a local surface water body. Drinking water sources like a public tube well or public tap are located in public areas in each village, but these can be at some distance from many houses, making daily transport and storage of sufficient amounts of water necessary to be able to use the latrine at home, unless the household has installed their own private tube-well inside their compound. Daily transport and storage of non-drinking water at home for non-drinking domestic needs, such as bathing or latrine usage, was never observed in any study communities and reported not to be a local practice. Making or helping a child use the latrine and then having to flush it, is considered more time consuming for mothers as it requires extra effort including her own purification after entering the latrine. Therefore, they find it more convenient to have the child defecate in the back yard and throw the child's faeces into a garbage heap, than to have them use or dispose their faeces in the latrine. Women felt it is more convenient if children defecated on the road side or in fields, and then cleanse themselves in the public pond or another open water body in and around the village. Traditionally, cleaning and maintaining hygiene in the household is a responsibility assigned to women (predominantly). Thus keeping toilets clean is also considered a women's job, and is seen as adding to their existing household chores.
Structural and design problems (small toilet size, no roof, water availability, etc.)	Overall, the construction of government subsidised latrines was of poor quality ⁵ , and in many cases it was not complete. The latrine design intervention delivered was a pour flush latrine cubicle with a single on-set or off-set pit with three cement rings (each 25 cm height), but without a roof or water facility. The covers of latrine pits were of such bad quality that they were quickly damaged. In some cases, the door and even the walls of the toilet were missing. For these reasons, both men and women abandoned the toilets. Those with a functional toilet but without a roof, lived with an expectation of receiving funds from the government someday for the roof, and so postponed using the latrine until its construction was completed. Some feared the NGO-sponsored masons when they returned to finish the structure, would not install the roof of a 'used' latrine. This prevented some from using the latrine until it was complete.	Women prefer using latrines only if they are fully complete, i.e. have a roof, a water point nearby and a door that can be locked from inside. When children start consuming foods (such as rice) beside the mother's milk, the child's faeces tends to have an unpleasant odour. Mothers have discomfort in handling faeces and it is at this time they begin training their children. Additionally, mothers do not find toilet designs to be safe for young children to use on their own, and they delay training the child to use a latrine until they are about 5 years old. The latrine cubicle is too small for squatting or even keeping a water bucket. Unlike in open fields, they cannot move freely inside the latrine and so do not like using it. Water bodies are typically located close to open defecation sites, and so OD does not require fetching any water. Fetching water for toilet use is seen as a time consuming new chore. This hinders their use.

Table 4 Reasons for members of households with GOI subsidized latrines to continue open defecation (OD) (Continued)

Privacy	Men have a lower need for privacy than women. Defecating and urinating in the open even during the day is not shameful. Sometimes latrines are located near the house entrance, and anybody passing by can see members entering or leaving the latrine.	Incomplete latrine structures do not provide sufficient privacy for women. Also, if the latrine is located within the compound it may be perceived as inappropriate to be seen by men while entering and leaving the latrine. Going to defecation sites is preferred, as men cannot see them there.
Habits	Rural men have the habit of going for OD. Changing habits is very difficult especially among elderly men. Men have different habits prior to actual defecation or during it which are not suitable to using a latrine. These include smoking <i>bizis</i> (cigarettes) which they find doing in the latrine difficult, unlike at open defecation sites.	Rural women especially the elderly are addicted to brushing <i>guddakhu</i> (tobacco paste) on their teeth before defecating. They believe <i>guddakhu</i> facilitates the bowel movement, which they feel freer and more comfortable doing in the open air or open field.

^aWe saw several subsidized pour flush household latrines in study villages, mostly on-set models, which were swarming with very small insects which may have been mosquitoes or flies

^bPoor quality construction which we observed included use of insufficient cement for constructing the walls, and the pan platform floor, rings supplied by the NGO for the pit were of bad quality (poor cement), so that some were already broken at the time of delivery but still used, and in some households, because the pit had not been dug when the NGO arrived with the mason to install the subsidized latrine, the rings were left stacked on the ground

Exposure and awareness

Latrines were adopted among the population who had some kind of exposure to them and understood well their advantages. For example, females who had become accustomed to using a latrine at their parents' home preferred to have a facility to use at their in-laws place which became their new home upon marriage. Others were exposed to latrines in urban areas during their formal education when they stayed in hostels, or when they visited the home of a relative who owned a latrine. There was also a segment of more educated people who were sensitised by NGOs about the disadvantages of open defecation related to health and disease transmission, and how OD was shameful for female family members, and became convinced. Situations of exposure and awareness from outside the village of the advantages of latrines were expressed predominantly among participants with SF latrines (FGDs #3 & 4).

Health and hookworm

Health and hookworm as a reason to build a toilet came up very rarely. Rather there were arguments by people saying that they had been defecating outside for ages and never had any health problem. There was only one case of a household installing and using a latrine for health reasons. Their adolescent son became very sick from hookworm and the doctor told them that to avoid hookworm they needed to stop OD and build and use a latrine.

Safety and protection

Even though participants reported it was very rare that women were harassed or faced a threat to their safety across the study villages when going for OD, fear of being attacked by someone in the dark persisted. A few male heads, out of concern for the safety and protecting the honour of female family members, especially a new daughter-in-law, built latrines, but these were designed with an attached bathroom so that women could bath and wash their clothes in fully privacy at home immediately after defecating in the latrine. There was also fear of insects, snake bites, leaches and other pests during the waterlogged season, and difficulty wading through standing water to find a place to defecate, expressed mainly by women. In these cases, setting up a latrine at home was deemed a better alternative. With a latrine, there was also no need for someone to safeguard or accompany the female member when going for defecation.

Routines

For a daughter-in-law in some households with a latrine, using the latrine in the morning was very convenient for her morning routine (but was not desirable for use in the evening) given her very busy morning schedule and

sole responsibilities for cooking for the whole household which required that she finish defecating and bathing before she could begin to cook. With a latrine, she did not have to wake up as early to go out and finish OD and bathing in public before the light of day, saving her time and allowing her to sleep in a bit longer. For those members who commuted to work or college in towns, and also needed to save time in the morning, using a latrine made more sense as long as a water source was available in or close-by the latrine.

Facilitators of consistent latrine use

In addition to the above cited motivations for latrine use, there were other facilitators that encouraged toilet adoption and use. Latrine design, location of the latrine structure close to the main house, and availability of a water source at the house or in the latrine were positive factors for adoption and consistent year-round use.

Most SF and many improved GOI subsidized latrines we visited had some signs of use, such as a broom, slippers, soap, a small water container, or a toilet cleaning agent. Most SF latrines we observed, although also pour-flush technology, also had a very different design from that of the government prescribed single pit pour flush subsidised latrines built under the TSC in study villages. Privately financed toilets were complete with full height walls, a roof, and a door or screened entrance to maintain privacy. The toilet cabin was installed on a raised platform, often several feet above ground level, rather than at or close to ground-level as were most of the subsidized off-set pour-flush latrines, so that the latrine could be used in all seasons and throughout the year, even during flooding.

SF latrines we observed were in proper functioning condition with nearby permanent availability of water either in a large water container in the latrine, and/or at a private water source, usually a private shallow tube-well or tap, located very close by or inside the latrine, and these households reported that each capable member, irrespective of gender, fetched their own water for using the latrine and bathing at home afterwards. Several SF and GOI subsidized latrines which had been self-improved had an attached bathroom cubicle (as mentioned above) or had a private place for bathing near the latrine in the back yard, for the convenience of household members to accomplish post-defecation bathing and washing purification rituals without having to walk sometimes long distance to public ponds or other open water bodies for these rituals. As explained earlier, the need and importance of sufficient quantities of easily accessible water at the latrine for accomplishing sanitation rituals was one of the primary reasons cited for rejecting the government's subsidised toilets, and most of the SF and improved GOI subsidized latrines had some kind of private water supply at the house or in the latrine

to avoid having to go and fetch water from public sources each time they defecated or entered the latrine.

With an aim to use their latrine for many years, SF latrine owners reported building a large below ground septic tank or two deep pits in series. This was also done so all the family members could use the facility in the morning without the tank or pit filling up with water and backing up into the pan. As a result of their elevated pans and larger pit water-holding capacities, during rising water tables and floods, the below-ground plumbing of SF latrine designs continued functioning without problems in contrast to the subsidized toilet designs in which contaminated water was reported to rise up from the latrine pit into the squat pan blocking use and attracting insects in several facilities in the village of FGD #5, several of which we observed and confirmed.

The need to empty full pits was not reported to be a problem or constraint on latrine usage by household members among SF owners, and several reported having either emptied their pit themselves (including two Brahmin men, FGD #4) after removing the cover and letting the contents dry for several days, or provided drinks or pay (typically Rs 500–600, and up to Rs 2000 plus soap and oil, for a large tank after many years of use) to someone locally who could be called on to empty the dried contents. (FGDs #1, 4, & 8) In contrast, owners of GOI subsidized toilets, whether self-improved or not, often indicated that the pits would need to be emptying frequently (e.g., every year) if all members used the latrine due to the very small size of the pit (see above), however, there was no perceived lack of people locally available to empty pits for a fee. (FGDs #1, 8, & 9)

Discussion

In this study, we used qualitative methods to explore and develop an in-depth understanding of different factors responsible for low adoption of latrines in rural areas in Odisha, India, notably the lower rates of use of government subsidised latrines implemented by local NGOs under the TSC programme, and preferences for open defecation. We found extensive evidence that even where people had an option to use a household latrine, many were reluctant to adopt latrine use habits and instead chose to continue their traditional behaviours to defecate under the open sky. A clear preference for open defecation in rural areas, particularly by members of households with a GOI subsidized latrine, has also been documented across five northern states of India [22] and confirmed separately for Puri in a study applying the Safe San Index, a new metric to measure person-level latrine use and open defecation rates [23].

We found different reasons for why government subsidised latrines (facilitated by NGOs under TSC) largely remaining unused and rejected. Even villages officially

attaining Open Defecation Free (ODF) status were not OD free, as was evident from the practices of participants of FGD #5. These results are consistent with earlier findings of TSC in other parts of India [9, 24–27].

Gender, age and caste

Men in our study who defecated in the open stated that latrine use did not suite their daily routines, and that latrines were meant for females, as they stay at home most of the time and thus have more need for them. In general, users of latrines were viewed by study participants to be mainly women, especially the newlywed daughter-in-law. There are increasing cases reported of latrine building in rural Odisha, as we observed in the study population, where the prime reason for the latrine installation was the arrival of the newly wed bride in the household. Although there is no evidence of efforts to apply the Community-Led Total Sanitation approach in Puri, as has been undertaken elsewhere in Odisha [28], or of social campaigns like ‘no toilet, no bride’ in Haryana [29], or use of messages around shame, dignity and security of females to promote latrine uptake, male heads of household and future husbands in our study showed more concern for protecting and preserving the dignity, privacy and security of their new daughter-in-law/bride when deciding to install a latrine. They did not want these young women to be seen while they defecated outside because it lowered the prestige of the family. In contrast, similar thinking or motivations were not observed in regard to their daughters or other females within the family. Indian and rural Puri society is still male-dominated, household decisions are taken by men, and females’ needs are rarely attempted to be understood, recognised or addressed by male heads [20]. Thus, policies aiming at empowering women in decision making could be fruitful in enabling females to demand for a life with dignity [30]. Female education and older age at marriage have been found to be key factors associated with greater empowerment of new daughters-in-law in decision-making and agency over their daily lives in their in-laws’ home [31] and thus may be important elements of such policies.

In many of the SF latrine households who tended to be wealthier or better educated upper caste families who had some prior exposure to latrines, daughters-in-law seemed to express gratitude for the ease and convenience of using the latrine (which typically always included a water supply and private place to bath), and for the liberation from worry of being publicly seen bathing as much as open defecating, a situation which could generate village gossip and family shame. On the other hand, married women in GOI subsidized latrine households who tended to be of low and middle castes with little outside exposure, going for open defecation in the evening provided many of them

with one of the rare daily opportunities to escape the house, the scrutiny of the mother-in-law, and the confines of their hamlet and socialize with women friends and peers. This was most strongly expressed by married women who were daughters-in-law (*i.e.* not yet mothers-in-law), and a few young ones expressed open regret for having to use the household latrine (FDG #5). This revealing finding is consistent with what some Indian researchers and experts have suggested, that the traditional role of women and rigid code of conduct for them within marriage, can be highly self-limiting, restrictive, and even boring, and contributes directly to the higher observed rates of depression among married women than married men across Indian society [20].

With attainment of mother-in-law status and old age, women were less concerned about being seen open defecating. As roles in the household shift with mother-in-law status, and women gain greater freedom of movement and control over their daily routines compared to daughters-in-law [19], mothers-in-law may be more able to choose where they go and what they do. Other studies of GOI subsidized latrine use have also found that older compared to younger married women in rural India are more likely to defecate in the open [23]. The exception to this pattern among older members was due to disability, immobility, or sickness which made open defecation difficult, similar to observations of reasons for early adoption in Benin [32] and reported elsewhere in India [33].

A study in Tamil Nadu found women and men had different defecation sites [18], and the same was found in our study in rural Puri. Unlike media reports from Northern India, we found little evidence that women saw or experienced going for open defecation as a safety problem or threat to their well-being. Social cohesion and fear of reprimand in the study villages appeared strong enough to prevent individual men from molesting women on their way to the open defecation sites.

While many studies of latrine use in rural India have observed a stronger tendency for adult women than men to use latrines (*e.g.* [10, 22, 23]), this study has revealed contrasting preferences for open defecation and an unexpectedly complex diversity of views and attitudes towards latrine use held by rural Indian women themselves, sometimes quite negative, which were found to vary with their age, marital status, caste, education, and role/status within the home. These insights suggest a universal preference among females in rural India for using latrines cannot be assumed, and that increased opportunities for social engagement and interaction outside the home for rural women, especially married women of lower socio-economic status, may need to be created so that open defecation no longer serves this purpose if rural women are to fully embrace latrine adoption and use. Others have pointed to the

need to increase understanding of the negative health implications of open defecation as important for behaviour change [22, 34]. Separate and concerted efforts focused specifically on how to change social norms of open defecation among rural men, given its greater convenience to them, will also clearly be needed.

Cultural pollution and purification beliefs and rituals

Although lack of finance and poor quality of government's subsidised latrines are constraints for not adopting latrines, our results show that primarily old habits and strongly ingrained beliefs around impurity and pollution and the required rituals for purification and cleansing post-defecation in Indian society may play a big part in the choice to continue defecating in the open in the study area. Faeces have always been considered ritually impure as well as physically filthy and water as the necessary medium of purification and ritual cleansing in Indian society [21, 35]. Bathing and clothes changing rituals are deeply ingrained practices post-defecation and after many other kinds of ritual defilement in Indian society [21, 35]. Together these cultural beliefs and practices explain the strong importance households have placed on the need for water provisioning inside the latrine to accomplish required cleansing acts following defecation [27]. Ritual pollution may extend to simply touching or entering the latrine for some higher castes [21, 35], as was described by Brahmin participants in our SF latrine group. This clearly poses a considerable barrier to safe child faeces disposal in the latrine as well as latrine cleaning if elaborate water purification rituals are perceived to be too time-consuming or difficult to perform, added to arguments for providing water availability in the latrine. This possibility is supported by findings from a survey of child faeces disposal practices in rural Indian households with a functioning latrine, that water availability on the premise for using the latrine was associated with safe child faeces disposal [36].

Beliefs that faeces are impure also caused a few participants to consider the practice of containing faeces in the latrine pit in the house as a 'sin', because idols and pictures of gods that are revered are kept and worshipped in every house; having toilets within or next to the house makes the entire house impure. These kinds of strong traditional beliefs can hold back people from adopting the new practice of defecating safely inside latrines [26, 33, 37]. The importance of considering cultural beliefs, however, has long held true for changing sanitation around the globe [38, 39].

TSC latrine design and implementation

While traditional habits and socio-cultural barriers may be contributing to the present day situation, several studies and reports have drawn attention to serious problems in the TSC programme design and implementation [2].

Inadequate inefficient programme implementation, unprofessional and ad-hoc target-making and inadequate institution building are also some of the reasons contributing to unchanging traditional behaviour [4]. We also found substantial problems with inadequate and inappropriate design and incomplete and sometimes poor quality construction of the TSC subsidized latrines which posed real barriers to latrine use. For example, near-annual risks of monsoon flooding and widespread inundation in the Puri District study area were not considered in the design and construction of the subsidized latrines, many of which had pans installed at or near ground-level and very small, shallow pits compared to SF latrines in the same communities (which typically had elevated pans and large pit volumes). As a result, many of the subsidised toilets were inundated or water-logged, and unusable in the rainy season. In their study across rural north India, Coffey et al. [22] also found that SF latrines had significantly larger pits than GOI subsidized latrines, and that latrines used by all household members were much more likely to have larger pits than those used only by some or few members. A desire for large dry pit volumes has also been observed in Africa, the motivation expressed being to maximize the investment in building the structure and serve the whole family for many years before the pit becomes full and has to be replaced [40, 41].

Others have criticised the single model technology and pointed at the structural deficiencies in the subsidy driven sanitation intervention promoted by the Indian government [3]. Although participants did not mention this explicitly, their non-involvement in shaping the toilet design to suit their needs and preferences may have been a strong reason for discarding their subsidized latrines in our study area. This phenomena was observed elsewhere in rural India in which people who had not been involved in choosing their sanitation technology persisted in their habit of open defecation [3], and has been confirmed in a quantitative study showing individuals in households that had been involved in the choice of their latrine design were 49 % less likely to practice any OD than members of households that had not [23]. The TSC GOI's individual household latrine unit design of 5 feet wall height, single cubicle, and single shallow pit pour flush latrine with no roof and no water provision and, in many cases, with doors missing [2], was regarded by people as incomplete and insufficient for use. Among the study population of rural Odisha, however, we found people not using a GOI subsidized latrine even if complete (as per government guidelines) and functional, but lacking a roof. Owners expected to receive more subsidies sometime later, so delayed using the facility, or completing the facility at their own costs. The long history of experience with hardware subsidies in sanitation programming has shown that toilet construction subsidies do not guarantee that toilets

will be used and are a poor substitute for creating real demand [42]. As per TSC guidelines, the subsidy was meant as an incentive for backward families, which was to be reimbursed only after the completion of the toilets. High reliance on the subsidies however has been observed among rural Indian families [2, 3, 30], and the subsidy amount reported as inadequate to construct an acceptable functional sanitation system [43]. In contrast, there is evidence of poorer households in India achieving higher levels of sanitation on their own [44].

Lack of provision for any water supply in the units emerged as a major factor for non-use in the design of facilities in the study setting, given the quantities of water needed for anal cleansing, flushing and sanitation purification rituals. Participants were optimistic that usage would increase among existing GOI subsidized latrine households with provision of water in the latrines. Our findings corroborate those of other Indian studies in Rajasthan [30], and Tamil Nadu [26, 45] which found that absence of water at the latrine for post-defecation anal cleansing and bathing (which is crucial to accomplish customary sanitation purification rituals described above) reduced latrine uptake and use. In places where the distance of water supply points was more than 500 metres from the latrine, villagers have shown unwillingness to fetch water [46]. In rural Madhya Pradesh, lack of a water connection was the second most frequent reason (excluding lack of money) for not having a toilet facility [47]. In a study using the Safe San Index to measure consistent latrine use in Puri District, a water source in the latrine was associated with a 2 fold increase in safe excreta disposal rates (*i.e.*, defecation and disposal in the latrine) across all members, compared to latrine owners with a public water source located outside the compound [23]. Water requirements for cleansing and purifying rituals mean that unavailability of water supply in sanitation facilities will continue to be a major shortcoming of the subsidised latrines, unless addressed. O'Reilly et al. [34], in taking a political ecology approach to understanding sanitation adoption in rural India, has argued for the critical importance of inaccessibility of water as an important ecological and structural constraint to be addressed. A global review of determinants of rural latrine use and open defecation behaviour has also highlighted the importance of accessible and reliable water availability as a factor in latrine adoption [48]. People will continue to do what was convenient and easy, and open defecate near local surface water bodies (ponds and rivers) [49].

We found many interesting patterns of continued open defecation among different groups even among households with access to latrines, including self-financed owners, establishing the fact that only a small percentage of people in rural areas seemed motivated to build and use latrines. It may be less about sanitation unawareness and more about

the benefits and drivers of continued open defecation that have failed to bring about a shift in thinking about safe disposal of faeces. Lack of awareness on the health adversities caused by unsafe faeces disposal is also a pressing challenge in rural India [6]. The habit of defecating in an open environment without walls [49], lack of privacy provided by poorly designed and incomplete GOI toilets, absence of water in the latrines, purity and sanitation rituals, extra work and effort associated with latrine use, and socialising especially for married women while going for defecation, are some of the strong drivers of continued defecation in fields and open areas rather than in a household latrine, despite access.

A shift in thinking about sanitation and latrines, and a change in old sanitary habits are possible if people are taken through the experiences of the negative impacts of open defecation. Efforts and the approaches to motivate these changes in thinking have not generally been rigorously undertaken by the TSC program, such that the direct link between using a sanitation facility and its benefits remained unclear to most open defecators [38]. If they had made these connections, participants would not have developed the perception that walking long distances to the defecation sites is good for health or that defecation outside is not unhealthy.

There were segments of the rural population who were found to be regular users. These people tended to be more educated, informed, had a higher financial status, travelled more and had greater awareness on the benefits of using latrines. They generally belonged to higher castes who traditionally have better financial status, better access to formal education, and are more likely to obtain jobs in towns and cities that expose them to a different living style, including to latrines, as has been observed with early latrine adopters elsewhere [32]. For these reasons, in the study population most toilet adopters were found to have lived in cities or served in government jobs where they had opportunities to become acquainted with using latrines. Realising the importance of past exposure in latrine adoption, future programmes may attempt extensively to work on the exposure aspect of toilet promotion. This was suggested by one of the participants who served as a teacher in different parts of the state.

While lack of sanitation may seem to be a basic problem, with a seemingly easy solution, in reality it is far more complex to implement successfully than would seem at first. There are underlying factors like beliefs, old habits, and rituals that complicate the success of sanitation interventions and impact toilet uptake [38]. Extensive research to understand the relationship between dynamics of individuals and societal dynamics with regard to defecation and new sanitation behaviours are needed before implementation. These findings may help in development of sustainable strategies for motivating people to build and

use toilets in rural Odisha and other places in rural India where traditional open defecation is entrenched.

Conclusions

Our findings suggest that absence of latrine infrastructure is not a primary factor for continued open defecation and that toilet building alone will not address the widespread problem of open defecation in rural India. Poor quality and an inappropriate and single latrine design made available to rural people under government sanitation schemes may be important factors but are not the sole reason for low latrine uptake and use. There are other behavioural aspects which constrain the adoption and use of latrines. These behavioural aspects vary with communities, across gender and different age groups and castes. Any future sanitation intervention, instead of achieving targets, needs to consider these aspects and approach the issue of sanitation behaviour change holistically.

Abbreviations

CRSP: Central Rural Sanitation Programme; GOI: Government of India; NBA: Nirmal Bharat Abhiyan; NGO: Non-governmental Organisation; OD: Open Defecation; RATS: Relevance of study question appropriateness of qualitative method, transparency of procedures, soundness of interpretive approach; SF: Self-financed; TSC: Total Sanitation Campaign.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

MJ and PR prepared the study design and protocols, implemented data collection and managed data. PR analyzed the data with contributions from MJ. PR drafted the manuscript article with inputs from MJ, WS, TC and SB. All authors read and approved the final manuscript.

Acknowledgements

We thank the study participants and LSHTM's Bhubaneswar office staff for their support in data collection logistics. We are grateful to SAMPARK, the local NGO working in Puri District who helped arrange village meetings and other logistics. While working on this research, PR was supported by a PhD studentship at LSHTM from the SHARE consortium and MJ was supported with funding from the LSHTM SHARE consortium, 3ie, and the Bill and Melinda Gates Foundation for the Orissa Rural Sanitation Health Impact Trial.

Author details

¹Environmental Health Group, Faculty of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK. ²Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA. ³Department of Civil and Environmental Engineering, University of California Davis, One Shields Ave., Davis, CA 95616, USA.

Received: 21 November 2014 Accepted: 2 September 2015

Published online: 10 September 2015

References

1. WHO and UNICEF. Progress on sanitation and drinking water: 2013 update. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 2013
2. WHO and UNICEF Consultant Team. India: Assessment 2002- Water Supply and Sanitation. Planning Commission, Government of India, 2002. <http://planningcommission.nic.in/reports/genrep/wtrsrani.pdf> Accessed on 6 Feb 2011
3. World Bank WSP. A decade of TSC: Rapid assessment of processes and outcomes. Delhi, India: Water and Sanitation Programme, The World Bank; 2010.

4. Akram, D.M. Sanitation, Health and Development Deficit in India: A Sociological Perspective. *Sociology of Sanitation*. Sulabh International. 2013. <http://www.sociologyofsanitation.com/wp-content/uploads/2013/02/Sociology-of-Sanitation-Volume-I.pdf>. Accessed on 30 Jul 2014
5. Ministry of Drinking Water and Sanitation, Government of India. Baseline Survey 2012 - All India Abstract Report. <http://tsc.nic.in/BLS2012/Home.aspx>. Accessed on 6 Jan 2014
6. Ministry of Drinking Water and Sanitation, Government of India. About NBA. <http://tsc.gov.in/TSC/NBA/AboutNBA.aspx>. Accessed on 20 Jul 2015.
7. Ghosh A, Cairncross S. The uneven progress of sanitation in India. *J Water, Sanitation & Hygiene for Devel* 2013, 4: DOI: 10.2166/washdev.2013.185
8. Census of India, Availability and type of latrine facility: 2001-2011. Government of India, 2011. http://censusindia.gov.in/2011census/hlo/Data_sheet/India/Latrine.pdf. Accessed 17 Dec 2013
9. Ministry of Drinking Water and Sanitation and UNICEF. Sanitation and Hygiene Advocacy and Communication Strategy Framework 2012-2017. Government of India, 2012. http://www.mdws.gov.in/hindi/sites/upload_files/ddwshindi/files/pdfs/NSHAC_strategy_11-09-2012_Final.pdf. Accessed on 7 Jun 2013
10. Barnard S, Routray P, Majorin F, Peletz R, Boisson S, Sinha A, et al. Impact of Indian Total Sanitation Campaign on Latrine Coverage and Use: A Cross-Sectional Study in Orissa Three Years following Programme Implementation. *PLoS One*. 2013;8(8):e71438.
11. World Bank WSP. Economic Impacts of Inadequate Sanitation in India - Flagship Report. The World Bank, Delhi, India: Water and Sanitation Programme; 2011.
12. Ministry of Women and Child Development, Government of India. Gendering Human Development Indices: Recasting the Gender Development Index and Gender Empowerment Measure for India. Summary and Full report. Government of India, 2009. <http://wcd.nic.in/publication/GDIGEReport/Part1.pdf>. Accessed on 20 Aug 2015.
13. Government of India. Census. 2011. <http://www.census2011.co.in/census/district/411-puri.html>. Accessed on 12 Jul 2015.
14. Government of Odisha. Odisha Economic Survey 2013-14. http://www.odisha.gov.in/pc/Download/Economic_Survey_2013-14.pdf. Assessed on 16 Jul 2015
15. Centre for Migration and Labor Solutions. Studies, Stories and a Canvas - Seasonal Labor Migration and Migrant Workers from Odisha, Ajeevika Bureau, Udaipur, India. 2014. <http://www.aajeevika.org/assets/pdfs/Odisha%20State%20Migration%20Profile%20Report.pdf> Accessed on 17 Jun 2015
16. Schriewer A, Odagiri M, Wuertz A, Misra PR, Panigrahi P, Clasen T et al. Human and animal fecal contamination of community water sources, stored drinking water and hands in rural India measured with validated microbial source tracking assays. *Am J Trop Med Hyg* 2015. doi:10.4269/ajtmh.1
17. Ministry of Drinking Water and Sanitation, Government of India. Puri District coverage figures. <http://indiawater.gov.in/IMISReports/NRDWPBlockMain.aspx?APP=IMIS&District=0352&DtName=PURI> Accessed 20 Aug 2015.
18. Gopal S, Sarkar R, Banda K, Govindarajan J, Harijan BB, Jeyakumar MB, et al. Study of water supply & sanitation practices in India using geographic information systems: some design & other considerations in a village setting. *Indian J Med Res*. 2009;129(3):233-41.
19. Medhi DK. In Her Husband's Family: A Newly Wed Woman's Expectations and Her New Family's Attitudes in Rural Assam. *Indian J Int Women's Stud*. 2002;4(1):107-16.
20. Sharma I, Pandit B, Pathak A, Sharma R. Hinduism, marriage and mental illness. *Indian J Psychiatry*. 2013;55 Suppl 2:S243-9. doi:10.4103/0019-5545.105544.
21. Laungani PD. Understanding Cross-Cultural Psychology: Eastern and Western Perspectives. New Delhi: Sage; 2007.
22. Coffey D, Gupta A, Hathi P, Khurana N, Srivastav N, et al. Open defecation: Evidence from new survey in rural north India. *Econ Polit Wkly*. 2014;XLIX(38):43-55.
23. Jenkins MW, Freeman MC, Routray P. Measuring the safety of excreta disposal behavior in India with the new Safe San Index: Reliability, validity and utility. *Int J Environ Res Public Health*. 2014;11(8):8319-46. doi:10.3390/ijerph110808319.
24. WaterAid. Feeling the Pulse: A Study of the Total Sanitation Campaign in Five States. New Delhi: WaterAid India; 2008.
25. UNICEF India. Field Data Validation of Total Sanitation Campaign. Briefing paper series. UNICEF, New Delhi, India, 2011. http://unicef.in/Uploads/Publications/Resources/pub_doc79.pdf. Accessed 14 Jan 2014
26. Singh P, Chavan P, Mathur D. Open Defecation: This is also your business! Policy Brief for Parliamentarians. Policy Brief Series No. 20. Centre for Legislative Research & Advocacy, India, August-September 2013 <http://www.clraindia.org/include/ODpolicybriefFinal.pdf>. Accessed on 6 Jan 2014
27. Mania SR. Situation of Sanitation with special reference to rural Odisha. National Conference on Sociology of Sanitation. Sulabh International, 2013. <http://www.sociologyofsanitation.com/wp-content/uploads/2013/02/Sociology-of-Sanitation-Volume-I.pdf>, Pg 79 - 83. Accessed on 30 Jul 2014
28. Pattanayak SK, Yang JC, Dickinson KL, Poulos C, Patil SR, Mallick RK, et al. Shame or subsidy revisited: social mobilization for sanitation in Orissa. *India Bull World Health Organ*. 2009;87(8):580-7.
29. Stopnitzky Y. No toilet, No bride: Latrine adoption and marriage markets in India. Working Paper, May 2011. http://www.webmeets.com/files/papers/aere/2011/444/Stopnitzky_NoToiletNoBride_WorkingPaper.pdf. Accessed on 11 May 2013.
30. O'Reilly K. Combining Sanitation and Women's Participation in Water Supply. *Dev Pract*. 2010;1:45-56. doi:10.1080/09614520903436976.
31. Santhya KG, Ram U, Acharya R, Jejeebhoy SJ, Ram F, Singh A. Associations between early marriage and young women's marital and reproductive health outcomes: Evidence from India. *International Perspectives of Sexual and Reproductive Health*. 2010;36(3):132-9. doi:10.1363/3613210.
32. Jenkins MW, Curtis V. Achieving the 'good life': Why some people want latrines in rural Benin. *Soc Sci and Med*. 2005;61(11):2446-59.
33. Coffey D, Gupta A, Hathi P, Spears D, Srivastav N, et al. Culture and health transition - understanding sanitation behavior in rural north India. New Delhi, India, April: Unpublished working paper. Research Institute for Compassionate Economics; 2015. Available at [www.riceinstitute.org/file:///C:/Users/tsu2/Downloads/CultureSanitationIndia_Dec_2014%20\(1\).pdf](http://www.riceinstitute.org/file:///C:/Users/tsu2/Downloads/CultureSanitationIndia_Dec_2014%20(1).pdf). Accessed 25 July 2015.
34. O'Reilly L, Louis E. The toilet tripod: Understanding successful toilet adoption in rural India. *Health and Place*. 2014;2014(29):43-51.
35. Bean S. Towards a semiotics of "purity" and "pollution" in India. *Symbolism and Cognition*. 1981;8(3):575-95. The American Anthropological Society.
36. Majorin F, Freeman MC, Barnard S, Routray P, Boisson S, Clasen T. Child Feces Disposal Practices in Rural Orissa: A Cross Sectional Study. *PLoS One*. 2014;9(2):e89551.
37. Asian Development Bank. India's Sanitation for All: How to Make it Happen, Water for All Series 18. Manila, Philippines: Asian Development Bank; 2009.
38. LaFond AK. A review of sanitation programme evaluations in developing countries. 1995. USAID. http://pdf.usaid.gov/pdf_docs/PNACB331.PDF. Accessed 8 Jan 2011
39. Elmendorf M, Buckles PK. Appropriate Technology for Water Supply and Sanitation, vol. 5. The World Bank, Washington, D.C.: Sociocultural Aspects of Water Supply and Excreta Disposal; 1980.
40. WSP, IFC. Kenya on-site sanitation: Demand generation strategies. Nairobi, Kenya: Water and Sanitation Program, The World Bank; 2013. <https://www.wsp.org/sites/wsp.org/files/publications/WSP-Kenya-Demand-Generation-Strategies-Brochure.pdf>. Accessed on 21 Aug 2015.
41. Jenkins MW. Sanitation Promotion in Developing Countries: Why the latrines of Benin are few and far between. PhD dissertation. Dept of Civil & Environ: Eng. University of California, Davis; 1999.
42. UK DFID. Water, Sanitation and Hygiene, Evidence Paper. UK: Department for International Development; 2013.
43. Finding Solutions to India's Sanitation Problems. <http://www.ideaconnection.com/open-innovation-success/Finding-Solutions-to-India-s-Sanitation-Problems-00285.html>. Accessed on 27 May, 2013
44. Bonu S, Kim H. Sanitation in India: Progress, Differentials, Correlates, and Challenges. South Asia Occasional Paper Series 2. Manila, Philippines: Asian Development Bank; 2009.
45. Banda K, Sarkar R, Gopal S, Govindarajan J, Harijan BB, Jeyakumar MB, et al. Water handling, sanitation and defecation practices in rural southern India: a knowledge, attitudes and practices study. *Trans R Soc Trop Med Hyg* 2007;57-68.
46. Pushpangadan K. Social Returns from Drinking Water, Sanitation and Hygiene Education: A Case Study of Two Coastal Villages in Kerala. CDS Working Paper, 2002. <http://opendocs.ids.ac.uk/opendocs/handle/123456789/3045#VbTpOaSqkq>. Accessed on 4 Jan 2013
47. Bhattacharya M, Joon V, Jaiswal V. Water handling and sanitation practices in rural community of Madhya Pradesh: A knowledge, attitude and practice study. *Indian J Prev Soc Med*. 2011;42(1):94-7.

48. O'Connell K. What Influences Open Defecation and Latrine Ownership in Rural Households? Water and Sanitation Programme, The World Bank, New Delhi, India: Findings from a Global Review. Working Paper; 2014.
49. All India Institute of Hygiene and Public Health. Draft report on monitoring and evaluation study in respect of rural water supply and sanitation in the state of Orissa, Calcutta, India: Department of Sanitary Engineering, All India Institute of Hygiene and Public Health; 1998. <http://www.ircwash.org/sites/default/files/822-98-15132.pdf>. Accessed on 5 Jan 2013.

**Submit your next manuscript to BioMed Central
and take full advantage of:**

- Convenient online submission
- Thorough peer review
- No space constraints or color figure charges
- Immediate publication on acceptance
- Inclusion in PubMed, CAS, Scopus and Google Scholar
- Research which is freely available for redistribution

Submit your manuscript at
www.biomedcentral.com/submit



4.2 Additional information

This PhD was funded by DFID's SHARE research consortium scholarship. It was a requirement under the scholarship that the research must relate to one of the four research areas identified by SHARE in the field of sanitation and hygiene, and should have demonstrable relevance to 'barrier(s) to sector progresses'. To develop the synopsis for applying the scholarship, field visits were undertaken in rural areas of Puri in order to understand the sanitation conditions. FGDs were conducted during these trips. The data collected through these FGDs are presented in this published paper 1. All these FGD data were processed and analysed after the literature review, when the literatures indicated about the socio-cultural factors constraining latrine adoption.

5. RESEARCH PAPER 2:

Processes and challenges of community mobilisation for latrine promotion under Nirmal Bharat Abhiyan in rural Odisha, India

London School of Hygiene & Tropical Medicine
Keppel Street, London WC1E 7HT
www.lshtm.ac.uk



Registry
T: +44(0)20 7299 4646
F: +44(0)20 7299 4656
E: registry@lshtm.ac.uk

RESEARCH PAPER COVER SHEET

PLEASE NOTE THAT A COVER SHEET MUST BE COMPLETED FOR EACH RESEARCH PAPER INCLUDED IN A THESIS.

SECTION A – Student Details

Student	Parimita Routray
Principal Supervisor	Wolf Peter Schmidt
Thesis Title	Latrine adoption and use in rural Odisha, India : Constraints and challenges

If the Research Paper has previously been published please complete Section B, if not please move to Section C

SECTION B – Paper already published

Where was the work published?	Bio Med Central Public Health		
When was the work published?	16 May, 2017		
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion	No.		
Have you retained the copyright for the work?*	Yes	Was the work subject to academic peer review?	Yes

**If yes, please attach evidence of retention. If no, or if the work is being included in its published format, please attach evidence of permission from the copyright holder (publisher or other author) to include this work.*

SECTION C – Prepared for publication, but not yet published

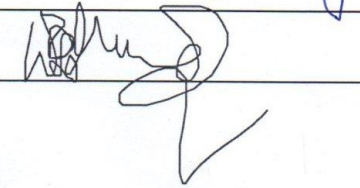
Where is the work intended to be published?	
Please list the paper's authors in the intended authorship order:	
Stage of publication	Choose an item.

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I developed the research idea. Conducted the field work - indepth interviews, focus group discussions, trained the enumerators and supervised the data collection. I analysed the data, drafted the manuscript with inputs from co- authors and responded to peer review comments.
--	--

Student Signature: Pavinita Rautray

Date: 03/09/2017

Supervisor Signature: 

Date: 3-9-17

RESEARCH ARTICLE

Open Access



Processes and challenges of community mobilisation for latrine promotion under *Nirmal Bharat Abhiyan* in rural Odisha, India

Parimita Routray^{1*} , Belen Torondel¹, Marion W. Jenkins^{1,2}, Thomas Clasen^{1,3} and Wolf-Peter Schmidt¹

Abstract

Background: Despite efforts to eradicate it, open defecation remains widely practiced in India, especially in rural areas. Between 2013 and 2014, 50 villages in one district of Odisha, India, received a sanitation programme under the *Nirmal Bharat Abhiyan* (NBA – “Clean India Campaign”), the successor of India’s Total Sanitation Campaign. This paper documents the strategies and processes of NBA community mobilisation for latrine promotion in these villages and assesses the strengths and limitations of the mobilisation activities.

Methods: NBA’s community mobilisation activities were observed and assessed against the programme’s theory of change in 10 randomly selected programme villages from start to finish. Additional data was collected through review of documents, individual interviews ($n = 80$) and focus group discussions ($n = 26$) with staff of the implementing NGOs and community members.

Results: Our study revealed the lack of a consistent implementation strategy, lack of capacities and facilitation skills of NGO staff to implement sanitation programmes, political interference, challenges in accessing government financial incentives for latrine construction, and lack of clarity on the roles and responsibilities among government and NGO staff, leading to failure in translating government policies into sustainable actions. Social divisions and village dynamics related to gender and caste further constrained the effectiveness of mobilisation activities. Meetings were often dominated by male members of upper caste households, and excluded low caste community members and views of women. Community discussions revolved largely around the government’s cash incentive for latrines. Activities aimed at creating demand for sanitation and use of latrines often resonated poorly with community members. An assessment by the implementers, 1 year after community mobilisation found 19% of households had a completed latrine across the 50 villages, a marginal increase of 7 percentage points over baseline.

Conclusions: In this setting, the Government of India’s NBA programme to increase rural sanitation coverage and use is hampered by political, programmatic, logistical and socio-structural constraints. Sanitation demand generation was difficult for local implementing NGOs as village populations had lost trust in organisations due to previous indications of fraud. Agencies or organisations implementing sanitation campaigns and conducting sanitation promotions need to enhance their staff’s knowledge and build capacity in order to address important social heterogeneity within villages. This trial’s registration number is NCT01214785 (October 4, 2010).

Keywords: Nirmal Bharat Abhiyan, Community mobilisation, Sanitation promotion, Caste and power dynamics

* Correspondence: Parimita.Routray@lshtm.ac.uk

¹Faculty of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, London, UK

Full list of author information is available at the end of the article



© The Author(s). 2017 **Open Access** This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.

Background

Widespread open defecation remains a major cause of transmission of diarrhoea [1, 2], worm infection and trachoma worldwide [3]. More than half of the world's population who defecates in the open, resides in India [4]. In the 2011 Indian census, 67% of rural and 13% of urban households reported defecating in the open [5]. Much of the disease burden associated with diarrhoea and stunting in India are thought due to lack of sanitation [6]; and improving sanitation could significantly reduce this heavy burden [7, 8].

The Indian government's attention to sanitation and nationwide interventions promoting rural sanitation started in the 1980's. The Central Rural Sanitation Programme (CRSP), the first large-scale initiative, was launched in 1986. Households were given subsidized hardware to build latrines. The CRSP failed to achieve and sustain high levels of sanitation coverage and usage [9]. In 1999, CRSP was restructured as the Total Sanitation Campaign (TSC) with an aim to end open defecation [10]. To encourage communities to reach full sanitation coverage, Clean Village Awards (*Nirmal Gram Puraskar*) were introduced in 2003 to offer cash prizes to villages that achieved open defecation free status [11, 12]. In a revised guideline in 2007 [11], TSC adopted a 'community-led' and 'people-centered' strategy in which intensive IEC (information, education and communication) activities would lead to increased awareness, changes in open defecation social norms and behavior, and demand for sanitary facilities among rural people.

As in the CRSP, the Government of India (GoI) and state governments continued to extend financial subsidies to individual households to build latrines under TSC, but restricted the support to households below the poverty line (BPL) and changed it from an input subsidy to an output 'incentive', by revising the delivery mechanism from a hardware input under CRSP to a post-construction cash payment [10]. These efforts increased latrine coverage, but many households that built latrines continued to defecate in the open despite owning a functional latrine at home [9, 11–16]. Evaluations of many TSC programmes found that the primary reasons why many failed to generate the expected large gains in rural demand for and use of latrines, were an over-emphasis on latrine construction and ineffective implementation of behavior change processes and IEC activities [11–13, 15].

In 2012, the GoI initiated *Nirmal Bharat Abhiyan* (NBA, "Clean India Campaign") to succeed the TSC with a goal to achieve 100% sanitation access to all rural households by 2022 [17]. This new campaign aimed to accelerate rural sanitation coverage by continuing the 'community-led' and 'people-centred' strategies of the TSC, with increased emphasis on community mobilisation, collective and sustainable behaviour change, and

IEC activities. Financial incentives support continued for building latrines and were offered to more households, both BPL and those identified as above poverty line (IAPL). In October 2014, the NBA was relaunched as (SBA, "Clean India Mission") to achieve *Swachh Bharat* ("Clean India") by 2019 [18]. The SBA approach is also 'community-led' with the addition of 'community saturation', putting a central focus on awareness raising and triggering collective behaviour change [18].

In each of these recent sanitation campaigns (TSC, NBA and SBA), the promotion approach has remained very similar but the financial incentive for building individual household latrine climbed from 3200 Indian rupees (about US\$48) at the end of TSC, to minimum 4600 to 9100 rupees (US\$69 -US\$ 136) maximum in NBA, to 12,000 rupees (US\$179) in SBA [10, 17, 18]. However, the funding for IEC and mobilisation activities in TSC and NBA remained unchanged at 15% of the total project costs [10, 17].

Community mobilisation is a participatory communications approach that seeks to engage the whole community as individuals and as groups, including marginalised populations, to identify their problems, suggest solutions and initiate actions themselves [19]. Participatory methodologies to promote community-wide hygiene, sanitation, and community management of water and hygiene facilities, were formally first developed in the 1980's under the PHAST (Participatory Hygiene and Sanitation Transformation) community-led approach and implemented in African countries and elsewhere during the 1990s [20]. PHAST was an adaptation of SARAR (Self-esteem, Associative strengths, Resourcefulness, Action planning and Responsibility) from the 1970s to motivate communities to improve sanitation and hygiene [21].

Participatory approaches at community level have proved to be effective in changing sanitation behaviours and encouraging latrine adoption in rural Bangladesh, India, Zimbabwe, Ethiopia, and elsewhere. Community-Led Total Sanitation (CLTS) is one example of a participatory approach developed in Bangladesh in the year 2000, to change sanitation behaviours in communities specifically to end open defecation, whose success led to its adoption in communities of Asia and Africa [22, 23]. CLTS adapted PHAST tools and participatory rural appraisal (PRA) techniques and features like 'disgust' and 'shame', to trigger community members to realise that open defecation causes them to ingest each other's faeces and creates risks to the health of the whole community, and to take action to totally end it. Community health clubs, another community-led participatory methodology originally from Zimbabwe was designed to develop community cohesion and a culture of health among the target population, which subsequently led to large increases in latrine coverage, and its success led to

its replication in Asia and Africa [24]. Similarly, a community mobilisation programme for sanitation developed locally in Amahara District, Ethiopia in 2004 resulted in large increases in basic latrine ownership within a year, without any financial incentives or subsidies for construction [25].

Effective community mobilisation interventions for sanitation promotion in India that used various participatory approaches including CLTS also had success increasing the latrine coverage and stimulating adoption and use. Community mobilisation intervention in Neen Gram Panchayat in Shimla District, Himachal Pradesh, led to ODF status in 3 months and a similar mobilisation, radically transformed the traditional lifestyle of a tribal community in Koraput District, Odisha, to become ODF [26]. An intensified IEC campaign and social mobilisation for latrine construction within the framework of TSC in Odisha's Bhadrak District also had a substantial effect on latrine adoption and use [27].

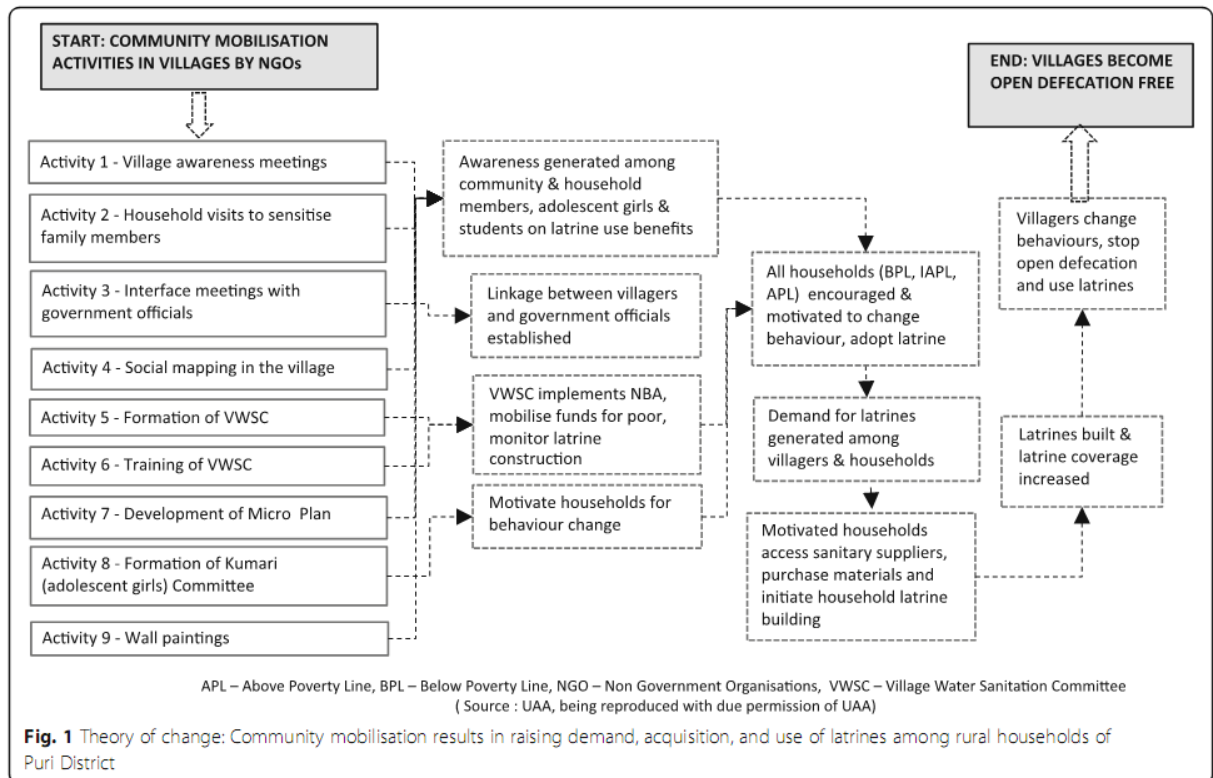
This paper presents the processes and challenges of conducting community mobilisation for latrine promotion under NBA. The key objectives of this study were to: 1) assess the strategies and processes of community mobilisation and community triggering for latrine demand generation as implemented under the NBA, and 2) examine the challenges of executing community-based mobilisation for sanitation promotion in rural communities comprising diverse people of different castes.

Methods

Study setting

This study was undertaken as part of a cluster randomized health impact trial of the TSC intervention in 100 villages of Puri District, Odisha, India [28], where the 50 intervention villages received the TSC programme between 2011 and 2012. The trial's details and the latrine promotion under TSC are described elsewhere [28, 29]. Following the conclusion of the trial, the 50 control villages received the NBA sanitation intervention between 2013 and 2014, as the TSC had been replaced by NBA.

This study examines the roll out of the NBA's community mobilisation for latrine promotion in the 50 control villages, and compares them to the programme's theory of change and to the TSC community mobilisation (described elsewhere) as implemented in the 50 intervention villages [29]. The theory of change shown in Fig. 1, was developed jointly by the lead agency and the intermediary organisation, that involved a series of mobilisation activities, leading to the expected changes and outcomes like higher motivations and demand for sanitation among villagers, change in their sanitation behaviours and end of open defecation. This study was approved by the ethics committees of the London School of Hygiene and Tropical Medicine and the local collaborator - Xavier University, Bhubaneswar, Odisha.



NBA's community-led approach

An intensive IEC campaign was the corner stone of NBA. Each Indian state was to develop its own IEC strategy, including methods such as folk, mass and outdoor media like wall painting and hoarding. Each district then prepares a detailed IEC plan using additional strategies as needed engaging all sections of the community including the *Panchayati Raj* Institutions (PRI - local government), cooperatives, school teachers, community health workers, *Anganwadi* (pre-school nursery centre) workers, women groups, self-help groups (SHGs), etc. To strengthen communication within villages, motivators (*Swachchhata Doot* - "Sanitation Messenger") were to be engaged [17]. Local NGOs of repute could be contracted to implement community mobilisation activities, conduct interpersonal communication (IPC) activities, select motivators, execute IEC such as wall paintings and street plays, and organise capacity building and training of village water and sanitation committees (VWSC), PRIs and grass root functionaries.

NBA's financial incentive for latrine construction

The NBA guidelines prescribed a completed household sanitary latrine to be a 'Latrine Unit' including a super structure constructed by the 'household itself', and upon completion and verification by government officials, the cash incentive was to be directly transferred to the household's bank account. The financial incentive for a completed latrine was 4600 rupees (US\$ 70). All BPL and IAPL households belonging to Scheduled Caste (SC - lowest caste, considered 'untouchable') or Scheduled Tribe (ST - socially disadvantaged indigenous people) were eligible for the financial incentive. Other APL households were supposed to self-finance and construct their own latrines. To further help the BPL households with additional construction costs, the government's Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) was aligned with NBA, that allowed BPL households reimburse from MGNREGS for up to 26 days of labour towards constructing their latrine, a cash value of 4500 rupees (US\$ 69.2) resulting in up to 9100 rupees (US\$ 140) under the NBA-MGNREGS agreement.

Data collection and analyses

For each implementing NGO, two assigned villages were randomly selected for a total of 10 study villages. The research team had access to implementer's field plan prior to the start of mobilisation activities, so the team attended the NGO's staff training and the community-based mobilisation and promotional activities (shown in Fig. 1) in each study village, to observe the settings and the context in which they were delivered, assess and compare them to TSC implemented villages. Two researchers who could understand, read, write and speak

Odia (the local language) attended, observed and documented the processes of these promotions. Data collection began in August 2013 with the start of the training of NGO staff and continued until April 2014. Attending the training helped to understand the implementer's strategy/plans for community mobilisation and guided development of data collection tools. Table 1 outlines the research questions, methods, indicators and tools used in this study.

The assessment involved qualitative data collection of the mobilisation activities (as in Fig. 1) by attending and observing; review of records and reports of NGOs and different committees at village level, conducting Focus group discussions (FGDs) with NGO field staff ($n = 6$) and community members ($n = 20$); and in-depth interviews (IDIs) with community members ($n = 80$) who had participated and witnessed promotional activities (Table 1).

In each study village, two FGDs were held with community members, one each with men and women (comprising 6 participants), 2 weeks after the NGO had completed all their mobilisation and sanitation promotions, so that participants could recall the NGO's activities. FGD respondents were purposefully sampled for their insights and experiences into specific components or processes. FGDs lasted for 1–1.15 h and were facilitated by the lead researcher, who was fully conversant in *Odia*.

Similarly, 8 individuals (2 each of adult men and women, 2 each of adolescent [ages 16–18 years] girls and boys) per study village were interviewed about: 1) different aspects of community mobilisations by the NGO; 2) their understanding of the NBA; 3) how the mobilisation activities resulted in triggering people to demand for latrines; and 4) challenges posed by the communities to the NGOs during mobilisations. Using a sample frame from the attendees at the initial community meetings, we purposefully selected participants representing different community demography. The IDIs lasted for 25–30 min and to help ensure data quality, the lead investigator was present in half of the IDIs. FGDs and IDIs were audio recorded, transcribed and translated into English for analysis.

All data collection tools were developed in English and translated to *Odia*. The FGD and IDI protocols were piloted to check acceptability, feasibility and accuracy prior to use. All the qualitative data (transcripts of FGDs and IDIs and the observation notes) were collated and analysed using a thematic approach and the steps involved were: (1) familiarisation with the data by reviewing transcripts and notes and listing recurrent themes; (2) development of a coding framework for emerging themes; (3) coding the data and annotating the transcripts and observation notes; (4) rearranging the data according to the appropriate theme in N.Vivo (QSR International); and (5) interpreting the thematic data and identifying association between themes.

Table 1 Sanitation promotion under NBA: Assessment objectives, indicators and data collection tool

Aspects of Community Mobilisation	Data collection method	Indicators	Data Source
Aim 1: To assess the strategies and processes of community mobilisation and community triggering for rural sanitation demand generation under the NBA			
NGO field staff training	Document review, Attending the trainings/ Direct observation, FGDs with facilitators (n = 6)	Enhanced knowledge of facilitators	Training manual and presentations; Researcher's observations; FGD notes
Staff's action plans of implementing NGOs	Documents review	Existence of NGO's field action plans	Field/Action plans
Facilitators' understanding of the intervention design/plan	FGDs with facilitators	Existence of activity plans of field staff	NGO's field plans; FDG notes
Formation of different committees	Document review, Attending the meetings	Committee members executing the campaign	Committee registers
Community's understanding of the intervention	FGDs with villagers (n = 20)	Villagers' awareness on objective of NBA; Changed perception and attitude towards OD; Demand for latrines generated	FGD notes
Aim 2: Examine the challenges of executing NBA in socially diverse villages			
Challenges in organizing community mobilisation	Attending and observing village mobilisation activities FGDs with villagers (n = 20) IDIs with (n = 80)	Community understands latrine's importance and unites to implement NBA Challenges identified by community members; Existence of IEC materials, their distribution among people and their effective use for awareness generation and behaviour change	Researcher observations FGD and IDI notes; Researchers observations
Facilitators' understanding of the challenges	FGDs with facilitators	Challenges identified by NGO staff	FGD notes

Results

Programme preparation process

Programme structure

The implementation of NBA in the 50 villages was led by WaterAid, an international water, sanitation and hygiene (WASH) NGO that contracted an Odisha based NGO - the United Artists' Association (UAA) with substantial experience in WASH, to facilitate the community mobilisation and latrine promotion. A Memorandum of Understanding (MOU) was signed between WaterAid (hereinafter referred as 'lead agency') and UAA (hereinafter referred as 'intermediary organisation') to facilitate NBA implementation in the villages. The village level mobilisations and promotions was subcontracted to 5 local NGOs (10 activities shown in Fig. 1), but UAA was responsible to coordinate the implementation between the local NGOs, the government representatives and the concerned departments and its officials. Specific criteria was not outlined for the selection of local NGOs, but all of them had 5 or more years of experience implementing WASH and had been past partners of the lead agency.

Each NGO formed a field team of four members - one Cluster Coordinator (CC) and three Gram Panchayat Sanitation Facilitators (GPSFs). Each GPSF was assigned 3–4 villages; their field plans were discussed and

finalised in consultation with their CC. CCs were the focal points responsible for overall implementation in the 11–12 villages and tasked with supporting the GPSFs in the delivery of all activities and monitor their work. The delegation of work and the staffing for the field execution were the same as that of the TSC villages [29].

Training of NGO field staff

In August 2013, with guidance and support of the lead agency, the intermediary organisation conducted a 3 days training for the NGO field team. Topics covered were (i) poverty and its relation with sanitation; (ii) millennium development goals and the country's sanitation targets; (iii) faecal-oral transmission routes [30]; (iv) PRA techniques for mobilising people; (v) preparation of village's social map; (vi) NBA's features and guidelines; and (vii) lead agency's sanitation promotion strategy and their achievements. These topics were largely the same as those covered in the NGO field staff training for TSC villages [29]. Power point presentations, games, group exercises and picture cards (with drawings of sanitation and hygiene scenarios) were the methodologies used in the training.

While being occasionally supported by experts from private institutes and District Water and Sanitation

Mission (DWSM - a district level government agency that promotes WASH), sessions were led by just one male staff of the intermediary organisation, who seemed to lack adequate knowledge on some of the mentioned training topics. DWSM experts were unable to remain present for the full sessions allotted to them, to explain the NBA guidelines and government's strategy for implementation. Therefore, many of the questions of staff regarding components of NBA were left unheard, unanswered and not clarified. Staff's roles and responsibilities were not explained in the trainings, but latrine construction and achieving latrine targets in a certain timeframe was emphasised throughout the training, though latrine construction not being NGOs' responsibility under the NBA (see quotes Table 2, Lack of clarity among NGO staff).

Newly joined staff and those lacking prior experience implementing sanitation campaigns or WASH, found the trainings 'not adequate'. Some experienced staff were dissatisfied and felt these trainings as general orientation to different sanitation related topics, which did not help enhance their capacities, acquire new knowledge or skills essential to take up the bigger role of mobilising and facilitating participatory approaches for behaviour change and sanitation uptake among villagers (see quotes Table 2, Poor quality of training for NGO field staff). Apart from this one training, no further refresher training over the 9-month mobilisation period were organized, despite staff's request for more trainings on aspects like PRA, etc. The field staff largely applied their existing knowledge, which could be unrelated to sanitation.

Process of community mobilisation

Introductory meetings and programme initiation

GPSFs and CCs visited each village and mostly met the *Sarpanch* (elected local Panchayat head) or the village ward member to inform them of their visit purpose, and fix a date for conducting an initial awareness meeting for all villagers. They delegated a responsible and respected influential villager to call a meeting for the said date. In this first or in subsequent visits, they also got introduced to others - such as the Panchayat *Samiti* (committee) member, *Anganwadi* worker, adolescent girls and women SHG members. However, in two villages of two different NGOs, the introductory meetings could not be held due to resistance by some local politicians (for reasons related to corruption explained in discussion). All efforts by NGO staff, the lead agency and the intermediary organisation were blocked and none were able to rectify the situation. As a result, these two villages were dropped from the NBA intervention. Similarly, field staff in a few other villages were frequently pressured by local politicians to prioritise or de-

prioritise certain communities (see quotes Table 2, Programme initiation: political interference).

One of the 5 NGOs adopted a different approach. They made door-to-door visits where households were informed about NBA's implementation in their village and this gave the staff an opportunity to meet all family members and sensitise them about sanitation and latrine's importance. The value of these home visits and how more effective they were for engaging women in the process compared to the general village awareness meetings, is illustrated by one villager's quote (see Table 2, Programme initiation: value of door-to-door visits). From a gender inclusive community participation perspective, door-to-door visits appeared to be a promising way to increase awareness and demand for sanitation, especially among females.

Village awareness meetings

Awareness meetings gathering villagers at a public place was convened by NGO staff in each village, where they mostly delivered a speech touching on topics around health impacts and dignity loss especially of women by open defecating, and the importance of latrines. Latrine construction was greatly emphasized and no other triggering activities were done. Patriarchal logic were used to promote the construction of latrines and the messages frequently conveyed were:

- *Defecating in the open is shameful especially for women. (NGO staff)*
- *We should feel ashamed that women are seen with their private parts exposed while defecating in fields, whereas at home, they are asked to keep their heads covered, under veil. (NGO staff)*

We observed, villagers were often clearly uninterested in these topics but higher financial incentive of NBA lured many villagers to attend and they were impatient to learn about the budget the NGO had for latrines, and how the latrine would be built (see quotes Table 2, Village awareness meeting: fixation with construction subsidies). Staff spent considerable time explaining the funds available for latrines under NBA and MGNREGS and ways to access them.

Motivated by the cash incentive, many households initiated latrine construction preparations just a few days after these meetings, expecting the NGO to build latrines for them, advance all costs and organize transportation of construction materials (as practiced under the TSC), and themselves making only the nominal cash and labour contribution. Upon this not happening, many who lacked funds to finance construction on their own, abandoned their efforts. Many refused to resume the construction, if they did not get paid the initial money

Table 2 Study participant's quotes on sanitation promotion and community mobilisation activities

Topic	Detailed quotes
Poor quality of training of NGO field staff	<ul style="list-style-type: none"> • <i>Training was not enough, and we should have had another training programme. We still have doubts as to how it [NBA] will be done, who will do it and when will it happen. (FGD – NGO)</i> • <i>When people say we don't have sufficient funds to build a latrine, then, we don't know how to motivate them. (FGD – NGO)</i> • <i>In a community there are different ways of educating them but we were not given those aids and tools. (FGD – NGO).</i> • <i>At the time of recruitment, we perceived funds to be given to us by the intermediary NGO or government to build latrines in the villages. It is only in the training in Puri, we got to know that through 'awareness generation and mobilisation' only, we have to facilitate the latrine building in villages and achieve the latrine targets, which is difficult. (FDG – NGO)</i> • <i>At the end of the training, we were given latrine targets to be built each month, although we were not directly responsible for latrine construction. (FGD – NGO)</i>
Lack of clarity among NGO staff	<ul style="list-style-type: none"> • <i>When we visit the villages for mobilisation meetings, whatever strikes to my mind, I tell them. If I have experience on HIV, then, I tell them about HIV and other health issues even if it is not related to sanitation. Whatever little I know about sanitation, I just tell that to those villagers. (FGD – NGO)</i> • <i>We have learnt only 7–8 points from the 3 days training and when it comes to applying these learnings in the field to motivate people, these 7–8 points is insufficient. Then, we apply our existing knowledgebase and not the knowledge gained from the trainings.(FGD – NGO)</i> • <i>Whatever we have in our brain, we speak and discuss those, as much as possible and when our stock get exhausted, then we keep mum. (FGD –NGO)</i> • <i>I have joined now and villages are new for me, so I wanted more training and clarity on mobilizing government funds, but old staff said they don't need any training. I was then told to concentrate on construction and let go the training. (FGD - NGO)</i>
Programme initiation: Political interference	<ul style="list-style-type: none"> • <i>There are interferences by political parties and the local politicians. The local leaders dictate us [NGOs] in which village to work/ not work. And if we don't listen to them, then they do not let us to enter the village or allow holding any meetings. They also directed in which hamlets, the latrines are to be built/ left out. They even threatened to take our lives, if we did not listen to them. (FDG – NGO)</i>
Programme initiation: value of door-to-door-visits	<ul style="list-style-type: none"> • <i>The NGO man visited our houses and explained about the latrine programme to all the members present in the house and answered our queries too. His visiting our house was nice, and we could learn more about the latrine building work [programme] of government. By this, the female family members who would not have participated in the village meetings and in the midst of the crowd, could participate and interact with them. (IDI – adult female)</i>
Logistical constraints in mobilising people for community meetings	<ul style="list-style-type: none"> • <i>Gathering people at a common place is very time consuming. There are people who do not come to meetings, even if they are informed in advance. Some come as per their wish. So, we have to wait and sit [convene the meeting] according to villager's availability and time. Whichever time they gave us, we made ourselves available in the village, which could be a Sunday or Saturday, and sometimes in the evening. (FDG – NGO)</i> • <i>Ours is a big village, and it is difficult to bring people of all castes and sections to one location and do the meeting. (IDI- adult female, general caste)</i>
Village awareness meeting: challenges engaging women	<ul style="list-style-type: none"> • <i>In many villages, we held meetings in a public place like schools instead of a temple [as some lower caste people are not allowed to enter the temple premises] so that all sections of the village, men and women could attend. In the meetings, women always sat at the back, behind the men and mostly do not voice their opinions, which was a challenge to engage women in the discussions and to get their views and feedback. It's because our society does not allow them to sit in the front. (FDG - NGO)</i> • <i>There are gender related issues, the challenge of bringing people of both sex to the same platform. To mobilize men and women and getting them to sit in one platform was difficult. Men and women do not agree to sit together [share the same space]. Married women said they will not sit along with men, as they may touch their (elder) brother-in-laws [referring to the social norm]. Despite trying several times, we failed to bring them together. (FGD – NGO)</i> • <i>Due to this social norm of women reluctant to share the same platform with men, we had to hold separate meetings with women and men folks. Due to this, we also had challenges in formation of Village Water Sanitation Committee. Some members for the committee were nominated by men and the rest by women, in separate groups. (FGD – NGO)</i>
Village-wide meetings: exclusion of low caste members	<ul style="list-style-type: none"> • <i>While conducting a meeting at the mandap [a raised platform next to the temple], general caste people are unwilling to let the lower /scheduled caste (SC) people sit with them and were made to sit on the floor. During a VWSC formation, SC people had to sit away from the general caste people. (FGD –NGO and Observation)</i>

Table 2 Study participant's quotes on sanitation promotion and community mobilisation activities (Continued)

	<ul style="list-style-type: none"> • We heard of a meeting taking place in the main village to discuss latrine construction but, we were not called to the meeting. Only 2–3 elders from our hamlet attended it. (IDI – adult female, low caste hamlet) • We are low caste people, and higher caste people did not like our joining the meetings. (IDI – adult male, low caste). • What's the point in attending such [interface] meetings where all the decisions are done by high class and influential people and our views are not even heard. (IDI – Adult male)
Village awareness meeting: fixation with construction subsidies	<ul style="list-style-type: none"> • Don't we know about open defecation, and impact? Don't beat around the bush. Who has time to listen to all these things? Come to the main topic. Just tell how much you have got to pay us for the latrine. (Observation– village mobilisation meeting) • The NGO had a meeting, and told about dignity loss and shame by defecating in the open. This is nothing new, we already know, it is also shown on TV. Instead, if the NGO have got funds for latrines, then, they should immediately start building them. (IDI – Adult Male) • We were told that the NGO has brought the latrine programme to our village and if we do not attend the NGO meeting, we will be excluded from the latrine construction list. Therefore, I have come to attend this mapping meeting. (IDI – Adult male)
WVSC membership: exclusion of low caste	<ul style="list-style-type: none"> • Why nominate those SC people for the committee. They are illiterate and it will not be useful to have them in the committee. (Observation – village mobilisation meeting)
Kumari Committee: perceived value	<ul style="list-style-type: none"> • Adolescent girls are a good channel/ medium to influence the parents on sanitary habits which would later facilitate latrine adoption. (FGD – NGO) • If a son asks his father for something, the father may not listen or turn it down, whereas if the daughter demands it, then the father listens and pays attention. (FGD - NGO) • If a daughter tells her father that I am now grown up and feel shy to defecate in the open, the father would construct a latrine for her. Whereas, if a son repeatedly asks the father, he would not do it. (FGD - NGO)
Kumari Committee: lack of purpose	<ul style="list-style-type: none"> • We were told to clean the village by the NGO, which all girls did a couple of times with other villagers help. But after those few cleaning events, everything stopped. Now we do not do anything as no one directed us, what we should be doing next. So we don't know what we are supposed to do as a member of the Kumari Committee and what our deliverables are? (IDI –Kumari Committee member)
Social mapping: used to track open defecation	<ul style="list-style-type: none"> • Through maps, we show the villagers the vulnerable or contamination points caused by open defecation, and after latrines are constructed and used, they can see the transformation of these contamination points to better places. (FDG- NGO).
Wall painting: dissonant NGO and villager perceptions	<ul style="list-style-type: none"> • By seeing the wall painting, they [villagers] identified the open defecation sites and also felt guilty for their acts and realised what their village's sanitation situation was. (FDG – NGO) • These NGOs have received funds from government to build latrines for our village, but they have siphoned off money meant for us, and in return only doing this painting. (IDI – adult male)

spent on construction. The change in supply-side execution modalities in NBA, in which NGOs were no longer pre-financing and managing the latrine construction on behalf of eligible households, made villagers realize that they were no longer dependent on the NGOs to get the cash incentive reimbursed from the government. So they did not consider these awareness meetings important. This posed challenge for the NGOs to mobilize more people to these meetings and motivate them for latrine adoption.

An important objective of these awareness meetings was to regain lost trust during previous sanitation campaigns, in which some other NGOs and individuals had fraudulently collected money from households, with the promise to build latrines. NGOs used this forum to issue alerts to villagers to not give money to anyone coming in the name of latrine construction. Many villagers did not attend these meetings, when they learnt they were ineligible to receive

any cash incentive, as they already claimed one in government's previous sanitation programmes. With low level of participation in these meetings, it became difficult for the field staff to prepare a comprehensive list of households eligible for the cash incentives.

In one out of 10 awareness meetings, we observed cards containing pictures of sanitation and hygiene scenarios being used to enable villagers distinguish between good and bad sanitation and hygiene practices. This picture card set was developed by the lead agency for a past sanitation programme and had not been pre-tested for use in NBA's mobilisation activities, but each NGO was provided with only 'one' set of these cards. Without a card set for each staff to carry to the field, NGOs stored the set in their offices. Other than these meetings, staff mentioned using these cards during household visits and group meetings. In IDIs with villagers, none mentioned being shown any

picture cards. Other than this card set, staff were not equipped sufficiently with audio - visual aids, essential to be used as channels to sensitise, and generate interest among villagers for latrine adoption, though it was the intermediary organization's responsibility to make these resources available to the NGOs staff. With this not happening, leaflets with features of NBA (by DWSM for free distribution) were obtained by only two NGOs and were seen being distributed in only two meetings.

We observed several other challenges encountered by the staff in mobilizing people and convening awareness meetings such as fixing a meeting date and time that suited most villagers. Fundamental logistical constraints were faced in bringing together villagers of different castes to the meeting venue and facilitating the discussion especially engaging all in the discussion (see quotes Table 2, Logistical constraints in mobilizing people for awareness meetings). In most study village's meetings, a small portion of the population (mostly adult and young men from higher castes) attended and voiced their opinion. In all cases, though women joined these meetings, their numbers were very low compared to men and refused to sit with men. They allowed the men to speak on their behalf and themselves did not participate in these discussions (see quotes Table 2, Village awareness meetings: challenges engaging women). There were no systematic attempts either by higher caste people or by the staff to overcome existing caste divisions and engaging lower caste people in these meetings and in the discussions (see quotes Table 2, Village wide meetings: exclusion of low caste members).

Interface meeting between NGO staff, villagers and local government representatives

Convened by NGO staff, with representation from lead agency and intermediate organisation, the interface meeting meant to introduce villagers to key government officials ((block level officer(s), engineer(s)) in charge of NBA's and MGNREGS's financial incentive processing, so that households could directly access their help for funds reimbursement. The ward member was present in most meetings, but the *Sarpanch* and the government officials, whose presence was considered important, were largely absent. This forum was eventually used to validate the village social map and prepare the list of eligible households for the cash incentive. Far fewer villagers attended interface meetings than attended awareness meetings. SC people (considered lower caste) were not allowed to share the same sitting space with that of higher castes. Similarly, women did not sit with men (for the same reasons as described earlier). In villages dominated by Brahmin (highest caste) households, the discrimination for lower caste people sharing the same platform space was particularly pronounced especially when interface meetings were held in temples, which occurred in 3 study villages. NGO staff

were also not seen making dedicated efforts to mobilise more villagers to attend and those that attended could not differentiate between the objectives and outcomes of interface and awareness meetings.

Village water and sanitation committee (VWSC) formation and training

VWSC comprised of 15–20 members with representation from all sections, castes, and with equal numbers of men and women and it's formation was the responsibility of the local implementing NGO. The role of VWSC as explained by NGOs was to facilitate sanitation implementation in villages, like identify space and take decisions about allocating communal land for poor landless families lacking land to build latrine, mobilise credit or revolving funds to finance their construction in advance of receiving their cash incentive, and monitor latrine use post construction. But, initiatives around funds mobilisation for poor were not observed being undertaken either by the NGOs or the VWSC. Some discrimination against SC people's nomination to VWSC by villagers was noticed (see quotes Table 2, VWSC membership: exclusion of low caste).

A single training of one half to 1 day was convened by each NGO for 2–3 members invited per VWSC (mostly President and Secretary). A resource person from the intermediary organisation mostly imparted these trainings, which lasted for only 2–3 h. Any module nor any schedules were observed being prepared or followed for the training, indicating lack of advance planning or designing of the sessions. The attendees did not seem to take the training seriously, and often the female attendees reached late to the venue, delaying the start by 1–2 h. More effort was seen being laid on preparing lunch for the attendees than conducting the training. The learning from these trainings was to be shared with other VWSC members but in the IDIs, members frequently expressed lack of clarity on their roles and responsibilities.

Kumari committees and sanitation promotion

Kumari Committee as a concept was conceived by the lead agency and previously implemented in the TSC villages, which was replicated in NBA villages. It is an adolescent (unmarried) girls group formed in each village, where its members are expected to reach out to other households in the village, motivate and encourage the family members to adopt and use latrines. Without any restrictions on committee size, membership varied depending on the number of unmarried adolescent girls living in the village. The NGO leaders and it's senior staff regarded *Kumari* Committees, to be playing an important role in generating demand for latrine, which was based on their belief that adolescent girls have a particular persuasion power on parents (see quotes Table 2, *Kumari* Committee: perceived value). In contrast to NGO leadership, CCs and GPSFs

seemed far less convinced of this concept. They remarked of forming these committees upon receiving instructions from the intermediary organisation, without fully understanding the committee's purpose and its member's roles and responsibilities. No training programme was specifically organized for the members and members seemed to have not understood their roles and responsibilities.

Documentation of committee's formation, resolutions, guidelines for membership or activities report were not found, except the research team witnessing the one time drawing competition held among the members, following instruction from the intermediary organisation. In these competitions, participating members were asked to draw the WASH situation of their village, but the members were unable to relate the idea of drawing competition with the latrine promotion, though NGO staff believed such competitions would sensitise the members to maintain a hygienic and dignified life. As indicated in quotes (see Table 2, *Kumari* Committee: lack of purpose), the committee's activities appeared to have been implemented primarily to fulfil instructions from higher up.

Social mapping exercise

Social mapping (Activity 4, Fig. 1) was supposed to be held in village's any public place engaging maximum villagers possible, in drawing a map of their village identifying habitations, streets, important landmarks and locating all open defecation sites with the aim to raise awareness on adverse impacts of open defecation. In the absence of government's specific guideline for social mapping, variations were observed in the way the mapping exercise was carried out by the NGO field staff. Some mobilized 'only villagers (around 50 – 60)'; while others involved 'only VWSC members (around 6–7)'; some fully entrusted the 'VWSC' to prepare whereas, some sketched the map themselves and finalised it later in consultation with VWSC members. Some were creative in drawing the map, identifying and labelling OD areas as "contamination points", with the aim to draw a comparative map 20 months post this sanitation intervention, to show people the changes in the village's sanitation situation (see quotes, Table 2, Social mapping: used to track open defecation). The time spent preparing the maps varied between few hours to several days.

In one NGO, none of the staff had experience preparing social maps. Despite their requests to the intermediary organisation for trainings especially on PRA and mapping, it was not held. One CC admitted not knowing what a social map comprised of, its purpose or the preparation process, explaining he was entrusted by his organisation to draw the maps because he was good at map drawing. Many villagers revealed of not knowing about their village's social map preparation. Some villagers participated in these mapping exercises because they felt somewhat coerced (see last quote, Table 2, Village awareness meeting: fixation



Fig. 2 Wall painting in a study village

with construction subsidies), but were not able to explain the purpose of these maps and correlate with sanitation.

Wall painting

A wall painting was drawn as a part of mobilisation activities (see example, Fig. 2) at a strategic location in the village, facilitated by NGOs with funding support from lead agency. The painting had two elements: the F-Diagram of faecal - oral transmission pathways of diarrhoea pathogens [30], and the village's social map. A few wall paintings included slogans on the impacts of open defecation and the importance of latrine use. These paintings were believed to open villagers' eyes to their village's poor sanitation situation and the negative health impacts of open defecation. However, the F-Diagram was not explained to villagers, and therefore many failed to understand or explain it to us. In some villages, these paintings created a negative impression, and rumours were spread against the NGO misusing latrine construction's financial incentive for the wall paintings (see quotes Table 2, Wall painting: dissonant NGO and villager perceptions).

Micro plan

A 'micro plan' was prepared for each village by the NGO staff. Together with a few villagers and sometimes involving VWSC members, they collected past 20 years data on people's lifestyle, their health and education status, drinking water provisions in the village, which was then mapped to see the development in the past years and then identified the present needs. The staff could not explain the objective behind the preparation of the micro-plan, how the data or plan would be used or integrated into other sanitation promotion activities but informed of receiving instructions from higher ups to collect data in a prescribed format (covering the above mentioned aspects). During interviews,

villagers and VWSC members expressed their unawareness of any micro plan prepared for their village and had not heard the term 'micro plan' before.

Discussion

This research shows the community mobilisation and IEC activities (meant to generate demand for latrines, encourage latrine adoption and eliminate open defecation behaviour) in the villages, implemented in both the versions of the sanitation campaigns - TSC and NBA, differed little [29]. Similarities were many that included the programmatic arrangements where the lead agency - WaterAid collaborated with the same intermediate organisation - UAA to execute the campaigns, and the intermediate organisation further delegating the village level sanitation promotion to the local NGOs. The implementation strategy, approaches and the management of village level activities and mobilisations by the cluster coordinators with the team of motivators were same which included the introductory meetings by NGO field staff, awareness meetings, door to door household visits, formation of VWSC and Kumari committees, training of the VWSC members on the same topics, social mapping of the village, wall paintings and messaging around health impacts, environment pollution and dignity loss of women. The additional activities held in TSC but not held in NBA were the transect walks in the village and walk through the open defecation site, wealth ranking to identify poorest households and latrine allocation to households based on their economic status, field staff training on PRA techniques, selection of 'master masons' and their training on latrine construction. Some of the new mobilisation activities tried in NBA were the interface meetings and micro plan preparation. The major difference were the roles and responsibilities of the field staff implementing these campaigns. In NBA staff were confined to conducting sanitation promotions and mobilisations, whereas in TSC, they had additional responsibilities of facilitating household latrine construction and procurement of construction materials [29].

The mobilisation activities were not well received by villagers in NBA implemented villages is evident, as people were mainly interested in the enhanced financial incentive for latrine construction. The infrastructure building orientation was a major weakness of the TSC which the NBA was designed to overcome, but in practice at least in this case, it has not [31, 32]. NGO staff was assigned latrine targets although household latrine construction was not their responsibility, resulting in a strong bias on pushing latrine construction in village awareness meetings. Several important logistical and organisational weaknesses observed in the approaches to promote sanitation under NBA, many of which have been noted previously in the context of TSC [11] are discussed below.

Implementation strategy

A well defined implementation strategy was not laid out by the implementers – both the intermediary and the local NGOs for NBA's mobilisation and sanitation promotion, which is reminiscent of TSC's inconsistent implementation of community mobilisation and IEC activities in the first 50 villages [29] and in other parts of India [9, 11, 12]. There were neither clear government instructions or guidelines for the NGOs to follow, nor any monitoring mechanism by government to track NGO's work and deliverables. Evaluations have found IPC to be the most effective communication method within IEC to persuade people and create demand for sanitation [12], which again proved to work well with home visits for sensitising all household members. The GoI's 'Sanitation and Hygiene Advocacy and Communication Strategy Framework 2012-17' [33] emphasises IPC at the grassroots level, but our research shows, staff were not trained on IPC and facilitation skills resulting in non use of this framework.

Post mobilisation activities, presence of a supply side, sanitation marts or a supply chain strategy and some mechanism to obtain credit would have encouraged the motivated villagers to access the latrine construction materials and services or obtain credit to pre-finance their latrine construction, but its complete absence during this NBA implementation is a major oversight in any sanitation programme aiming to achieve gains in improved latrine coverage.

NGO – Government collaboration

Though local NGOs were implementing NBA on behalf of the government, block level government officers were not officially introduced by the lead agency or the intermediary organisation about the NGO partners. This official recognition of NGOs and their field staff was important, as they were the liaison point between government and villagers, and responsible for facilitating and implementing NBA's various components. Requests by NGO staff to the intermediary organisation to organise their introduction meetings with government officials had yet to be addressed 1 year into programme implementation. The lack of NGO's official recognition compromised their acceptability by villagers, as well by the government officials. This possibly did not motivate the NGO field staff to reach out to the government officials, engage them in interface meetings or avail their resources like IEC materials. At the other end, in the absence of any monitoring mechanism by government, officials failed to gain knowledge on how the NBA was delivered and its performance in the villages, which is a clear sign that NBA, like TSC, continues to be a poorly coordinated campaign at the local government and political level [9, 11, 32].

Political interference

Political will or supportive political leadership is considered to be essential for sanitation promotion [34, 35]. In India, political will is strong at the national level with the Prime Minister taking special interest in sanitation. There are also cases in India where sanitation targets were achieved within a few months due to the special interest shown by a local minister [36]. In contrast in this case, some political leaders interfered to block all latrine promotion activities in few villages. During general elections held across the country and in Odisha state in May 2014, political tensions led to halting of promotional activities. In the post-election phase, some new elected representatives who had recently gained power, sometimes caused problems, as one NGO facilitator noted: *"If some villagers did not vote for a particular leader, that leader did not cooperate to approve the documents needed for government's financial incentive reimbursement."* Some representatives were not keen to take forward the programmes initiated by their predecessors. *"Many government programmes are passed through the local representatives, so these leaders take advantage of this situation and create hindrances in processing the subsidies"*, said a villager who was also a ward member.

Corruption

Cases of corruption have been reported in previous sanitation programmes [38]. The discrepancies in sanitation coverage rates between the Census 2011 and the Ministry of Drinking Water and Sanitation, attest to the existence of latrines in government records that are not real [37, 38]. In 4 study villages, community members reported of past fraud by some other NGOs collecting money per house to construct latrines and then absconding forever. As a result, these villagers stated that they distrusted the present NGOs and therefore largely ignored the mobilisation activities. In another study village, the ward member along with some influential people had previously raised false bills and stole the TSC's incentives for new latrine construction, meaning households owning latrines in government records. As a result, households were disqualified from receiving government's financial incentive. When the NGO staff tried visiting this village to convene mobilisation meetings under the NBA, the ward member and his partners threatened these staff to not enter this village for fear of being exposed; the village was then dropped from the NBA implementation.

Financial incentive for household latrines

The latrine coverage in the 50 NBA programme villages, 9 months after the completion of mobilisation activities was only 19%, an increase of 7 percentage points compared to the baseline (as per UAA's own report), despite the increased financial incentive. This is low compared to 63% coverage achieved within a year of TSC implementation in

first 50 villages [28]. There are various possible contributing factors for this lower latrine coverage. First, there were changed roles and responsibilities of NGOs in these two campaigns in organising, procuring, and transporting materials and constructing latrines. People were used to NGOs building their household's latrine under the TSC, whereas in NBA, NGOs were no longer building or pre-financing latrines for eligible households, so people may have lacked the initiative, knowledge, technical skills, or credit/financing to procure and build latrines themselves. Second, there was no viable supply strategy in place and rural sanitation markets not set up as in TSC, which led to lack of information among interested households about the models to build, cost of construction, availability and quality of the supplies, etc. Third, there was poor communication by the NGOs about NBA's financial incentives reimbursement modalities, so villagers were unaware when they could claim reimbursement. The guidelines stated that a household could claim the cash incentive only upon latrine completion and met the government's design requirements. Fourth, the GoI had long recognised the financial reimbursement to be cumbersome for both the households and officials under the TSC [12], yet improvements were not made in this aspect in the NBA, as officials and NGOs facilitating, both lacked understanding on processing of the incentive [14, 39]. Further the process got more cumbersome after institutional convergence and part reimbursement from DWSSM and MGNREGS. Block officials in-charge of issuing the work orders required for a household to obtain MGNREGS reimbursement of the labour contribution for latrine construction had no knowledge about the convergence and did not cooperate with the NGOs. Thus, it is evident that sanitation promotion through community mobilisation and behaviour change activities alone, failed to deliver the desired results as envisaged by the theory of change by the lead agency and intermediary organisation.

Capacities of NGOs and intermediary organisations

One of the key issues identified in this study, corroborating earlier findings from the TSC, is the lack of trained professionals and agencies to implement sanitation campaigns at village level [9, 11, 40]. Experiences from CLTS in Bangladesh [23], a community-managed sanitation programme in India's Kerala state [41], evaluations of the TSC [11, 12] and PHAST approach [20], all emphasise the importance of training and developing skills of programme staff to plan and carry out community-based activities effectively. Sanitation promotion activities comprising mobilisation and awareness meetings, behaviour change triggering processes and other activities to generate demand among community members require experience and facilitation skills, which the NGO staff in this study admitted to be lacking [22, 23]. Despite years of experience in WASH programme

implementation, both the intermediary organisation and the NGOs did not implement any innovative mobilisation/triggering strategies and most activities were similar to that followed in the TSC. Even the messaging was built around the same old patriarchal logic of women losing dignity by defecating in the open, which made people to perceive that a latrine is mainly important for a 'woman,' and 'men' to perceive no felt need to change their defecation behaviour. These findings suggest the need for competent and experienced NGOs that are process orientated and their approach to sanitation promotion is well planned and sustainable. Additionally, the staff's capacities in terms of improving their facilitation skills, engaging the communities in the development process, enabling them to be more innovative and creative in designing and delivering the programme components is equally important, so also the budget allocation for the staff's capacity building.

Socio-cultural dynamics among communities

There are significant cultural reasons for low sanitation demand in India [42]. Studies have found people continuing their age-old habits of open defecation and their sanitation behaviours being strongly influenced/ingrained with rituals, attitudes, and mindsets which tend to contribute to lower motivation and demand for latrines and inhibit the latrine use [13, 36]. In addition, these study communities were found to be socially segregated in terms of caste, hierarchy, education, occupation, income and gender. The caste discrimination and power hierarchies were practiced between men and women, and the social norms were against women participating in open forums. In addition, not all NGO staff were experienced, skilled, trained or equipped, to face these challenges in bringing people of all castes, tackle aspects of caste discrimination, mobilise people of both genders in the same forum, handle the power hierarchies/dynamics, motivate and engage all sections to participate, identify problems, and provide solutions. Overcoming the discrimination and hierarchies may require greater social cohesion and solidarity within communities, therefore skill building of NGOs' staff is important.

Study limitations

This was a purely qualitative study that may have benefitted from the availability of quantitative data to study the effect of the programme on latrine adoption and use. However, it was obvious from the data that coverage with functional latrines and use of latrines was very low in study villages. It can be concluded that the campaign failed as a whole. As the campaign almost uniformly failed in the study villages, we are unable to identify which aspects of the campaign may have particularly contributed to programme failure. We did not assess whether the community mobilisation has resulted in a

greater desire or motivation of households to build latrines in the longer term. A follow up survey may have helped to determine whether the increase in latrine construction and use in these villages resulted from community mobilisation or from the financial incentive. Soon after we finished the data collection in 2014, NBA was adapted and renamed SBA in October 2014 with a raised financial incentive of 12,000 rupees (179\$). Therefore, a follow-up survey of the impact of the NBA community mobilisation activities on increased coverage would have been confounded by potential effects from the increased incentive amount.

Qualitative studies such as this are limited by the selection bias due to purposive sampling of participants and also by the extent to which study participants are willing to provide truthful answers. For example, villagers may have exaggerated accounts of corruption and other features of programme mismanagement in order to hide the fact that they may not have been interested in sanitation to begin with. Likewise, NGO staff may have exaggerated difficulties faced in the villages to divert attention from their potentially poor implementation performance. The study was done in a single district in Odisha and further studies are needed to determine to what extent the findings reflect issues relevant for other districts where NBA has been implemented.

Conclusions

Similar to previous sanitation programmes in India, implementation of the NBA in this setting was not community-driven. There was disconnect between programme planning at the national level, its execution in villages, and the target population of households. Mobilising communities for sanitation promotion and behaviour change entails various constraints that are hard to overcome in communities that are divided in terms of caste, gender and local politics, and where demand for sanitation is exceptionally low. It is unclear whether under current circumstances, a better designed and implemented programme would have the potential to increase latrine coverage and use in the short term. Nevertheless, our study suggests the following recommendations for future sanitation promotion in rural India: 1) A realistic strategy needs to be in place. 2) The promotional campaign should be well designed based on the latest behaviour change theory and tailored to the target population and the situation in the villages. 3) The government needs to clarify the roles and responsibilities of its different departments and water and sanitation missions and extend official recognition to implementing NGOs. 4) The promotion and mobilisation strategy must be linked to a viable and tested supply-side strategy and provisions be made for households enabling them to obtain pre-finances for latrine

construction. 5) A mechanism should be in place to monitor the NGOs' work in the field. 6) Training of NGO staff is a very important element of whole sanitation implementation; therefore more resources should be allocated to build their capacities. 7) Communities should be given incentives ("carrots and sticks") to overcome social disparities that currently hinder sanitation adoption in rural India, i.e., incentives should be allocated in a way to encourage demand for latrines.

Abbreviations

BPL: Below Poverty Line; CLTS: Community Led Total Sanitation; CRSP: Central Rural Sanitation Programme; DWSM: District Water and Sanitation Mission; FGD: Focus Group Discussions; GoI: Government of India; GPSF: Gram Panchayat Sanitation Facilitators; IAPL: Identified Above Poverty Line; IDI: In-depth Interviews; IEC: Information, Education & Communication; IHHL: Individual Household Latrine; MGNREGS: Mahatma Gandhi National Rural Employment Guarantee Scheme; MOU: Memorandum of Understanding; NBA: Nirmal Bharat Abhiyan; NGO: Non Governmental Organisation; PRA: Participatory Rural Appraisal; PRI: Panchayati Raj Institution; RWSS: Rural Water Supply and Sanitation; SBA: Swachh Bharat Abhiyan; SHG: Self Help Group; TSC: Total Sanitation Campaign; UAA: United Artists' Association; VWSC: Village Water Sanitation Committee

Acknowledgements

The authors would like to thank the study participants and the field teams in Bhubaneswar office (Odisha), who helped in data collection. We are thankful to the staff of the implementing NGOs: UAA, MWA, GUS, SWAD, SOLAR & JJS for their time and sharing their experiences.

Competing interest

The authors declared that they have no competing interest.

Funding

Thanks to DFID's SHARE consortium for the funding support extended to PR for PhD studies. The funding agency did not had any role in the designing of the study, data collection and its analysis, interpretation of data and in writing the manuscript.

Availability of data and materials

The data analysed in the current study is in the form of audio files and transcriptions (in MS word). It can be obtained from the corresponding author on request.

Authors' contributions

PR developed the study protocol. WS, MJ, TC and BT contributed to finalising the protocol. PR collected and analysed the data and wrote the paper. WS, MJ, BT & TC read the manuscript and helped revise. All authors read and approved the final manuscript.

Consent for publication

Not applicable.

Ethics approval and consent to participate

The study was approved by the ethics committees of the London School of Hygiene and Tropical Medicine and the Xavier University (the local collaborator), Bhubaneswar, Odisha. Permission for both written and verbal consent was approved by the ethics committee of the local collaborator, but as study participants preferred verbal over written consent, verbal consents were obtained prior to discussions and interviews from individuals, groups and community members.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Author details

¹Faculty of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, London, UK. ²Department of Civil and Environmental

Engineering, University of California Davis, One Shields Ave, Davis, CA 95616, USA. ³Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA.

Received: 23 July 2016 Accepted: 7 May 2017

Published online: 16 May 2017

References

- Clasen TF, Bostoen K, Schmidt WP, Boisson S, Fung IC, Jenkins MW, Scott B, Sugden S, Cairncross S. Interventions to improve disposal of human excreta for preventing diarrhoea. *Cochrane Database Syst Rev*. 2010;(6):CD007180. doi:10.1002/14651858.CD007180.pub2.
- Acharya DR, Bell JS, Sirmkhada P, Van Teijlingen ER, Regmi PR. Women's autonomy in household decision-making: a demographic study in Nepal. *Reprod Health*. 2010 Jul 15;7(1):15.
- Stocks ME, Ogden S, Haddad D, Addiss DG, McGuire C, Freeman MC. Effect of water, sanitation, and hygiene on the prevention of trachoma: a systematic review and meta-analysis. *PLoS Med*. 2014 Feb 25;11(2):e1001605.
- World Health Organization, UNICEF. Progress on sanitation and drinking water—2015 update and MDG assessment. World Health Organization. 2015. https://www.unicef.org/publications/index_82419.html. Accessed 15 Jan 2016.
- Government of India. Census of India, 2011 : Availability and type of latrine facility - 2001-2011. http://censusindia.gov.in/2011census/hilo/Data_sheet/India/Latrine.pdf. Accessed 17 Dec 2014.
- Spears D, Ghosh A, Cumming O. Open defecation and childhood stunting in India: an ecological analysis of new data from 112 districts. *Plos One*. 2013 Sep 16;8(9):e73784.
- Cairncross S, Hunt C, Boisson S, Bostoen K, Curtis V, Fung IC, Schmidt WP. Water, sanitation and hygiene for the prevention of diarrhoea. *Int J Epidemiol*. 2010 Apr 1;39(suppl 1):i193–205.
- Fewtrell L, Kaufmann RB, Kay D, Enanoria W, Haller L, Colford JM. Water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries: a systematic review and meta-analysis. *Lancet Infect Dis*. 2005 Jan 31;5(1):42–52.
- Water and Sanitation Program. World Bank. A Decade of the Total Sanitation Campaign: Rapid Assessment of Processes and Outcomes. 2010. https://www.wsp.org/sites/wsp.org/files/publications/WSP_India_TSC_Report_Vol_1_Press.pdf. Accessed 13 Feb 2013.
- Government of India Guidelines : Total Sanitation Campaign in India. 2010. <http://rural.nic.in/sites/TSC.asp>. Accessed 15 Sept 2015.
- WaterAid. Feeling the Pulse - A study of the Total Sanitation Campaign in five states of India. 2008. http://reindiaenvironmentportal.org.in/files/feeling_the_pulse.pdf. Accessed 10 May 2012.
- Planning Commission. Evaluation study on total sanitation campaign. Programme Evaluation Organisation, Government of India. 2013. http://planningcommission.nic.in/reports/peoreport/peo/rep_tscv1_2205.pdf. Accessed 13 Oct 2015.
- Routray P, Schmidt WP, Boisson S, Clasen T, Jenkins MW. Socio-cultural and behavioural factors constraining latrine adoption in rural coastal Odisha: an exploratory qualitative study. *BMC Public Health*. 2015 Sep 10;15(1):880.
- Coffey D, Gupta A, Hathi P, Khurana N, Spears D, Srivastav N, Vyas S. Revealed preference for open defecation. *Econ Polit Wkly*. 2014 Sep 20;49(38):43.
- Barnard S, Routray P, Majorin F, Peletz R, Boisson S, Sinha A, Clasen T. Impact of Indian Total sanitation campaign on latrine coverage and use: a cross-sectional study in Orissa 3 years following programme implementation. *Plos One*. 2013 Aug 21;8(8):e71438.
- Patil SR, Arnold BF, Salvatore AL, Briceno B, Ganguly S, Colford JM Jr, Gertler PJ. The effect of India's total sanitation campaign on defecation behaviors and child health in rural Madhya Pradesh: a cluster randomized controlled trial. *Plos Med*. 2014 Aug 26;11(8):e1001709.
- Government of India. Nirmal Bharat Abhiyan - Guidelines. 2012. <http://tsc.gov.in/tsc/NBA/NBAHome.aspx>. Accessed 21 Sep 2015.
- Government of India. Swachh Bharat Mission(Gramin). 2014. <http://sbm.gov.in/sbm/>. Accessed 10 May 2017.
- Cops M. Guide to community mobilization programming. <https://www.mercycorps.org/sites/default/files/CoMobProgrammingGd.pdf>. Accessed 6 Apr 2016.
- WHO, UNDP, and World Bank, The PHAST initiative - A new approach to working with communities. 2000. http://www.who.int/water_sanitation_health/hygiene/envsan/EOS96-11a.pdf. Accessed 30 Jun 2016.

21. SARAR Methodology - Factsheet. <http://www.solutionsforwater.org/wp-content/uploads/2011/12/SARAR-METHODOLOGY-FACTSHEET.pdf>. Accessed 14 Nov 2014.
22. Chambers R. Going to scale with community-led Total sanitation: reflections on experience, issues and ways forward. *IDS Pract Papers*. 2009 Mar 1;2009(1):01–50.
23. Kar K, Chambers R. Handbook on community-led total sanitation. London: Plan UK; 2008 Apr.
24. Waterkeyn J, Cairncross S. Creating demand for sanitation and hygiene through community health clubs: a cost-effective intervention in two districts in Zimbabwe. *Soc Sci Med*. 2005 Nov 30;61(9):1958–70.
25. O'loughlin R, Fentle G, Flannery B, Emerson PM. Follow-up of a low cost latrine promotion programme in one district of Amhara, Ethiopia: characteristics of early adopters and non-adopters. *Tropical Med Int Health*. 2006 Sep 1;11(9):1406–15.
26. Government of India, World Bank From Dreams to Reality : Compendium of Best Practices in Rural Sanitation in India. 2010. https://www.wsp.org/sites/wsp.org/files/publications/WSP_Compendium_India.pdf. Accessed 1 Apr 2016.
27. Pattanayak SK, Yang JC, Dickinson KL, Poulos C, Patil SR, Mallick RK, Blitstein JL, Prahara P. Shame or subsidy revisited: social mobilisation for sanitation in Orissa, India. *Bull World Health Organ*. 2009 Aug;87(8):580–7.
28. Clasen T, Boisson S, Routray P, Torondel B, Bell M, Cumming O, Ensink J, Freeman M, Jenkins M, Odagiri M, Ray S. Effectiveness of a rural sanitation programme on diarrhoea, soil-transmitted helminth infection, and child malnutrition in Odisha, India: a cluster-randomised trial. *Lancet Glob Health*. 2014 Nov 30;2(11):e645–53.
29. Boisson S, Sosai P, Ray S, Routray P, Torondel B, Schmidt WP, Bhanja B, Clasen T. Promoting latrine construction and use in rural villages practicing open defecation: process evaluation in connection with a randomised controlled trial in Orissa, India. *BMC Res Notes*. 2014 Aug 1;7(1):486.
30. Wagner E, Lanoix JN. Excreta disposal for rural areas and small communities. WHO monograph series no 39. Geneva: World Health Organisation; 1958.
31. DFID, Sutra Consulting. Rapid Appraisal of WASH sector in Odisha : A Community Report. <http://www.nrhmorissa.gov.in/writereaddata/Upload/Documents/Rapid%20Appraisal%20of%20Rural.pdf>. Accessed 12 Apr 2016.
32. Hueso A, Bell B. An untold story of policy failure: the Total sanitation campaign in India. *Water Policy*. 2013 Dec 1;15(6):1001–17. doi:10.2166/wp.2013.032.
33. Government of India, UNICEF. Sanitation and Hygiene Advocacy and Communication Strategy Framework 2012–2017. http://www.mdws.gov.in/sites/default/files/NSHAC_strategy_11-09-2012_Final_0.pdf. Accessed 10 May 2017.
34. O'Reilly K, Louis E. The toilet tripod: understanding successful sanitation in rural India. *Health Place*. 2014 Sep 30;29:43–51.
35. Water Supply and Sanitation Collaborative Council, World Health Organisation. Sanitation and Hygiene Promotion - Programming Guidance. 2005. http://www.who.int/water_sanitation_health/hygiene/sanhygpromo.pdf?ua=1. Accessed 12 Feb 2015.
36. Mehrotra N, Patnaik SM. Culture versus Coercion: Other Side of Nirmal Gram Yojana. *Econ Polt Wkly*. 2008;43(43). http://www.epw.in/system/files/pdf/2008_43/43/Culture_versus_Coercion_Other_Side_of_Nirmal_Gram_Yojana.pdf. Accessed 8 Sept 2016.
37. Government of India. Census Data. Toilet Coverage and Sanitation Performance in India By States (2001–2011). http://censusindia.gov.in/2011census/hlo/Data_sheet/India/Latrine.pdf. Accessed 14 Sept 2015.
38. Kumar A. Sanitation in rural India: an analysis of households' latrine facility. *J Stud Dyn Chang (JSDC)*ISSN: 2348–7038. 2014 Oct 16;1(6):231–246.
39. Pardeshi G, Shirke A, Jagtap M. SWOT analysis of total sanitation campaign in Yavatmal district of Maharashtra. *Indian J Community Med*. 2008 Oct; 33(4):255.
40. Kraemer P, Sinha S. Capacity building-a tool for up-scaling decentralised sanitation infrastructure provision. *Water Pract Technol*. 2010 Dec 1;5(4): wpt2010116.
41. Kurup KB, Abdulla KA, Kurien CO, Remadevi OT, Mathew T. The community-managed sanitation programme in Kerala: learning from experience. <https://www.irchwash.org/sites/default/files/Kurup-1996-Community.pdf>. Accessed 2 Feb 2014.
42. Movik S, Mehta L. The Dynamics and Sustainability Of Community -led Total Sanitation Mapping Challenges And Pathways. [http://opendocs/handle/123456789/2464#.VycDKRNJnDc](http://opendocs.ids.ac.uk/opendocs/handle/123456789/2464#.VycDKRNJnDc). Accessed 21 Mar 2016.

Submit your next manuscript to BioMed Central and we will help you at every step:

- We accept pre-submission inquiries
- Our selector tool helps you to find the most relevant journal
- We provide round the clock customer support
- Convenient online submission
- Thorough peer review
- Inclusion in PubMed and all major indexing services
- Maximum visibility for your research

Submit your manuscript at
www.biomedcentral.com/submit



6. RESEARCH PAPER 3:

Women's role in sanitation decision making in rural Coastal Odisha, India

London School of Hygiene & Tropical Medicine
Keppel Street, London WC1E 7HT
www.lshtm.ac.uk



Registry
T: +44(0)20 7299 4646
F: +44(0)20 7299 4656
E: registry@lshtm.ac.uk

RESEARCH PAPER COVER SHEET

PLEASE NOTE THAT A COVER SHEET MUST BE COMPLETED **FOR EACH** RESEARCH PAPER INCLUDED IN A THESIS.

SECTION A – Student Details

Student	Parimita Routray
Principal Supervisor	Wolf Peter Schmidt
Thesis Title	Latrine adoption and use in rural Odisha, India : Constraints and challenges

If the Research Paper has previously been published please complete Section B, if not please move to Section C

SECTION B – Paper already published

Where was the work published?	Plos One		
When was the work published?	24 May 2017		
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion	No		
Have you retained the copyright for the work?*	Yes	Was the work subject to academic peer review?	Yes

**If yes, please attach evidence of retention. If no, or if the work is being included in its published format, please attach evidence of permission from the copyright holder (publisher or other author) to include this work.*

SECTION C – Prepared for publication, but not yet published


Where is the work intended to be published?	
Please list the paper's authors in the intended authorship order:	
Stage of publication	Choose an item.

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I developed the research idea with inputs of Supervisor and co-supervisor. Conducted and supervised the data collection. I analysed the data with the guidance of my supervisor. I drafted the manuscript with inputs from co-authors and responded to peer review comments.
--	--

Student Signature: Paninita Rautray

Date: 03/09/2017

Supervisor Signature: 

Date: 3-9-17

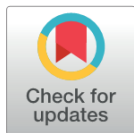
RESEARCH ARTICLE

Women's role in sanitation decision making in rural coastal Odisha, India

Parimita Routray^{1*}, Belen Torondel¹, Thomas Clasen^{1,2}, Wolf-Peter Schmidt¹

1 Faculty of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, London, United Kingdom, **2** Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, Georgia, United States of America

* Parimita.Routray@lshtm.ac.uk



Abstract

Background

While women and girls face special risks from lack of access to sanitation facilities, their ability to participate and influence household-level sanitation is not well understood. This paper examines the association between women's decision-making autonomy and latrine construction in rural areas of Odisha, India.

Methods

We conducted a mixed-method study among rural households in Puri district. This included a cross sectional survey among 475 randomly selected households. These were classified as either having a functional latrine, a non-functional latrine or no latrine at all. We also conducted 17 in-depth interviews and 9 focus group discussions among household members of these three categories of households.

Results

Decisions on the construction of household level sanitation facilities were made exclusively by the male head in 80% of households; in 11% the decision was made by men who consulted or otherwise involved women. In only 9% of households the decision was made by women. Households where women were more involved in general decision making processes were no more likely to build a latrine, compared to households where they were excluded from decisions. Qualitative research revealed that women's non-involvement in sanitation decision making is attributed to their low socio-economic status and inability to influence the household's financial decisions. Female heads lacked confidence to take decisions independently, and were dependent on their spouse or other male family members for most decisions. The study revealed the existence of power hierarchies and dynamics within households, which constrained female's participation in decision-making processes regarding sanitation.

OPEN ACCESS

Citation: Routray P, Torondel B, Clasen T, Schmidt W-P (2017) Women's role in sanitation decision making in rural coastal Odisha, India. *PLoS ONE* 12 (5): e0178042. <https://doi.org/10.1371/journal.pone.0178042>

Editor: Hafiz T.A. Khan, University of West London, UNITED KINGDOM

Received: January 17, 2017

Accepted: May 8, 2017

Published: May 24, 2017

Copyright: This is an open access article, free of all copyright, and may be freely reproduced, distributed, transmitted, modified, built upon, or otherwise used by anyone for any lawful purpose. The work is made available under the [Creative Commons CC0](https://creativecommons.org/licenses/by/4.0/) public domain dedication.

Data Availability Statement: All relevant data are included in the paper and its Supporting Information files.

Funding: This research was sponsored by DFID's SHARE consortium. The funding agency did not have any role in the designing of the study, data collection and its analysis, interpretation of data or in writing the manuscript.

Competing interests: The authors have declared that no competing interests exist.

Abbreviations: FGD, Focus Group Discussion; GoI, Government of India; HoH, Head of Household; IDI, In-depth Interviews; NBA, Nirmal Bharat Abhiyan; OBC, Other Backward Class; SC, Scheduled Castes; TSC, Total Sanitation Programme.

Conclusions

Though governments and implementers emphasize women's involvement in sanitation programmes, socio-cultural factors and community and household level dynamics often prevent women from participating in sanitation-related decisions. Measures are needed for strengthening sanitation policies and effective implementation of programmes to address gender power relations and familial relationships that influence latrine adoption and use.

Introduction

Women and girls are the most affected by lack of access to sanitation facilities and safe water [1], as they have greater need for privacy during defecation and bathing compared to men [2]. Absence of sanitation makes females vulnerable and exposes them to the risk of faecal-orally transmitted diseases, uro-genital tract infections, urinary incontinence and chronic constipation [3, 4]. Females avoid being seen while defecating in the day light and wait till dark to use the open space for defecation, which may force them to eat less, resulting in malnutrition [5]. Inadequate sanitation access leads to psychosocial stress, harassment and sexual violence, and increased work from water fetching, care-giving burdens and carrying out post defecation needs of old and ailing family members [6–8]. Provision of adequate water, sanitation and hygiene facilities is thought to mitigate these adverse impacts, making their lives safer, easier and healthier [9, 10]. However, as of 2012, an estimated 1.25 billion women and girls (or 1 in 3 worldwide) were without access to adequate sanitation. Of these, 526 million had no access to any form of sanitation and defecated in the open [10].

In most low-income settings, women and girls are considered to be primary users, providers, and managers of water and sanitation in a household [11]. They are often regarded as guardians of household hygiene, and their inclusion in programmes is believed to be an efficient and sustainable approach to sanitation [1, 6]. Studies have found that the effectiveness of the water and sanitation projects was strongly associated with women's participation in decisions about water supplies, transparency and management of sanitation interventions [6, 12, 13]. A study in Kenya suggests that if women had the decision making power on major household purchases, then they would influence sanitation improvement [14]. Many development programmes acknowledge the need for women participation for their success, and women participation in water and sanitation sector is highly emphasised for the programme's sustenance [15].

Policies have increasingly emphasized 'women' inclusion in sanitation programmes. A few countries in Africa prescribe a minimum percentage of women participation in sanitation interventions and related decision making from the ministerial level to village levels [12]. The Indian government tried addressing the gender inequality in its country wide sanitation programmes—Total Sanitation Campaign (TSC), *Nirmal Bharat Abhiyan* (Clean India Campaign—NBA) and *Swachh Bharat Abhiyan* (Clean India Mission—SBA) [16–18] by reserving 33% membership for women in institutions and bodies related to water and sanitation [16, 18].

However, in actual practice, women's participation is seldom actively encouraged by the promoters at the field level [19]. Studies have shown that attempts to include women as members in water and sanitation committees, does not guarantee their participation [Routray, 2016 submitted]. Similarly, women attending the community meetings for sanitation promotion and awareness, has not resulted in their participation in community level decision making. Societal and cultural barriers for females, their age, and position within the household are

some of the factors, that determine their participation in the sanitation decision making [20–22]. A global review on determinants of latrine ownership in rural households, found a tendency for the final decision to rest with the male head of the household [23]. A study in Ghana found male heads were the decision maker in one in four adopter households, although the whole house owned the toilet [24]. Studies from India show male heads deciding for latrine acquisition, whereas, women were responsible for latrine's maintenance, keeping the system functioning, fetching water for latrine flushing [6, 22, 25]. There are examples of latrines being acquired by male heads only to secure the privacy and the perceived dignity of the newlywed daughters-in-law, but male heads themselves lacked motivation to use the facility [26–28]. Further, men have been found to be less inconvenienced by the absence of a latrine, and tend to have a lower interest and willingness to install and use sanitary facilities. Thus, low priority among men for sanitation, may result in lower latrine adoption [2].

There are a large number of studies that have analysed female decision making autonomy on different aspects like health, fertility decisions and well-being, and most of them found males taking the decisions [29, 30]. Past research has addressed psychological, economical, social, and environmental determinants of improved sanitation [24, 31]. Studies have also identified behavioural indicators like preference, intention and choice stages for household sanitation decision making [24], with cost stated as a main reason for not constructing latrines [32]. But a recent study on rural Indian population found evidence against this cost proposition. It found that people are defecating in the open not because they are poor, but because they perceived latrines to be expensive [22]. Little research in the field of sanitation is available to inform about women's autonomy within the households, their participation and contribution, and the household dynamics that could influence women's ability to contribute to latrine adoption.

This study examines the association between women's decision-making autonomy and latrine adoption in rural areas of Odisha. Decision-making autonomy was assessed in the domains of health care, mobility, small and large purchases, investments and decisions related to household's latrine acquisition. The paper seeks to answer the following questions—1) Who takes the final decision to build a latrine?; 2) How are the decisions to build a household latrine made?; 3) How do women participate in a household's latrine installation decisions? 4) Is decision making autonomy associated with latrine adoption?

Methods

Ethics (and consent to participate)

The study was approved by the ethics committees of the London School of Hygiene and Tropical Medicine and the local collaborator—the Xavier University. Verbal consent was taken from all the participants of focus groups and interviews. No compensation was paid to study participants. In order to ensure anonymity, names recorded during data collection were deleted, and the analysis was done using household codes. For the questionnaire survey, the participants were explained the study and its objective. Upon consenting to participate, the survey was administered.

Study area

The study was conducted in rural villages of Puri, a coastal district in the Indian state of Odisha. The villages were also the study villages of a larger randomised controlled trial (RCT) conducted between 2011–2013 and the study setting is described elsewhere [28, 33–35].

Study design

We conducted a mixed-method study by combining a cross-sectional survey and qualitative research.

Quantitative study

A survey questionnaire was administered in 12 villages of three blocks—Pipli, Nimapada and Delang in December 2015, that were part of the earlier RCT. From the 12 villages, 6 received the TSC intervention in 2012 and rest received the NBA intervention in 2014. The approaches of these two interventions have been described elsewhere [Routray, 2016 submitted]. Pipli was initially chosen as the only block where the survey would take place. On not achieving the targeted sample size from Pipli's RCT villages, additional villages were included from Nimapada and Delang blocks, and these villages were randomly selected. Within a village, we aimed at recruiting every household in that village, by conducting house to house visits. If a household was not available or declined to participate, we approached the next house. The female head was targeted to be the respondent. Where the female head was either unable or unwilling to participate in the study or not present at the time of the visit, the next household was approached, till all households in the village were covered. Prior to the survey, qualitative research was conducted to understand and identify women's decision making autonomy in household activities in general. Findings of this qualitative research were used to develop the questionnaire for the cross-sectional survey.

The quantitative cross-sectional survey aimed to capture dimensions of women's autonomy: 1) decision making power that entailed financial investments such as purchase of large household items, cattle or farm animals, daily needs, repairs or additions to the existing house, and tube-well installation, and, 2) their freedom of mobility in deciding for own health care and accessing health care services, visiting families and friends. The survey also included questions on basic demographics, type and family composition, caste, education and occupation of female and male heads, type of household construction, assets and availability of latrine facility. Decision making in the context of household latrine installation was specifically studied, including aspects such as final decision to build, site identification, purchase of raw materials, arrangement of masons and initial monetary investment. The questionnaire was developed in English, translated to *Odia* (the local language) and then back-translated to assess accuracy. Physical verification of latrine status was done through spot checks; based on which latrines were categorised as functional or non-functional. In order to be deemed functional, the latrine was required to have proper walls, roof, door, a completed pit, and pan not broken/not blocked/and not blocked by leaves.

We aimed to recruit a random sample of at least 400 households. The sample size was chosen to estimate a proportion of 50% with a margin of error no greater than 5%. The sample size was pragmatically increased to include at least 200 households with a functional latrine and 200 households without any latrine, while maintain random sampling irrespective of latrine ownership or latrine functionality.

Qualitative study

Members (female and male heads, and other married male and female in the household) from all the three categories of households were selected purposefully based on their availability and willingness to participate in individual in-depth interviews (IDIs) and focus group discussions (FGDs). Seventeen IDIs and 9 FGDs (see Table 1) were held to understand the stages and processes around latrine decision making, and the roles women played in the decision making up till completion of latrine construction. Due to prevailing power hierarchies and social norms

Table 1. Characteristics of participants in focus groups and individual interviews.

Type	Participants (n)	Gender	Age range (years)	Group type
Focus group 1	8	F	30–45	Female heads
Focus group 2	6	F	30–40	Female heads
Focus group 3	9	F	35–50	Female heads
Focus group 4	8	F	40–55	Female heads
Focus group 5	8	F	25–35	Married younger females
Focus group 6	7	M	40–50	Male heads
Focus group 7	6	M	35–45	Married younger males
Focus group 8	8	M	40–55	Male heads
Focus group 9	8	M	55–65	Male heads
17 Interviews—individuals		M– 8, F– 9	30–65	

Female = F, Male = M

<https://doi.org/10.1371/journal.pone.0178042.t001>

that restricted young family members to voice their opinions before the elders, FGDs were held with female and male heads, and male/female family members separated by gender. All the IDIs and FGDs were facilitated by the lead researcher, with the support of a note taker. Additionally, all the IDIs and FGDs were audio recorded and later translated into English for analysis. The lead researcher and the note taker were fully conversant in *Odia*.

Data analysis

Analysis of the quantitative data

For the analysis, households were grouped into 1) owning a functional latrine, 2) owning a non-functional latrine, and 3) not owning any latrine (none of the households shared a latrine with neighbours). These groups were compared pair-wise. Binary and non-ordered categorical variables were compared using the Chi square test. Ordered categorical variables were compared using the Wilcoxon Ranksum Test. Continuous variables were compared using the t-Test. The score test for trend of odds was done to study the association between socio economic status of families and women’s inclusion in latrine installation decision making.

For the analysis of decision making within households, we grouped the various combinations of household members making decisions into three groups: 1) decisions made exclusively by males, 2) decisions involving males and females and 3) decisions made exclusively by females. Data was entered in Epi Info and analysis was performed using STATA version 12.0.

The analysis of the qualitative data was done by thematic ordering and interpretation to identify using Microsoft excel software- 1) the important and active family members taking the final decision to build latrine, 2) processes followed at household level for latrine adoption and 3) factors that favoured or influenced women’s participation in the decision making of the latrine. Each opinion (captured in the form of statements) was highlighted and coded as per the above stated themes. All quotations are in italics and any text within the quote enclosed by square brackets, have been inserted by the authors.

Results

A total of 475 households were sampled out of which 217 had no latrine, 211 had a functional and 47 with a non-functional latrine. The mean number of households was 39.5 per village. Average age of the respondents was 51 years (range = 23 to 86). A total of 2740 individuals lived in the participating households, and the average number of persons per house was 5.8

(range 2 to 16 persons). All the surveyed households practised Hinduism, but belonging to different castes—61% were general caste, 25% were Other Backward Class (OBC) and 14% were Scheduled Castes (SC—lower caste). Seven percent of households were joint families (Table 2).

The majority of households had male heads. Only in 16% of households, women led after their husband's death. Very few male heads had higher education in colleges or universities. Percentages of female heads attending senior secondary classes were low compared to male heads (40%). A high percentage (38%) of female heads were illiterate and never went to school. Agriculture was the primary occupation of more than half of male heads. The majority of respondents (85%) were housewives, the rest worked either as agricultural labourers, construction and masonry helpers, had government or a private job, or ran some business.

Compared to households without latrines, households with functional latrines had better educated male and female heads, a larger family size, and higher income. Households belonging to SC tended to have fewer functional latrines than general and OBC families. Family income mostly comprised of the male head's earnings but in 65% of households (Table 2) other family members such as grown up sons contributed to the income. Households with a functional latrine were more often in higher income categories than households with a non-functional latrine or no latrine, but the difference was only significant in the second group ($p < 0.001$). Households with latrines more often owned agricultural land (85%) and a tube-well (83%) and were less often employed as share-croppers or labourer (Table 2). In contrast, households with non-functional or no latrines had more male heads with an occupation of lower perceived status (working as share cropper, mason or labour) and lower income ($p < 0.001$). Latrine functionality status was associated with the education of the male and female heads ($p < 0.001$). In 56% households that had no latrine and 50% households with a non-functional latrine, major additions to the house were made in the previous two years, suggesting financial capacity for other construction works.

Decision making of household activities and female's participation

Decision making of household's different activities. As Table 3 shows, the female head along with other females in the family were able to take decisions about their own health care in only 4.4% households. This proportion compares with 11.6% for decisions about visiting family and friends, 3.7% about upgrading the house (or make additions to their existing houses), 10% about tube-well installation, 5.4% about making large household purchases, 20.5% about purchase of farm animals or livestock, and 22.5% about making purchases for daily needs. Females mostly decided what to cook for daily meals, and there was not much involvement of men. The data also shows that women's non-involvement in the decision making of other important household activities had no strong association with latrine possession or latrine functionality. Even in the 16% households with female heads, males decided for latrine installation in 68% households and the site selection was again done by males in 66% households.

Decision making of latrine installation and its different components. Table 4 suggests, female's involvement in decisions regarding sanitation has been minimal. In 9% of households with male heads, females alone had the final say to build the latrine and in 10% households, women participated in the decision for latrine acquisition and installation. For the latrine site selection, in 11% households females exclusively decided, and in 9% households it was a joint decision. In other activities related to latrine installation, such as the purchase of raw materials, arranging masons and investing in latrine construction, female involvement was minimal.

Table 5 suggests the socio-economic conditions like caste, and education of male and female heads are not associated with female members inclusion in decision making directly.

Table 2. Characteristics of respondents (n = 475).

Variables	Variables (categories)	No Latrine (n = 217)	Latrine possession		Total (N = 475) (%)	Functional vs. No latrine (p -value)	Non -Functional vs. No latrine (p -value)
			Non— Functional (n = 47)	Functional (n = 211)			
Caste	General, n (%)	137 (63%)	25 (53%)	128 (61%)	290(61%)	0.81*	0.09*
	OBC, n (%)	49 (23%)	9(19%)	59 (28%)	117 (25%)		
	SC, n (%)	31 (14%)	13 (28%)	24 (11%)	68 (14%)		
Family type	Joint	16(7%)	2 (4%)	14 (7%)	32(7%)	0.76*	0.44*
	Nuclear	201(93%)	45(96%)	197(93%)	443(93%)		
Family size	Mean (SD)	5.4 (2.3)	5.8 (2.6)	6.1 (2.7)	5.8 (2.5)	0.00**	0.32**
Education of Male Heads	None (illiterate)	25 (13%)	7 (15%)	13 (7%)	45 (11%)	<0.001***	0.46***
	Primary (1–5 class)	83 (45%)	20 (51%)	59 (34%)	162 (41%)		
	Junior (6–10 class)	68 (37%)	11(28%)	80 (46%)	159 (40%)		
	Senior (11–12 class)	4(2%)	1 (3%)	13 (7%)	18 (4.5%)		
	Graduation/ College	5 (3%)	0	7 (4%)	12 (3%)		
	University	0	0	3 (2%)	3(0.75%)		
Education of Female Heads	None (illiterate)	99 (46%)	20 (43%)	61 (29%)	180 (38%)	<0.001***	0.87***
	Primary (1–5 class)	72 (33%)	18 (38%)	79 (37%)	169 (36%)		
	Junior (6–10 class)	46 (21%)	9 (19%)	64 (30%)	119 (25%)		
	Senior (11–12 class)	0	0	6 (3%)	6 (1%)		
	Graduation/ College	0	0	0	0		
	University	0	0	1 (0.5%)	1		
Occupation of Male heads	Farmer	101 (55%)	19 (49%)	99 (58%)	218 (55%)	<0.000*	0.42*
	Share cropper	32 (17%)	10 (26%)	8 (5%)	50 (13%)		
	Labour/Mason	26 (14%)	5 (13%)	13 (8%)	44 (11%)		
	Job (Govt./ private)	5 (3%)	3 (8%)	21 (12%)	29 (7%)		
	Business (small)	8 (4%)	1 (3%)	9 (5%)	18 (5%)		
	Business (big)	0	0	1 (0.6%)	1 (0.25%)		
	Unemployed	13 (7%)	1 (3%)	21 (12%)	35 (9%)		
Occupation of Female head	Farmer	2 (1%)	0	1 (0.5%)	3 (0.6%)	0.31*	0.55*
	Share cropper	1 (0%)	0	2 (0.9%)	3(0.6%)		
	Labour/Mason	15 (7%)	7 (15%)	5 (2%)	27 (6%)		
	Job (Govt./ private)	5 (2%)	0	8 (4%)	13 (3%)		
	Business (small)	4 (2%)	1 (2%)	2 (1%)	7 (1%)		
	Business (big)	0	0	1 (0.47%)	1 (0%)		
	Unemployed	183 (84%)	37 (78%)	183 (87%)	403 (85%)		
	Others	7 (3%)	2 (4%)	9 (4%)	18 (4%)		
Other Earning members	Yes	124(57%)	33(70)	151 (72%)	308(65%)	<0.002*	0.10*
	No	92 (43%)	14 (30%)	60 (28%)	166 (35%)		

(Continued)

Table 2. (Continued)

Variables	Variables (categories)	No Latrine (n = 217)	Latrine possession		Total (N = 475) (%)	Functional vs. No latrine (p -value)	Non -Functional vs. No latrine (p -value)
			Non—Functional (n = 47)	Functional (n = 211)			
HHs monthly income (INR)	< 5000	106 (49%)	24 (51%)	56 (26%)	186 (39%)	<0.001***	0.87***
	5000–10000	86 (40%)	17 (36%)	108 (51%)	211 (44%)		
	10000–20000	21 (10%)	5 (11%)	26 (12%)	52 (11%)		
	>20000	4 (2%)	1 (2%)	21 (10%)	26 (6%)		
No. of assets		2.76 (1.24)	2.78 (0.97)	3.85 (1.47)	3.13 (1.22)	0	0.90**
Owned house	Own a house)	215(99%)	46 (98%)	210 (99%)	471 (99%)	0.58*	0.48*
	Did not own	2 (1%)	1 (2%)	1 (0.47%)	4 (0.84%)		
House built or inherited	Built self	71 (33%)	12 (26%)	67 (32%)	150 (32%)	0.80***	0.29***
	Inherited	139(66%)	33 (72%)	141 (67%)	313 (67%)		
	Someone else	2 (1%)	1 (2%)	1 (0.48%)	4 (0.86%)		
House up-gradation	Major additions	121 (56%)	23 (50%)	142 (68%)	286 (61%)	0.02*	0.42*
	No additions	93 (43%)	23 (50%)	68 (32%)	184 (39%)		
Own farm animals	Yes	137(63%)	24(51%)	115 (54.5%)	276(58%)	0.07*	0.12*
	No	80 (37%)	23 (49%)	96 (45.5%)	199 (42%)		
Own tube-well	Yes	112(52%)	23(49%)	176 (83%)	311(65%)	<0.000*	0.74*
	No	105 (48%)	24 (51%)	35 (17%)	164 (34%)		
Own agricultural land	Yes	147(68%)	30(64%)	179 (85%)	356(75%)	<0.000*	0.60*
	No	70 (32%)	17 (36%)	32 (15%)	119 (25%)		

*-Chi- square test,
 **—T—Test,
 ***—Wilcoxon Ranksum test

<https://doi.org/10.1371/journal.pone.0178042.t002>

However, in families that had income less than 5000 Indian rupees per month, the female member’s participation in latrine installation decision making was found to be high (30%).

Qualitative research: How are latrine decisions made in rural households?

The findings of qualitative data collected through FGDs and IDIs corroborates the quantitative survey results. It shows male heads taking most decisions and women’s participation in all these decisions is minimal. This section describes the stages and the processes involved in the decision, to install latrines in rural houses.

Power hierarchies within households. Power hierarchies and the economic status determined the decision making power of the family members: “After all, the husband is the head of the family, he is elder in age and in relationship and he will spend for the latrine, therefore, the decision making power lies with him”. (IDI—6, Female Head, aged 52). Another participant explains the prominence ‘men’ have in the communities: “Whatever happens here (in the family or society), it is the father who is looked for, and anyone hardly looks for the mother. The NGO staff [promoting latrines] also came and asked for men and not us. (IDI—4, Female Head, aged 62). An earning son and an elderly mother-in-law, had more say than the daughter(s) or daughter- in- law: “When my sons built the house, they informed me, but usually males decide. Daughter- in- laws are consulted in matters like cooking food, purchase of grocery or clothes. In matters of expenditures [financial], we usually don’t consult the daughter- in- law”. (IDI– 8,

Table 3. Women's involvement in decision making of their own personal lives and household items (n = 475).

Variables	Variables (categories)	No Latrine	Latrine possession		Total N (%)	Functional vs. No latrine (p-value)	Non Functional vs. No latrine (p-value)
			Non-Functional	Functional			
Determining own health care	Only males, n (%)	199 (91.7%)	42 (89.3%)	192 (91%)	433 (91.1%)	0.79*	0.56*
	Both groups, n (%)	10 (4.6%)	1 (2.1%)	10 (4.7%)	21 (4.4%)		
	Only females, n (%)	8 (3.7%)	4 (8.5%)	9 (4.3%)	21 (4.4%)		
Visiting family and relatives	Only males, n (%)	123 (56.9%)	26 (55.3%)	101 (47.9%)	250 (52.7%)	0.05*	0.82*
	Both groups, n (%)	72 (33.3%)	16 (34.0%)	81 (38.4%)	169 (35.6%)		
	Only females, n (%)	21 (9.7%)	5 (10.6%)	29 (13.7%)	55 (11.6%)		
Upgrading the house / making additions	Only males, n (%)	102 (84.3%)	21 (91.3%)	113 (80.1%)	236 (82.8%)	0.37*	0.37*
	Both groups, n (%)	15 (12.4%)	2 (8.7%)	21 (14.9%)	38 (13.3%)		
	Only females, n (%)	4 (3.3%)	0	7 (4.9%)	11 (3.7%)		
Tube-well installation at home	Only males, n (%)	91 (81.2%)	18 (81.8%)	131 (75.7%)	240 (78.2%)	0.29*	0.97*
	Both groups, n (%)	11 (9.8%)	1 (4.5%)	24 (13.8%)	36 (11.7%)		
	Only females, n (%)	10 (8.9%)	3 (13.6%)	18 (10.4%)	31 (10.1%)		
Purchase of cattle or farm animals	Only males, n (%)	25 (65.8%)	5 (83.3%)	24 (70.6%)	54 (69.2%)	0.79*	0.32*
	Both groups, n (%)	5 (13.2%)	1 (16.7%)	2 (5.9%)	8 (10.3%)		
	Only females, n (%)	8 (21.0%)	0	8 (23.5%)	16 (20.5%)		
Making large household purchases	Only males, n (%)	65 (82.3%)	19 (90.5%)	91 (75.8%)	175 (79.5%)	0.25*	0.34*
	Both groups, n (%)	11 (13.9%)	2 (9.5%)	20 (16.7%)	33 (15%)		
	Only females, n (%)	3 (3.8%)	0	9 (7.5%)	12 (5.4%)		
Making purchases for daily needs	Only males, n (%)	156 (71.9%)	36 (76.6%)	145 (68.7%)	337 (70.9%)	0.46*	0.61*
	Both groups, n (%)	15 (6.9%)	1 (2.1%)	15 (7.1%)	31 (6.5%)		
	Only females, n (%)	46 (21.2%)	10 (21.3%)	51 (24.2%)	107 (22.5%)		

*-Chi square test

<https://doi.org/10.1371/journal.pone.0178042.t003>

Female head—aged 70). These indicate about the prevailing power structures (hierarchy) in the communities of Puri.

Financial dependency. Money constraint was the most recurring theme through all interviews and focus group discussions and a common reason cited for not opting for latrines, keeping the latrine unfinished and not investing to make the latrine functional. They perceived latrine installation expensive, so men who controlled the household budget, were not keen to

Table 4. Women’s involvement in decision making around stages of latrine building(N = 258).

Variables	Variables (categories)	Latrine possession		Total (%) (N = 258)	p -value
		Non Functional (n = 47)	Functional (n = 211)		
Final say to build a latrine	Only males, n (%)	41 (87%)	165 (79%)	206 (80%)	0.028*
	Both groups, n (%)	0	27 (13%)	27 (10.5%)	
	Only females, n (%)	6 (13%)	18 (9%)	24 (9%)	
Latrine site identification	Only males, n (%)	41 (87%)	165 (78%)	206 (80%)	0.21*
	Both groups, n (%)	1 (2%)	23 (11%)	24 (9%)	
	Only females, n (%)	5 (11%)	23 (11%)	28 (11%)	
Raw materials purchase for latrines	Only males, n (%)	10 (83%)	131 (91%)	141 (90%)	0.43*
	Both groups, n (%)	2 (17%)	8 (5.5%)	10 (6%)	
	Only females, n (%)	0	5 (3%)	5 (3%)	
Arranging masons for latrines	Only males, n (%)	11 (85%)	134 (92%)	145 (92%)	0.32*
	Both groups, n (%)	1 (8%)	6 (4%)	7 (4%)	
	Only females, n (%)	1 (8%)	5 (3%)	6 (4%)	
Investing in latrine building	Only males, n (%)	14 (100%)	119 (91%)	133 (92%)	0.26*
	Both groups, n (%)	0	7 (5%)	7 (5%)	
	Only females, n (%)	0	4 (3%)	4 (3%)	

*-Chi- square test

<https://doi.org/10.1371/journal.pone.0178042.t004>

build it. Some who had little finances were reluctant to invest in latrines, as they had other priorities.

Many mentioned they depended on the government to build latrines, so waited for subsidies. At the household level, high level of dependency was observed among females on their spouse or guardians (mostly father-in-law) or any earning members in the family (like a son), to decide for activities that had economic implications and this included building latrines: *“If something ‘big’ is to be done for the house that requires more money, then my husband, who is the family head decides. Son(s) join him in the decision, as they earn and have more knowledge than me. I can only make small purchases like buying a cream or powder [cosmetics], the big ones are to be decided by them (IDI -5, Female Head—aged 48). Females perceived latrine construction was a ‘big decision’, which only males could take. Even for small purchases, the females relied on their spouse: “I alone cannot decide, we depend on them [husband] for every penny. Even for small things like purchasing bangles, saree for ourselves, we ask them for money. (FGD 4—women group).*

Even when the NGOs approached households to construct latrines (under TSC, where NGOs did the initial spending and constructed the latrines), females would direct the NGO staff to speak to their husband or guardians and explain them the programme and get their approval. Even females with a higher status in the household like the mother—in—law(wife of household head) did not decide themselves, and let their husband and grown up sons (who were earning) to discuss with the NGO and decide. Many female participants mentioned of persuading their husbands for latrines till they get affirmation: *“When the girl [NGO field staff] told us to build a latrine, we waited for our husband to come home. We would wait for his [husband’s] right mood, and initiate the discussion about the latrine, otherwise he would get angry. They would not instantly agree to our requests, as they have to arrange money, but we keep on persuading them till they give a nod for it. Without their permission, we cannot move even a single inch”. (FGD– 3, Female Head, age range 45–60 years).*This suggests that females’ lack of earning, prevented them from making decisions regarding latrines.

Table 5. Association between socio-economic status and women’s decision making to build latrine*.

Variables	N	n	%	p for trend**
Caste				
General, n (%)	153	29	19.1%	0.648
OBC, n (%)	68	18	26.5%	
SC, n (%)	37	4	11.1%	
Male head’s education				
None (illiterate)	20	5	25.0%	0.127
Primary (1–5 class)	79	5	6.3%	
Junior (6–10 class)	91	22	24.4%	
Senior (11–12 class)	14	2	14.3%	
College/University	10	3	30.0%	
Female head’s education				
None (illiterate)	81	17	21.0%	0.509
Primary (1–5 class)	97	15	15.6%	
Junior (6–10 class)	73	17	23.3%	
Senior (11–12 class)	6	1	16.7%	
College/University	1	1	100.0%	
Family Income (Rupees)				
< 5000	80	24	30.0%	0.033
5000–10000	125	20	16.1%	
10000–20000	31	3	9.7%	
>20000	22	4	18.2%	
Female head earning				
No	219	38	17.4%	0.278
Yes	27	7	25.9%	

*Restricted to households with a latrine. The percentage indicates the share of households where women were involved in the decision making or made the decision alone;

**score test for trend of odds

<https://doi.org/10.1371/journal.pone.0178042.t005>

Gendered roles and perception about female’s abilities. Females had perceptions about their abilities and inabilities to take decisions. Their confinement to the village and the household, made them less confident and doubt their capacities: “*We females don’t know anything. All things beyond my house boundaries are done by my husband, so they [husband and other males] can decide for the family’s welfare, not we*”. (IDI—2, Female Head, aged 42). A male head’s response to the question—‘If they consulted any woman/female in the family, prior to latrine construction?’ corroborate to that of women’s thinking: “*Women are consulted when they either earn or have some education. In my home, I did not consult anyone, when I built the latrine. They [women] don’t understand many things, and have no role to play in latrine construction. They [women] needed a latrine, which we built*” (IDI—10—Male Head aged 55). Males also felt superior to women, as is evident from this quote: “*Females roles are cooking, taking care of children and doing household chores. But, when they need money, they come to us, and we then decide*. (IDI—12, Male head—aged 45; FGD 7 –male group)

In very few households, elderly females were involved in the decisions such as latrine’s site selection: “*My husband decided to build it [latrine] and arranged masons, and I was asked to choose the site. I then asked other females at home, and a commonly agreed site that would be convenient for all was chosen*.(IDI—14, Female Head—aged 65). The younger females also mentioned about their involvement in the site selection: “*When we [daughter- in- laws] placed*

our demand for a latrine with our husband and father-in-law, they agreed to our request but, before initiating construction, they asked us to locate a suitable place for the latrine. (FGD 5– Daughter-in-laws; age range 25–40). This indicates, males in a few houses considered women's views. The survey also found that only a handful of women were involved in the decision to purchase the construction materials for latrine. Most women participants had no prior experience in materials procurement nor had information from where they could get it. They questioned their own capacities: “Being females, can we take all decisions? Can we carry the bricks and other materials? We even do not know where to get these materials from and how much they would cost”. (FGD -2, women group).

In a few cases women arranged masons, for example if the mason belonged to the same village and helped procuring the materials. This again indicates that women are relying on men for any kind of purchases. Men made few efforts to engage women: “For any kind of construction, we arrange materials ourselves, as we know from where to get them. Women have no idea about the market, so, we did not involve them in such decisions. But for digging the pit, they sometimes helped (FGD -8, Men's group). Overall, in the different components of latrine construction like purchase of raw materials, arranging masons and investments in latrines, females had a very negligible role.

Female's land ownership / entitlement. Families in Puri district were mainly patriarchal. Daughters are not considered permanent members of their natal homes because they become part of their husband's family after marriage. Women had unequal access to their husband's parental property, meaning the lands and other properties would be inherited by the husband and not the wife. For example, after the completion of awareness meetings by an NGO, a few motivated females were interested in building a latrine, but could not allow the NGO to do so, as either they had no land or had no direct access to the in-law's property. They had to seek permission from the father-in-law or husband (whoever is the owner of the land) to build it. Some reported of disputes among siblings regarding parental property division (includes land and other assets), which delayed the decision to build latrine: “We have plans to build latrine as our daughters are now grown up and are reluctant to go out, but we are waiting for the division of the property. Once we confirm our share of land, we can then decide where to build [the toilet]” (IDI- 3, Female head, aged—45). Some feared that the latrine might go to the brother-in-law's [husband's brother] share after separation, and postponed the construction work. Among families who were landless and had only the homestead land, women who worked as labourers, had some economic power and were able to contribute and participate in household decisions. However, despite having interest in a latrine, many women could not opt for it, due to land unavailability: “We don't have any land other than this piece of land where we have our house. So, even if someone offers to build a latrine for us, we cannot do it. If someone made land available to us, then, we might dream to have a latrine. We are ready to contribute labour, invest some money but, the main thing [land] is what we do not have”. (FGD 5 & 7- women and men groups).

Approach by NGOs for toilet promotions. As NGOs were given latrine construction targets to be accomplished by deadlines, their field workers approached mostly the male heads, as getting their permission to construct would be easy, rather than involving women to get permission from their spouse or guardian. In previous paragraphs we described that women lacked the autonomy to decide, and were dependent on their husband or other male members for most decisions. Females complained that the NGOs did not engage them in the process: “The NGO person looked for the males. They had meetings with them [husband and other males], and told us to dig a pit and keep it ready. One day, they came with a mason, and started constructing the latrine. He was the only mason to construct all the latrines in the village, so, due to his unavailability, he left the structure unfinished” (IDI- 14, Female Head, aged 65). Many

females expressed unhappiness with their husband's and NGO's decision on latrine's site and mentioned their involvement would have made a much greater difference: "*We cannot use the latrine, because it's placement is wrong. It's built right in front of my house, facing the main road. How can we use it, if it is just on the road? This has not only wasted the land but also our house looks ugly with this broken [unfinished] structure at the entrance. Had we been engaged in the site selection, we would have suggested a better place*". (IDI 7 –Married Female Head, aged 32). This conveys that latrines failed to give females the privacy they needed. Thus the inappropriate locations of the latrines led people to abandon them: "*All the latrines in our hamlet are built in a line [row], facing our houses. It was the sack cement structure and not the concrete walls. Half of them are broken now, and these latrines are located so close to our house that anyone can see us while using even being inside their house. We will not like anyone to see us while defecation*". (FGD 3– Female heads; age range 35–50).

Discussion

Our results show that prevailing socio-cultural practices, socio-economic constraints, and power hierarchies among household members curtail women's autonomy regarding their preferences, choices and decision making power with respect to installation of sanitation facility. Women had less education, less exposure to the world beyond their home and village, and little control over resources and finances. This made them less confident, to make sanitation related decisions. Even if females were motivated to install a latrine, they relied on their spouse to take the decision and make arrangements for the construction.

We found latrines were present in households, where the male head had better education and the family's financial income was higher. But spending on latrine installation or improvement was of least priority to men, often arguing that they had other priorities and financial constraints to build a latrine, which is consistent with the finding of a global review on latrine ownership in rural households[22]. We also found that more than half of households that had a non-functional latrine upgraded their existing houses in the last couple of years, which may indicate, that money was available for upgrading the house but for latrine building. It also indicates rural men not being sensitive to the privacy and security needs of their women[28].

We found women's involvement in decisions regarding personal as well as household needs was very low, and there is no evidence that their involvement in decision making was greater in households with a functional latrine than with a non-functional latrine or no latrine at all. This signals, despite their varied roles and responsibilities, women often had no voice or choice in the different kinds of services including latrine acquisition. This is a potential constraint on latrine adoption and use in rural India, as is evident from previous research. A survey conducted in multiple states of India found young women who are most likely to use latrines were not the economic decision makers and were least likely to have the intra-household power to allocate resources to building latrine[22]. Similarly, women's lack of decision-making power in water supply and sanitation projects in India's Rajasthan state, impacted toilet adoption [25].

Other studies from India report women's participation in aspects of family decision making like own health care, making daily and major household purchases and socialisation (visiting her family or relatives) to be 37 percent[29], which is much higher than our results. Our findings on women having lower autonomy to decide compared to men on sanitation acquisition, is similar to other studies findings from India on paid work[36], agriculture[37, 38], family planning, pregnancy[39], maternal health care[40] and microenterprises[41]. But, states in India are heterogeneous in nature in terms of geography, environment, community, tradition and culture which are likely to have a significant effect on the nature of female autonomy. For example, women of Meghalaya state, play an important role in the decision-making process in

general, as it has a matriarchal society[23]. Similarly, women of Tamil Nadu state have more autonomy in family planning[42].

Female participation and their autonomy in decision making is considered to have positive multiplier effects for the overall social and economic development[43]. In sanitation, their inclusion in the planning and execution has been strongly advocated [6,44, 45]. Some sanitation interventions in recent years attempted motivating both men and women for improved sanitation[31] and focussed on behaviour change in defecation patterns and habits[44, 46]. A drinking water supply and sanitation project in Rajasthan encouraged women to decide on the location of the household latrine[25]. In the TSC implemented villages in Odisha, adolescent girls committee were formed in each village with the purpose to promote usage among household members post latrine construction[34]. A minimum of 33% of seats in the village water and sanitation committees in NBA implemented villages in Odisha were reserved for women [Routray, 2016 Submitted]. A NGO in Odisha state, considered a pioneer in the field of sanitation, trains young unskilled women in masonry—toilet construction and bathing rooms [47]. These examples suggest that measures to improve women participation in sanitation programmes are feasible in rural Indian settings.

However, a majority of the sanitation interventions delivered among the rural Indian communities as observed in TSC, NBA and CLTS, have often not addressed the existing family's social and political dynamics and gender inequality challenges that determines latrine acquisition[6, 27]. A potential reason could be, NGOs engaged for latrine promotion and demand generation at village level are inexperienced and undertrained[48] [Routray, 2016 Submitted], for which, they fail to address them.

Another aspect of the promotion is the patriarchal messages used for promoting latrine construction, both by national and state media[49]. Most slogans emphasise latrine building so that daughter and daughter-in-laws do not defecate in the open exposing themselves. Such slogans which reinforces the patriarchal ideas and promote only women dignity, might provide sanction to men to continue defecating outside. Therefore such promotions need to be more creative, gender inclusive and not promote patriarchy.

Our study has several limitations. The study was confined to female heads as survey respondents and views of other women family members were not included in the quantitative survey and analysis. In the qualitative study, the subjects were selected purposively, which might incur selection bias. The study did not involve adolescent girls and boys, which could have shed more light on their roles to influence decisions, which however is likely to be minimal. Responses in the quantitative and qualitative parts may be influenced by social desirability or attempts to anticipate what the data collectors supposedly wish to hear. For example, women may have exaggerated their lack of decision making power for latrine construction to hide the fact that their own demand for latrines may be low.

To conclude, the results of this study indicate that males were the explicit decision makers, and only in a few households, females participated or were involved or consulted during the final decision for latrine installation. Lack of control over financial resources was an important factor that limited women involvement in the sanitation decision making. Policies need to be formulated that enable women to participate in the sanitation interventions: We have the following recommendations for sanitation policy makers, planners and the local promoters:

1. Interventions aimed for sanitation promotion and sanitation behaviour change, should be designed to address household level dynamics.
2. Considering the vital roles played by men and women in sustenance of projects, strategies need to be developed to accommodate both gender of different age groups in the decision-making at different stages of sanitation intervention (pre and post latrine construction).

3. The contents of the mass media promotions should not focus on women's dignity only. Messages should be for both genders and avoid reinforcing patriarchal stereotypes.

Supporting information

S1 File. Discussion guide—Latrine installation and its decision making in rural households of Odisha: “DM—IDI & FGD guidance.docx”.

(DOCX)

S2 File. Household survey to assess sanitation decision making: “DM—survey.docx”.

(XLSX)

S3 File. Data set—Sanitation decision making in rural households in Odisha: “DM—data-set—10-02-16.xlsx”.

(XLSX)

Acknowledgments

The authors would like to thank the study participants and the field teams in Bhubaneswar office (Odisha), who helped in data collection.

Author Contributions

Conceptualization: PR.

Data curation: PR WS.

Formal analysis: PR WS BT.

Funding acquisition: PR TC.

Investigation: PR.

Methodology: PR WS BT.

Project administration: PR.

Supervision: PR.

Validation: PR WS BT TC.

Visualization: PR WS BT TC.

Writing – original draft: PR.

Writing – review & editing: PR WS BT TC.

References

1. WaterAid. Gender aspects of water and sanitation. <http://www.wateraid.org/~media/Publications/gender-aspects-water-sanitation.pdf>. Accessed on 6th May, 2016
2. UNHRC, Women and girls and their right to sanitation. 2011. <http://www.ohchr.org/EN/NewsEvents/Pages/Womenandgirlsrighttosanitation.aspx>. Accessed on 31st July, 2016
3. Mudey AB, Kesharwani N, Mudey GA, Goyal RC. A cross-sectional study on awareness regarding safe and hygienic practices amongst school going adolescent girls in rural area of Wardha District, India. *Global Journal of Health Science*. 2010 Oct 1; 2(2):225.
4. Fisher J. For her it's the big issue: putting women at the centre of water supply, sanitation and hygiene. *Water, Sanitation and Hygiene: Evidence Report*. Water Supply and Sanitation Collaborative Council. 2006.

5. Jose S, Navaneetham K. Social infrastructure and women's undernutrition. *Economic and Political Weekly*. 2010 Mar 27:83–9
6. Wijk-Sijbesma CV. Gender in water resources management, water supply and sanitation: Roles and realities revisited. IRC; 1998.
7. Jenkins MW, Curtis V. Achieving the 'good life': Why some people want latrines in rural Benin. *Social Science & Medicine*. 2005 Dec 31; 61(11):2446–59.
8. Sahoo KC, Hullah KR, Caruso B, Swain R, Freeman MC, Panigrahi P, et al., Sanitation-related psychosocial stress: A grounded theory study of women across the life-course in Odisha, India. *Social Science & Medicine*. 2015. 139: p. 80–9.
9. Caruso B. Sanitation Insecurity: Definition, Measurement, and Associations with Women's Mental Health in Rural Orissa, India, PhD. Dissertation. 2015.
10. 1 in 3 women lack access to toilets—A briefing note by Wateraid. 2012. http://www.wateraid.org/~media/Publications/WaterAid_1_in_3_World_Toilet_Day_Briefing.pdf. Accessed on 15th September, 2016
11. Kabeer N. World Survey on the Role of Women in Development: Women's Control over Economic Resources and Access to Financial Resources, including Microfinance. Sales No. E. 2009;9.
12. Gender, water and sanitation: a policy brief. UN, New York. 2006.
13. World Bank Working Paper. Mainstreaming Gender in Water and Sanitation. 2010. <https://openknowledge.worldbank.org/handle/10986/17274>. Accessed on 12th August, 2016
14. Hirai M, Graham JP, Sandberg J. Understanding women's decision making power and its link to improved household sanitation: the case of Kenya. *Journal of Water Sanitation and Hygiene for Development*. 2016 Mar 1; 6(1):151–60.
15. Wakeman W, Davis S, Wijk CV, Naithani A, Mundial B. Sourcebook for gender issues at the policy level in the water and sanitation sector. 1996. Banco Mundial.
16. Government of India. Nirmal Bharat Abhiyan—Guidelines. 2012. <http://www.mdws.gov.in/nirmal-bharat-abhiyan-nba-guidelines>. Accessed on 5th January, 2014
17. Government of India. Swachh Bharat Mission (Gramin) Guidelines. 2014. <http://www.mdws.gov.in/sites/default/files/SwachBharatGuidelines.pdf>. Accessed on 3rd April, 2015
18. Government of India Guidelines Total Sanitation Campaign in India. 2010 <http://www.mdws.gov.in/sites/default/files/TSCGUIDELINESJune2010.pdf>. Accessed on 12th June, 2012.
19. Dankelman I. Making Sustainable Sanitation work for women and men. Integrating a Gender Perspective into Sanitation Initiatives. 2009.
20. Acharya DR, Bell JS, Simkhada P, van Teijlingen ER, Regmi PR. Women's autonomy in household decision-making: a demographic study in Nepal. *Reproductive Health*, 2010. 7: p. 15–15. <https://doi.org/10.1186/1742-4755-7-15> PMID: 20630107
21. Senarath U, Gunawardena NS. Women's autonomy in decision making for health care in South Asia. *Asia-Pacific Journal of Public Health*. 2009. 21(2): p. 137–43. <https://doi.org/10.1177/1010539509331590> PMID: 19190000
22. Coffey D, Gupta A, Hathi P, Khurana N, Spears D, Srivastav N, et al., Revealed preference for open defecation. *Economic & Political Weekly*. 2014; 49(38):43.
23. O'Connell K. What Influences Open Defecation and Latrine Ownership in Rural Households?: Findings from a global review. 2014.
24. Jenkins MW, Scott B. Behavioral Indicators of Household Decision-Making and Demand for 1 Sanitation and Potential Gains from Sanitation Marketing in Ghana. *Social Science & Medicine*. 2007. 64(12): p. 2427–42.
25. O'Reilly K. Combining sanitation and women's participation in water supply: an example from Rajasthan. *Development in Practice*, 2010. 20(1): p. 45–56.
26. Stopnitzky Y. The bargaining power of missing women: Evidence from a sanitation campaign in India. Available at SSRN 2031273, 2012.
27. O'Reilly K, Louis W. The toilet tripod: Understanding successful sanitation in rural India. *Health & Place*, 2014. 29: p. 43–51.
28. Routray P, Schmidt WS, Boisson S, Clasen T, Jenkins MW. Socio-cultural and behavioural factors constraining latrine adoption in rural coastal Odisha: an exploratory qualitative study. *BMC Public Health* 2015, 15:880 2015. <https://doi.org/10.1186/s12889-015-2206-3> PMID: 26357958
29. Banerjee S, Roy A. Determinants of Female Autonomy across Indian States. *Journal of Economics, Business and Management*, 2015. Vol. 3(No. 11).

30. Dyson T, Moore M. On Kinship Structure, Female Autonomy, and Demographic Behavior in India. *Population and Development Review*. 1983; 9(1):35–60.
31. Mara D, Lane J, Scott B, Trouba D. Sanitation and health. *PLoS Med*. 2010 Nov 16; 7(11):e1000363. <https://doi.org/10.1371/journal.pmed.1000363> PMID: 21125018
32. Pattanayak SK, Yang JC, Dickinson KL, Poulos C, Patil SR, Mallick RK, et al. Shame or subsidy revisited: social mobilization for sanitation in Orissa, India. *Bulletin of the World Health Organization*. 2009; 87(8):580–7. <https://doi.org/10.2471/BLT.08.057422> PMID: 19705007
33. Clasen T, Boisson S, Routray P, Cumming O, Jenkins M, Ensink J, et al., The effect of improved rural sanitation on diarrhoea and helminth infection: design of a cluster-randomized trial in Orissa, India. *Emerging Themes in Epidemiology* 2012.
34. Boisson S, Peppin S, Ray S, Routray P, Torondel B, Schmidt WP, et al., Promoting latrine construction and use in rural villages practicing open defecation: process evaluation in connection with a randomised controlled trial in Orissa, India. *BMC Research Notes*. 2014. 7(1): p. 1–12.
35. Clasen T, Boisson S, Routray P, Torondel B, Bell M, Cumming O, et al., Effectiveness of a rural sanitation programme on diarrhoea, soil-transmitted helminth infection, and child malnutrition in Odisha, India: a cluster-randomised trial. *The Lancet Global Health*, 2014. 2(11): p. e645–e653. [https://doi.org/10.1016/S2214-109X\(14\)70307-9](https://doi.org/10.1016/S2214-109X(14)70307-9) PMID: 25442689
36. Arooj S, Hussain W, Arooj A, Iqbal A, Hameed S, Abbasi A. Paid Work & Decision Making Power of Married Women Cross Sectional Survey of Muzaffarabad Azad State of Jammu & Kashmir. *Advances in Applied Sociology*, 2013. 3, Number 3.
37. Baliyan K. Factors Affecting Participation of Woman in Household Decision Making: Implications for Family Welfare and Agriculture Development. 2014: http://www.indiastat.com/SOCIO_PDF/103/fulltext.pdf Accessed on 5th July, 2015.
38. Mamta M, Narayan P. Gender participation in rural farm household decision making: a case of Vaishali district, Bihar. *Indian Journal of Economics and Development* 2015. 11(3): p. 755–760.
39. Mistry R, Galal O, Lu M. Women's autonomy and pregnancy care in rural India: A contextual analysis. *Social Science & Medicine*. 2009; 69(6):926–33.
40. Bloom SS, Wypij D, Gupta MD. Dimensions of women's autonomy and the influence on maternal health care utilization in a north Indian city. *Demography*. 2001 38(1):67–78. PMID: 11227846
41. Mohanty SR, Das BL, Mohanty T. Capacity building and decision-making of Rural Odisha women through participation in microenterprises. *International Journal of Scientific and Research Publications*. 2013; 3(7).
42. Jejeebhoy SJ. Convergence and divergence in spouses' perspectives on women's autonomy in rural India. *Studies in Family Planning*. 2002; 33(4):299–308. PMID: 12553187
43. Centre for Social Development, Humanitarian Affairs (United Nations), United Nations. Dept. for Policy Coordination, Sustainable Development, United Nations. Division for the Advancement of Women. *World survey on the role of women in development*. United Nations; 1989.
44. Chambers R. Going to Scale with Community-Led Total Sanitation: Reflections on Experience, Issues and Ways Forward. *IDS Practice Papers*. 2009; 2009(1):01–50.
45. Khanna T, Das M. Why gender matters in the solution towards safe sanitation? Reflections from rural India. *Global public health*. 2015:1–7.
46. Kar K, Chambers R. *Handbook on community-led total sanitation*. Institute of Development Studies. 2008
47. MANTRA—Experiences of Gram Vikas. 2012; http://gramvikas.org/index.php?act_id=2&page_id=56. Accessed on: 3rd June, 2016
48. Hueso A, Bell B. An untold story of policy failure: The Total Sanitation Campaign in India. *Water Policy*. 2013; 15(6):1001–17.
49. Srivastav N, Gupta A. Why using patriarchal messaging to promote toilets is a bad idea. *The Wire*. 2015. <https://thewire.in/3402/why-using-patriarchal-messaging-to-promote-toilets-is-a-bad-idea/>. Accessed on 7th August, 2015

7. SUMMARY, REFLECTIONS AND RECOMMENDATIONS

The final chapter of this dissertation provides a summary of the study results based on the objectives spelled out in Chapter 2. As the chapters 4 through 6 presents the results in detail, I have therefore summarized only the most important findings at the beginning of this section, followed by it is a list of recommendations for policy changes and future research. The chapter concludes with reflections on different aspects that my research could have been improved.

7.1 Summary

The overall aim of this research was to investigate and understand the reasons for lower adoption and use of latrines in rural areas of India, especially the government's subsidised latrines. The investigation primarily focussed on three gap areas i.e. to explore the socio-cultural- behavioural determinants that constrained latrine use, to identify the programmatic challenges that constrained in the implementation of sanitation promotion activities under the campaigns, and to identify household level factors that influenced the decisions on latrine installation. Earlier studies and evaluations have identified a few deficiencies in the design and implementation of sanitation campaigns[1-4], identified cultural factors that motivated people to prefer open defecation[1, 5], and found unavailability of water near the latrines or no water provisioning in latrines as strong barriers to latrine adoption and use[6, 7]. Though the earlier research succeeded identifying a few causes of poor sanitation, but these were mostly the surface level issues and not the deeper ones that got identified. These studies lacked in in-depth investigation of the problem and identifying the underlying causes of lower latrine adoption and lower acceptance of government subsidised toilets. Many of these research studies recommended behaviour change interventions as solutions for sustaining sanitation campaigns in India, but at times without rigorous scientific investigation into the behavioural aspects of latrine adoption and use.

Old defecation habits, strongly ingrained beliefs around containing faeces nearer to houses, elaborate sanitation (cleansing and purification) rituals post defecation, requirement of large volumes of water for accomplishing these rituals, reluctance to change the old styles of performing their daily routine/activities were identified as

cultural and behavioural barriers to latrine use in the rural areas. Socialising, freedom from chores and confinement to house boundaries were other strong motivations among women especially, that made them to opt OD. The OD practices and patterns varied with age, caste, gender, occupation, education, marital status, hierarchy in the family, individual needs of people depending on their health and mobility conditions, times of the day, seasons, and water availability in the local water bodies. But, a certain section of people were found to have started using the latrines, especially those with higher education and prior exposure to latrines. The newlywed daughter-in-laws were found to be early adopters of latrines because of the pressure by male heads to preserve the dignity, prestige and security of the new daughter – in-law and protect family's name.

In addition to the above barriers, there were programmatic challenges that constrained in the implementation of latrine promotion related activities. No strategy was specifically developed to guide the NGOs during implementation and promotions. The NGO staff lacked experience working in WASH, lacked clarity about their own roles and responsibilities, they were not imparted the basic training on the implementation aspects of the campaign and the processes to be followed, the field challenges and local dynamics existing at village and household levels, such as social heterogeneity or diversity within the communities, the caste and gender discrimination that constrained in organising and facilitating the community mobilisation activities for sanitation promotion. Further, the field staff were not equipped with tools and aids which they could use for conducting the promotional activities. Increasing the toilet coverage and meeting the toilet construction targets continued to be a priority by the implementers and no emphasis on toilet use. They rarely motivated people to break their preferences and attitudes for OD and change their behaviours. Government's support with cash incentives to build toilets remained a strong motivation for people to acquire the amount but not motivated them to use.

The study further found that though latrine construction in the households was the ultimate goal of the sanitation campaign, no promotions were held at the household level involving all family members to sensitise and motivate them to change their defecation behaviours. Also, no interventions were held to empower or enable the

family members to demand latrines or take decisions around latrine installation. NGOs interventions aimed targeting the male members, lure them of receiving the government's financial incentive, and making them to agree to build the toilet. Engaging female members to participate or motivating them to be involved in latrine installation decisions was not emphasised. Therefore it was important to study the within-household dynamics to better for which I conducted a cross sectional survey. Only in a few households, the decision was jointly made where female family members were encouraged to suggest and decide on toilet's location and construction, which could be attributed to household's way of functioning and has nothing to do with the sanitation promotion. Women were found to be traditionally excluded from the financial planning and decision making in the households. They had low socio-economic status within the family and high financial dependency on earning male members, and they relied on their husband or male family members to decide in financial matters. They were bound by the power hierarchies and household dynamics and lacked confidence in their abilities to take 'any' decisions independently as they were not involved in the decision making, so had no previous experience to take decisions independently. Female headed households, where the female led the house after her husband's death, even they depended on other males in the family for matters related to finance and day to day matters. Thus female's inability to take decisions was a barrier for latrine adoption.

7.2 Reflections

Looking back on the study, there are aspects that could have been improved in this research. These may be considered in addition to the limitations already included in Chapters 5 and 6.

- We could observe the sanitation promotions under NBA in only 10 villages, with villages varying in nature due to its settings, people's composition, leadership and the dynamics. Observing implementation in all the 50 control villages, probably would have informed us about other important local dynamics and challenges of each village. But with the mobilisation activities of each NGO overlapping with partner NGOs, it was logistically difficult for the

research team to attend all the events in all the 50 villages. Additionally, there were budgetary limitations to visit all the 50 villages, therefore had to limit the investigation to 10 villages.

- In this research, perspective of the government officials responsible for executing these campaigns, have not been explored. If I were to do this research again, I would include them as study stakeholders.
- Pit emptying was found to be a barrier for latrine use in other states, and in this research few households with large family size discussed this issue. But in the study population, majority of the toilets were delivered only a couple of years ago and as people had not started using them regularly, so they did not perceive the pit filling up as a major constraint for use. Further research in this dimension may be helpful for future interventions.
- Puri district may not be an ideal research site, as there were other districts in the same state with lower latrine coverage and higher incidences of diseases. But the ongoing RCT in the district by LSHTM, provided the opportunity for the research's field work.
- Though FGDs are a good medium to elucidate more information from a group of people, but organising the FGDs without paying the participants for their time was challenging. Participants often expressed their reluctance to attend and did not critically review the NGO's role during implementation, anticipating that NGO would stop building their latrine, if they get to know of being criticised. In the FGDs with females, often the mothers would bring their kids to the meeting venue, which delayed and interrupted the discussion. Facilitating these discussions without hurting the sentiments of the mothers for the noise, was also challenging.
- Additionally, I would like to reflect on the experiences during the field work. The data collection was the most enjoying, as it gave an opportunity to spend

time with people, knowing them, learning about them and gaining a deeper understanding about the rural life, people's culture, rituals and customs. The RCT gave the opportunity to attend and witness the roll out of NBA, and their office set up facilitated in the conduction of field work in many ways. The trained and the skilled staff working in the RCT were a great support, and some of the staff were engaged in conducting the surveys, observations, IDIs and note taking during FGDs. Otherwise, finding skilled staff and training them on the qualitative tools would have been additional hassle and could have even affected the data quality. The in-depth information presented in the chapters – 4, 5 and 6, could not have been captured probably that well, if had I engaged professionals to conduct the FGDs and IDIs, who probably would have lacked in being keen to learn and understand the settings, may not have gone deeper to find the roots of the problem i.e. why people were reluctant to change their behaviours and their reasons for preferences for OD. My belonging to the same state, knowing and speaking the Odia language, helped get connected to people, establish rapport and understand the intricacies associated with the individual's behaviour, household and community level dynamics, which probably could not have been understood so in-depth or optimally evaluated.

7.3 Recommendations for increasing sanitation adoption and uptake

Further to the recommendations already made in Chapters 4, 5 and 6, additional recommendations are being made for consideration by policy makers, sanitation planners and practitioners. During framing of sanitation focussed policies and the designing of the sanitation interventions, consideration of these recommendations could have sustainable impact on sanitation uptake.

Based on the findings of the first research dimension, the recommendations are:

- Socio- cultural and behavioral factors was found to influence as well as constrained sanitation uptake, so addressing them becomes important to sustain the sanitation efforts and programmes. Therefore, prior to the designing of any sanitation campaigns, formative research should be

conducted to understand the local culture, prevailing practices around sanitation in the targeted communities, and the different local dynamics that could influence the interventions.

- Attitude and behaviour change is an important aspect of toilet uptake, therefore triggers, approaches and interventions to change the behaviours of individuals and motivating them to use toilets, should be executed at - community, group, household and individual levels. The culture of latrine use need to get inculcated into people's brains for sustainable outcomes.
- The research community should undertake more research in different parts of the country to understand the barriers and constraints of that particular area and provide data/ information to organizations working in WASH. Similarly, these organisations should design and develop their interventions based on the researched data.
- Instead of concentrating on latrine construction, trials should be conducted to explore different ways of promoting latrine use.
- As water forms an important role in the sanitation practices and behaviours, therefore any sanitation intervention need to include water/consider provisioning of water along with the toilet. Without, water availability, the toilets is likely to remain unused.

The second research dimension identifies the programme implementation related short comings, which the future programmes need acknowledge, rectify and improve the implementation. The recommendations are:

- The target oriented approach of increasing toilet coverage did not succeed in solving the sanitation crisis of the country. Therefore, the toilet targets should be replaced with process oriented interventions, approaches and behavioral trials to motivate and make people to change their behaviours. Toilets are to be delivered to households only when household members commit and pledge to use it. A mechanism may be established where the community

guarantees the use of the toilet by the household receiving the financial incentive.

- A uniform, sanitation programme and one fit toilet design has failed, therefore a single uniform programme should be avoided and not prescribed for the whole country. Instead the sanitation programmes should be designed taking into account the local challenges and modified as appropriate to the area /location. . The intervention strategies should be backed with formative research (as suggested earlier).
- Allocation of funds for enhancing staff capacity is essential for programme's effective implementation and sustainability. Staff to be imparted trainings on different aspects of the programme, exposure to both the successful and failed interventions in the past, behavioral strategies, facilitation skills and not just given toilet targets. Specialised trainings for staff capacity building is therefore recommended.
- One of the findings of this study is the absence of skilled staff in behavior change, staff at the village level lacking experience in WASH related programmes. So, it is recommended to establish resource centres/academies at different levels with a pool of dedicated personnel, trained in behaviour change, interpersonal communication and community triggering. These centres can conduct regular trainings to enhance the capacities and skills of grass root level workers, facilitate and extend help to implementers and monitor the programmes.
- In the absence of government officials at the village level to promote and take forward the campaigns, deployment of dedicated sanitation mobilisers in the villages is one of the recommendations. These mobilisers should be capacitated through regular trainings on participatory methodologies, trigger mechanisms for collective behaviour, IPC methods to conduct sustained face-to-face contact, motivate and target changing attitudes. Additionally, they should be aided with different tools which they could use for motivating

people and compensated with some remuneration. A mechanism should be developed to track the performance of these mobilisers in terms of sanitation uptake and be rewarded proportionately with incentives based on performance.

- An efficient monitoring system to track the qualitative aspects and performance of the campaign at all levels is recommended. The system should have qualitative indicators and means of verification to track the performances of government as well other agency's officials in charge of implementation. Regular analysis of these monitored data should be conducted to identify problems if any, and necessary interventions to be made to rectify/ improve/revise the programme components that are not doing well.
- The WASH organizations and government department in charge of sanitation are recommended to include action research into their interventions, meaning every intervention/action should be backed/ followed by mid-term evaluations. As a result, the activities in the programmes are revisited, modified and redesigned based on the findings of the mid-term evaluation during the programme period instead of doing the post-mortem after the programme period is over.
- The government programmes need to be streamlined to a large extent. The components of TSC and NBA especially the reimbursement of the financial incentive was very complicated, which needs to be simplified for convenience of the people as well as the NGOs for sustainable outcomes.
- Planning is necessary and arrangements should be done for the wide dissemination of the programme guidelines and implementation strategies. The translated versions of the guidelines and the strategies should be made available in the local languages for the reference by the implementers at the grassroots.

- Toilet use is a personal behaviour and to change it, requires interest, attitude and time of the individual. So, government should not withdraw or wind up its work once the toilet construction finishes. They need to establish some mechanism through NGOs or villagers forum either to make people feel their presence, and keep continue working in the villages till all have changed their behaviours and adopted the latrines. This is recommended as people tend to revert back to their old behaviours when they realise, there is no one monitoring or observing their behaviours, which will not sustain the campaign.
- Enforcement of some laws or rules that can penalize the household that received the government's financial incentive, built the toilet but not all its members using.
- Political engagement and involvement is necessary for the campaign to perform well, whereas, interference by political parties need to be minimised. Enforcement of laws restricting the politically influenced group and leaders in campaigns intervention could address the programmatic challenge to some extent.

Going by the findings of the third research dimension, the recommendations are:

- An individual's behaviour is shaped and influenced by other members in the family and the community. But, family dynamics and situation prevailing in households constrain latrine uptake. But the previous campaigns rarely intervened at the household level to promote latrine use. Targeting all the family members and motivating them to change their behaviours for toilet use becomes important, and therefore, strategies for household level interventions should be emphasized in future programmes. For this to realize, allocation of special funds, time and trained human resources for household level interventions is necessary.

- Women involvement was grossly neglected in the previous campaigns. Future campaigns should enforce strong guideline for inclusion and active participation of females in the programme implementation, at all levels.
- More experiments with women's involvement and participation in the sanitation interventions should be encouraged and evaluated, and the successful interventions should be replicated and scaled up.

7.4 Future research

Following suggestions are being made for future research, whose findings could benefit government, WASH organisations and practitioners working in sanitation sector.

- Research have indicated filling up and emptying of latrine pits as barriers for its use. As pit filling is associated with the soil texture, water table in the region, seasonality, users practices, availability of pit emptying services, so more research in this aspect would inform - whether the latrine design with single pit that is uniform across the country, need to be changed or modified based on the local condition, family size, etc.
- In-depth studies examining latrine use/non use and its association with water access/availability, household member's workload, impacts on familial relationship (between spouse, and other family members), children's education, time utility, occupation diversification will inform practitioners, sanitarians, government officials, and policy makers for improving the campaigns and for designing the behaviour interventions.
- Under the government's programmes, toilets are provided to the schools and the Anganwadi centres, but the literature search did not find any study on latrine use behaviours by students and children in schools and Anganwadi centers. It is suggested to evaluate the status of these toilets, and the usage pattern among the children and school students. These findings would inform, if the investments/efforts in building the toilets are yielding results or in vain. The data could also be used to design and target behavioural interventions for

young children and students, and a platform could be created to train the students and children learn toilet use while they are at the Anganwadi centres and schools.

- There is dearth of research on toilet use and the sanitation promotions for people with disabilities. More research should be done to find their sanitation situation, to understand their needs, which will contribute to the design of special programmes for people with disabilities.
- Studies evaluating women's role in sanitation promotion, behaviour change, decision making in India is lacking. Studies may be done to understand the association between women's participation in latrine installation and its sustained use. The findings would help identifying the right stakeholders for interventions.
- In this study population, female's low socio-economic status in the family was found to impact them taking latrine installation decisions independently. Other regions or places or communities, where women have higher socio- economic status and are financially independent, similar research to understand the association of female's financial independency with latrine installation decision making would be insightful. Similarly, in matriarchal societies, the status of latrine uptake or demand could also be researched and these findings could be used for designing the future interventions.
- Effectiveness of different media in sanitation promotion is leanly researched. Media played a crucial role in policy level advocacy, sensitization and generating awareness programmes among people previously. Therefore, media's role in sanitation campaigns could be investigated and they should be looped in to the various activities of the sanitation campaigns.

CHAPTER REFERENCES

1. Planning Commission, Government of India. Evaluation Study of Total Sanitation Campaign. 2013.
2. Planning Commission, Government of India. India Assessment Report (2002) Water Supply and Sanitation, a WHO-UNICEF sponsored study. 2002.
3. Water and Sanitation Program, World Bank. A Decade of the Total Sanitation Campaign: Rapid Assessment of Processes and Outcomes. 2010.
4. Hueso A, Bell B. An untold story of policy failure: the Total Sanitation Campaign in India. *Water Policy*. 2013 Dec 1;15(6):1001-17.
5. Coffey D, Gupta A, Hathi P, Khurana N, Spears D, Srivastav N, Vyas S. Revealed preference for open defecation. *Economic & Political Weekly*. 2014 Sep 20;49(38):43.
6. O'Reilly K, Louis E. The toilet tripod: Understanding successful sanitation in rural India. *Health & place*. 2014 Sep 30;29:43-51.
7. O'Reilly K. "Traditional" women, "modern" water: Linking gender and commodification in Rajasthan, India. *Geoforum*, 2006. 37(6): p. 958-972.

APPENDIX 1

Media coverage on published paper 1 – Indian Express

Friday, September 09, 2016

Home > States > **Odisha**

More Toilets Fail to Reduce Defecation in Open: Study

By Express News Service | Published: 22nd October 2015 04:32 AM | Last Updated: 22nd October 2015 04:32 AM

Email 0

BHUBANESWAR: Even as the number of household toilets has gone up substantially in recent years, the improved sanitation coverage does not seem to have effected proportionate reduction in open defecation in Odisha.

Despite having toilets or latrines in their houses, a substantial chunk of population in rural Odisha continues to prefer open defecation for different factors ranging from improper construction of the sanitation facilities to socio-cultural and behavioural aspects.

Poor quality and inappropriate single latrine design made available to rural people under Government sanitation schemes have contributed to their non-use. Socio-cultural and behavioural factors like purification beliefs and rituals, resistance to change and the thought that these are exclusive facility for women members are major constraints to universalisation of latrine use, a study by international researchers has revealed.

The study carried out by experts from the Environmental Health group, Faculty of Infectious and Tropical Diseases of London School of Hygiene and Tropical Medicine, Rollins School of Public Health, Emory University Atlanta, USA and Department of Civil and Environment Engineering, University of California in Puri district has focused on addressing behavioural barriers along with providing proper infrastructure to ensure maximum adoption of the toilet.

Toilet Trouble

2 Despite having toilets in their houses, a substantial chunk of population in rural Odisha continues to prefer open defecation

2 The factors range from improper construction of sanitation facilities to socio-cultural and behavioural aspects

2 Poor quality and inappropriate single latrine design made available to people under Govt schemes have contributed to their non-use

Odisha is among the lowest performing States in terms of latrine coverage. Worse still, even in some high coverage villages with more than 83 per cent household latrines, nearly 50 per cent of the population defecated in open. An evaluation of

the Total sanitation Campaign (TSC) in Puri district has found that 37 per cent of members of households with latrines reported to have never used them.

While traditional habits and socio-cultural barriers may be contributing to the present day situation, flaws in TSC programme design and implementations were also responsible. Government subsidised latrines were mostly found unfinished. Though pronounced complete as per Government standards, the units lacked a proper roof, door, adequate walls and any provision for water supply or storage. The space in these units was limited which hindered squatting to an extent that people habituated with free open environment were put off.

Lack of water in the latrine or near it was also a big hindrance as people here have an elaborate process of cleaning with water post-defecation. Long-term habits, socialising, sanitation rituals and daily routines varying with caste, gender and marital status, age and lifestyle also accounted for low adoption.

The study led by Parimita Routray of London School of Hygiene and Tropical Medicine and published in the BMC Public Health Journal, however, noted that the interest in construction of latrines was rising among family heads and decision makers, who were becoming more concerned about privacy of female members, especially newly-wed daughter-in-law. But the male members largely refrained from using them as they were free to move outside and relieve themselves.

APPENDIX 2

Blog by Dean Spears - RICE

9/9/2016

Read this important new qualitative paper from rural Orissa | r.i.c.e.



Follow @riceinstitute

Like 1K

research institute for compassionate economics

SQUAT

Contact Us

Donate

Menu



Search ...

Read this important new qualitative paper from rural Orissa

Written by [Dean Spears](#) on September 11th, 2015

Topics: [Sanitation](#)

Everyone concerned about the prospects of the Swachh Bharat Mission should check out this new paper in *BMC Public Health* by lead author Parimita Routray and some of the top thinkers in sanitation, available [at this link here](#):

RESEARCH ARTICLE

Open

Socio-cultural and behavioural factors constraining latrine adoption in rural coastal Odisha: an exploratory qualitative study

Parimita Routray^{1*}, Wolf-Peter Schmidt¹, Sophie Boisson¹, Thomas Clasen^{1,2} and Marion W. Jenkins^{3,1*}

They reach many of the same conclusions as our team did in [our qualitative study](#) that we did around the same time as the SQUAT report. In particular, they argue that government latrine construction programs that fail to take into consideration culturally-influenced constraints on demand for latrine use are unlikely to be enough to importantly reduce open defecation:

Conclusions: Findings show that providing infrastructure does not ensure use when there are significant and culturally engrained behavioural barriers to using latrines. Future sanitation programmes in rural India need to focus on understanding and addressing these behavioural barriers.

<http://riceinstitute.org/blog/read-this-important-new-qualitative-paper-from-rural-orissa/>

1/4

I am particularly delighted to see the call for more efforts to understand these issues. We don't know enough yet as a sector about how precisely we can design a rural sanitation effort around these issues that can succeed.

One way that this paper contributes to understanding the culture of purity and pollution around rural sanitation is by documenting how, in the population they study, defecation rituals differ across caste categories and ranks, and within these for men and women. In a detailed table that crosses caste rank by sex and age, they describe, for example, that Brahmin men (the highest castes) wear a special garment to defecate in the open: "This cloth is usually kept outside the living area, away from the main house and away from the reach of children and adults, so that no one touches it." About high-caste women, they write "For those with latrines, stepping over the squatting pan is considered *chuan* (i.e. getting impure) and both the body and clothes worn get impure. They are forbidden from entering the house wearing impure clothes." These rules, the authors describe, do not necessarily apply in the same way to lower castes. But, in so far as people in lower castes aspire to be socially higher ranking, they often seek to emulate the practices of higher castes. One memorable description of this practice is in Valmiki's *Joothan*, where the author recounts his regret at neighboring dalits' abandonment of pig raising – an important economic activity for their livelihood – in an attempt at social mobility.

One aspect of the paper that surprised me was the emphasis on access to water as a binding constraint and solution to the impurities of open defecation. There is a similar conclusion in a [recent NBER economics working paper](#) about health effects of sanitation, focusing on the same part of India, rural Orissa – it is also well worth reading. One reason this surprises me is that water is not a constraint that people describe as important in north India, where we have done most of our field research. Another is that in a range of national and international data sources, water doesn't seem to correlate much with open defecation (that's an [evolving work in progress](#)). Many data sources show that Muslims in India have less access to piped water but are less likely to defecate in the open. Other countries with much worse access to water have much less open defecation, so if improving water access would play a special role in reducing open defecation in rural India it would indeed be a *special* role, different from what the same intervention would do in other countries and cultural contexts.

But, different places are different, even (especially!) within India. According to the new 2012 IHDS data, 95% of households in rural Uttar Pradesh and 97% of rural Bihar report as their main water source public piped water, a tube well, or a hand pump. In these very large states, about 80% of households with such improved water report defecating in the open. Only 75% of households in rural Orissa report similarly good water supply: 20% of households there report getting water from an open well, compared with less than 5% in rural Uttar Pradesh. So, maybe the water constraints are different.

What strikes me as most important is that the consequences of purity and pollution are so much the same. To me, all of this calls for even more active hands-on work to test out solutions carefully designed – as this important new paper calls for – around the implications of purity and pollution for open defecation in rural India.

APPENDIX 3

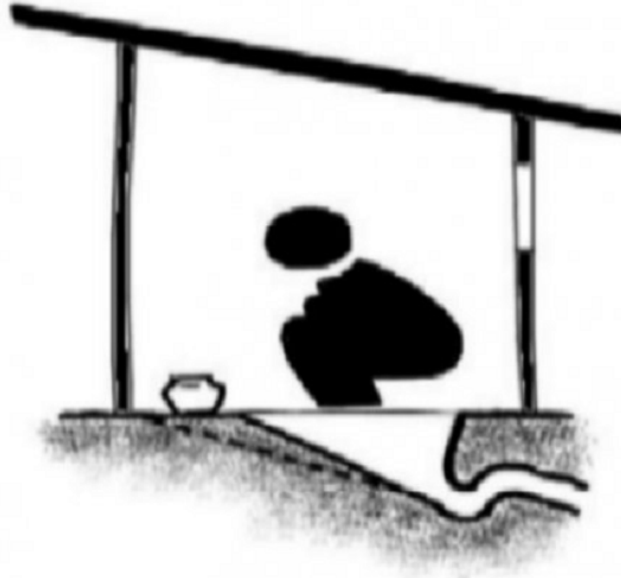
Article review by Aarti Kelkar – India Water Portal



Why do people choose to defecate in the open than use toilets in rural coastal Odisha?

Authored Parimita Routray Wolf-Peter Schmidt Sophie Boisson Thomas Clasen Marion W. Jenkins
By : (/authors/parimita- (/authors/wolf-peter- (/authors/sophie- (/authors/thomas- (/authors/marion-
routray), schmidt), boisson), clasen), w-jenkins)
Posted By : aarti kelkar kh... (/dashboard/aarti-kelkar-khambete)
Posted Date : Thu, 2015-11-19 16:45

Maybe beliefs that faeces were impure also caused people to look at the practice of containing faeces in the latrine pit in the house as a 'sin' is one reason but there are so many others.



Sociocultural factors affecting toilet use (Source: Sourabh Phadke)

Of the one billion defecating in the open globally 66% live in India, of which 92% live in rural areas. Despite concerted government efforts for the last three decades to promote sanitation, India continues to lag behind in terms of access to basic sanitation facilities. Odisha in eastern India, is among the lowest performing states in terms of toilet coverage, and recent evidence shows that open defecation is high in the state. Even among households who have toilets, many do not use them.

The paper titled 'Socio-cultural and behavioural factors constraining latrine adoption in rural coastal Odisha: An exploratory qualitative study (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4566293/pdf/12889_2015_Article_2206.pdf)' published in the journal BMC Public Health (<http://www.biomedcentral.com/bmcpublikehealth>), presents the findings of a study undertaken to understand the reasons for low latrine uptake and identify factors that motivate and constrain latrine use with regard to government subsidised facilities in Odisha.

The study was carried out across rural villages in Odisha and qualitative methods were used to explore and develop an in-depth understanding of different factors responsible for low adoption of latrines. People who owned one of the three types of latrine facilities namely, self-financed, GOI subsidised with improvements financed privately by the household, and GOI subsidised latrines constructed without further improvement were selected and interviewed.

Findings of the study

It was found that even where people had an option to use a household latrine, many were reluctant to use them and chose to continue to defecate in the open. Government subsidised latrines facilitated by NGOs under the Total Sanitation Campaign largely remained unused, and even villages officially attaining Open Defecation Free (ODF) status were not open defecation free.

<http://www.indiawaterportal.org/articles/why-do-people-choose-defecate-open-use-toilets-rural-coastal-odisha>

- The main reason for latrine installation was the arrival of a newly wed bride into the household, and the concern to protect and preserve her dignity, privacy and security as her defecating outside would lower the prestige of the family. However, the same kind of thinking was not followed in the case of the daughters or other females within the family.
- Women/daughters in law from wealthier or better educated and upper caste families expressed gratitude for the ease and convenience of using the latrine, which normally also included a water supply and private place to bathe, which liberated them from the worry of being seen bathing and defecating in public as it could generate village gossip and family shame.
- In contrast, married women in GOI subsidised latrine households who tended to be of low and middle castes expressed regret for having to use the household latrines as defecating in the open in the evening provided them with a rare daily opportunity to escape the house, the scrutiny of the mother-in-law, and socialise with women friends and peers.
- Women were less concerned about being seen defecating out in the open with the attainment of mother-in-law status and old age.

Local beliefs of purity and pollution

- Strong beliefs around impurity and pollution and the required rituals for purification and cleansing post-defecation played a big part in the choice to continue defecating in the open. Importance was placed on the need for water inside the latrine to complete the cleansing acts following defecation.
- Beliefs that faeces were impure also caused people to look at the practice of containing faeces in the latrine pit in the house as a 'sin', because idols and pictures of gods that were revered were kept and worshipped in every house and having toilets within or next to the house was perceived to make the entire house impure.

Poor planning and designs of latrines

- Problems with inadequate and inappropriate designs and poor and incomplete quality construction of the TSC subsidised latrines created barriers to latrine use. Annual risks of monsoon flooding in the area were not considered in the design and construction of the subsidised latrines, many of which had pans installed at or near ground-level and were very small, shallow pits. As a result, many of the toilets got water-logged and became unusable in the rainy season.
- Non-involvement of the users in deciding the toilet design to suit their needs and preferences also led to non use of latrines.
- Households were found to rely highly on subsidies, and the subsidy amount was found to be inadequate to construct a working toilet.

The findings reveal that poor quality and inappropriate latrine designs under government sanitation schemes are important factors, but are not the only reasons for low latrine uptake and use. A number of behavioural aspects constrain the adoption and use of latrines and these vary among communities by gender, age and caste. Any future sanitation intervention needs to consider these aspects and approach the issue of sanitation behaviour change holistically, rather than focusing on targets.

Lead image source: Sourabh Phadke in CONRADIN, K., KROPAC, M., SPUHLER, D. (Eds.) (2010): The SSWM Toolbox. Basel: seecon international gmbh. URL: <http://www.sswm.info> (<http://www.sswm.info>)

Download a copy of the paper below.

APPENDIX 4

Discussion guide: FGD with NGO functionaries on village level implementation of NBA activities

Discussion themes: mobilisation categories; mobilisation at different levels; staff capacities; constraints, challenges and shortcomings of the mobilization activities;

Main question: Was community mobilisation (under NBA) delivered the way it was supposed to?

Sub questions :

1. What were the different strategies laid out for community awareness, motivation and mobilisation?
2. How were these strategies or tools developed and selected? Describe the process and the stages involved in strategy development?
3. Evidence shows that : *'the most effective approach leading to behaviour change is a combination of efforts at all levels – individual, interpersonal network, community and societal. For effective mobilisation, different levels are reached with different communication approaches'*.
 - Did you have separate strategies/ways to motivate different actors and sets of people in the village?
 - How did you choose/decide which strategy / tool to apply for villager's motivation?
 - Did you had any instruction/guidance notes to follow, while selecting tools to be used for community mobilisation?
 - What different factors/village conditions you field staff consider while deciding the tool, to be used for awareness and mobilization?
 - How did you decide, whether the mobilisation should be targeted to the individual hh or community as a whole, or any other?

4. What was the aim behind these community mobilization activities? What change you expected from people to take place in terms of their sanitation behaviours, after these community mobilisation activities?
5. How did your community mobilization activities result in raising demand for latrines? Any examples?
6. How did it impact in changing the age old beliefs and norms of people? Were people more motivated to build toilets after your mobilization activities? Any examples that expresses people's motivations? Are there evidences of behavioral change due to the mobilisation?
7. Can community mobilization exercises be facilitated /carried out by all your staff, or any special skills you feel is needed to deliver such activities?
8. What different skill enhancement or capacity development activities done for the staff engaged for this campaign? What are your feedback on these skill enhancement exercise? Do you feel these trainings were sufficient to enable the staff to deliver their roles and responsibilities effectively?
9. Describe the capacity building trainings held especially for staff engaged to implement this NBA?
 - What capacities or skill sets were existing within your team members to implement this new campaign?
 - What weaknesses staff had, which challenged them in meeting their deliverables? How did you all overcome those weaknesses? Probe - work on self, support from seniors?
 - What are the threats encountered during this sanitation campaign implementation? Probe for varied responses by male and female implementers (motivators)
 - How were those threats dealt?
 - Community mobilizations are essential ? (opinion from staff)
 - What channels - communication materials or other aids were made available to field staff?
 - What are the practical challenges in organizing these community level meetings/mobilization activities?

- What are your personal experiences or thoughts on improving this community mobilization component of NBA?

10. Are there any funding constraints to conduct these activities?

11. What are the shortcomings of this programme specifically these village level mobilizations?

- What were people informed about the programme before they agreeing to construct toilets?
- Factors that attracted HHs to build latrines
- What made the HHs build the latrine, even if the most essential thing - water was not present? Or,
- Had they anticipated the water need and water fetching difficulties before opting for latrine?
- Why did the households not complete the toilet, even if they consented for it?

APPENDIX 5

Discussion guide: IDI of community members on community mobilization for sanitation promotion

Date of Interview:

Name: Sex: Male/female

Marital status: Married/ unmarried Age: Caste
:

Hamlet /Village: Block:

Profession/occupation:

Questions:

Introductory / ice breaking questions to initiate the interview:

1. Reflections about the current defecation practices by villagers (both by the interviewer and the interviewee (participant)).
2. How essential is it to stop and change the defecation behaviors/practices of the villagers? Why?
 - ..
 - ...
 - ...
 -
3. Who do you think should take up the task of changing villager's open defecation behaviors?
Self; Government ; NGO ; Any other
4. Was there any sanitation promotion/meetings held recently in your village?
Yes; No
5. Who (agency) did it?
Government; Non-government; Any other ; Don't know
6. What were the different activities carried out by that agency?
 - Village meeting ;
 - Village mapping ;
 - Interface meetings ;
 - HH visits ;
 - Wall paintings ;
 - VWSC formation ;
 - Adolescent girls committee formation ;

- Awareness for school students
 - Competition among adolescent girls
7. From the above activities mentioned above, in which all activities did you participate?
 - Village meeting ;
 - Village mapping ;
 - Interface meetings ;
 - HH visits ;
 - Wall paintings ;
 - VWSC formation ;
 - Adolescent girls committee formation ;
 - Awareness for school students
 - Competition among adolescent girls
 8. Were activities carried out by NGOs regards to latrine construction in the village? What were they?
 9. Are you a member of any committee formed for sanitation promotion or toilet construction by this NGO?
 10. How effective you feel, are these committees?
 11. Sanitation promotion through community mobilization is perceived to impact people's defecation behavior and raise people demand for toilets. Did this strategy work in your village?
 12. Do you feel, community mobilization as a strategy is sufficient in impacting people's mind set and motivated them for constructing a latrine? If not, which other approach could be adopted to motivate villagers for toilet adoption?
 13. How easy or difficult was for the NGO to conduct mobilisation activities in your villages? Probe – if there were leadership issues, caste feelings or discrimination, political influence. What influence these issues had in mobilising and awaring the communities?
 14. What can be done to address these issues that hinders development programmes like the sanitation promotion?

APPENDIX 6

Observation checklist: Latrine observations

Village :

Date :

1. Type of latrine : Pour flush/ pit latrine/ any other
2. Constructed by : Self financed / government sponsored
3. Construction Status : Complete/ incomplete
4. Functional Status : Functional/ non – functional
5. If not in use, what is the latrine being used for?
6. Pictures of the latrine and description
7. Remarks :

APPENDIX 7

Observation checklist: Sanitation promotion and community mobilisation activities by NGOs

Village :

Date :

Time :

Things to be observed and noted during the mobilisation process:

1. Activity / exercise name :
2. Tools or methods applied ; brief description :
3. Who conducted ; name and designation ; organization :
4. When (time): dd/mm/year time : am/pm
5. Who & no. of people participated:men ,women, children
6. Remarks :

.....

.....

.....

.....

7. Pictures taken and description
No. 1 :
No. 2 :
No. 3 :
No. :
No. :
8. Identification of key opinion makers for FGD or in-depth interviews

APPENDIX 8

Discussion guide: FGD with community members on village motivation by NGOs for sanitation promotion

Themes:

Community level activities:

- Could you recall and share the different activities held in your village in order to inform, motivate the villagers for building a latrine? Did you participate in those activities or you heard from someone else.
- What is your feeling about the awareness and other activities that took place before the toilet construction programme?

Learnings and messages from mobilisation activities:

- What were the new things you learnt from the community meetings and other mobilization activities; What messages touched you? How do you relate these activities with your life? What relevance these messages have in your personal lives and in your family? How will you apply these messages in personal lives? Why will you not apply these messages?

Facilitation of the village mobilisation activities:

- Who facilitated the community meetings and other village level activities; who attended ; Who participated; how were decisions taken in the meetings or the mapping, etc.

Challenges and facilitators of the mobilisation activities:

- Did all villagers (all categories and sections; men and women; adolescent girls and boys) participate in these activities? Why and why not?
- How villagers supported in making these activities meaningful and successful?
- What difficulties/factors hindered them to participate? Probe - Time on people, Culture; Social norms that prohibits people from coming together.
- Existing discriminations that prohibits the NGOs to conduct these mobilisation effectively?
- Are there any village dynamics; or influences by external powers like the politicians or the political parties?

APPENDIX 9

Discussion guide: IDI on household sanitation decision making

Participant's name : Village :

Sex : M/F Age : Marital status : Respondent's consented : Y/N

Date of Interview:/...../..... Start time : End time :

Introduction /ice breaking questions:

1. Tell something about your village, your family, friends, and yourself.
2. How is life in rural areas? What are the challenges of living in a village(general) ? What are the good things/what you appreciate about your village?

Probe : Explore what are the different infrastructure the village has; are any government programmes to improve people's lives; Any sanitation (latrine) related activities in their village; how united are the villagers; village dynamics; customs and ceremonies

3. Your own challenges living in this village/in the family?

Thematic questions:

4. Has your household participated in any of government's development schemes?
5. Did your household participate in the recent sanitation programmes of government or in the past?
6. What facilities do you have for defecation/sanitation?
7. Since how long you have this facility at home?
8. Was the facility installed by your household with personal funds or, someone built these facilities for you?
9. If the latrine was built by your household, then who was the initiator of this? What made him to build a latrine/what was his/her motive/idea?

10. Was it a family member or some relative? Any special event, that triggered the family member to build the facility?

11. How were you involved /participated in this latrine installation process?

Probe: What were your contribution in the whole process of latrine installation, starting from the idea level till completion?

12. If any external organisation built the latrine for your household, then please describe all the process they followed and built the latrine?

Probe: Who approached your family? How was the decision taken? How were the sites selected? Who made the investments? Who constructed?

13. What are the factors that facilitates or constraints this decision in the households?

Probe: Any household level dynamics; power hierarchies within the family members ; dominance of which members; who has a more strong say in the family and why - economically strong, elderly member, more education ; any special member in the house, who is mostly given importance and why?

14. If you given an opportunity to build a latrine, how differently you will go about it /do it?

APPENDIX 10

Discussion guide: FGD on household sanitation decision making

Total number of Participant:	Village :	Group : M/F
Age group :	Marital status :	Consented : Y/N
Date of FGD:/...../..... Start time : End time :		

Introduction /ice breaking questions:

1. Tell something about your village, your family, friends, and yourselves.
2. How is life in rural areas? What are the challenges of living in a village(general) ? What are the good things/what you appreciate about your village?

Probe : Explore what are the different infrastructure the village has; are any government programmes to improve people's lives; Any sanitation (latrine) related activities in their village; how united are the villagers; village dynamics; customs and ceremonies

3. Your own challenges living in this village?

Thematic questions:

4. Has your village participated in any of government's development schemes?

Probe : sanitation programmes of government or in the past ; rural employment scheme; indira awaw yojana; antodaya; mid day meals, etc?

5. What facilities the villagers have for defecation/sanitation? Rough estimate (in years) if any villager has the latrine facility.
6. Any external organisation came forward and built the latrine for your households, then please describe all the process they followed and built the latrine?

Probe: Who approached your family? How was the decision taken? How were the sites selected? Who made the investments? Who constructed?

7. What are the factors that facilitates or constraints this decision in the households? Share personal experiences.

Probe: Any household or village level dynamics; power hierarchies within the household and village ; dominance of which type of members (who has a more strong say in the family and why - economically strong, elderly member, more education)

8. If you had to implement a programme like the sanitation /latrine building, then, how would you approach to household? Or, are you happy the way the programme was delivered?

APPENDIX 11

Survey to assess household decision making

Date of survey	Village Name/code	
Household ID :	Enumerator code :	
1 Respondent's Name ଉତ୍ତରଦାତାଙ୍କନାମ	.....
2 Age of the respondent ଉତ୍ତରଦାତାଙ୍କବୟସ	.....
SECTION A : DEMOGRAPHIC AND SOCIO- ECONOMIC STATUS ସାମାଜିକଓଅର୍ଥନୈତିକସ୍ଥିତି		
3 Caste ଜାତି	General ସାଧାରଣ	01
	Other backward class (OBC) ଅନ୍ୟ ପଛୁଆ ବର୍ଗ	02
	Scheduled caste (SC) ଅନୁସୂଚିତ ଜାତି	03
	Scheduled tribe (ST) ଅନୁସୂଚିତ ଜନଜାତି	04
	Can't say/ Don't know ଜଣା ନାହିଁ	99
4 Family Type (presently) ପରିବାରରପ୍ରକାର	Joint ଯୌଥ ପରିବାର	01
	Nuclear ମୌଳିକ ପରିବାର	02
5 Family Composition (nos.) Dont Tick. Note down the no. of persons in each group	Parents (male head) ବାପା	
	Parents (female head) ମା	
	Married Sons / married men ବିବାହିତପୁଅ	

ପରିବାର ରଚନା. ପ୍ରତି ବର୍ଗରେ କେତେ ଲୋକ, ମୋଟ ସଂଖ୍ୟା ଲେଖନ୍ତୁ	Daughter in law / married females ବୋହୂ		
	Unmarried Sons > 15 yrs 15 ବର୍ଷ ରୁ ଉର୍ଦ୍ଧ୍ୱ ଅବିବାହିତ ପୁଅ		
	Unmarried Daughter > 15 yrs 15 ବର୍ଷ ରୁ ଉର୍ଦ୍ଧ୍ୱ ଅବିବାହିତ ଝିଅ		
	Children (boys & girls) < 15 yrs 15 ବର୍ଷ ରୁ ସାନ ଛୁଆ(ପୁଅ ଓ ଝିଅ)		
	Married daughters ବିବାହିତ ଝିଅ		
	Any others ଅନ୍ୟାନ୍ୟ		
6	Persons living in this household presently? ବର୍ତ୍ତମାନ ଆପଣଙ୍କ ଘରେ କେତେ ଜଣ ସଦସ୍ୟ ରହୁଛନ୍ତି?	.....
7	Educational status of MALE head? ଘରର ପୁରୁଷ ମୁଖ୍ୟଙ୍କ ଶିକ୍ଷାଗତ ଯୋଗ୍ୟତା?	None (illiterate) ଅଶିକ୍ଷିତ	01
		Primary (1 - 5th class) ପ୍ରାଥମିକ(1-5 ଶ୍ରେଣୀ)	02
		Junior Secondary (6-10th class) ମାଧ୍ୟମିକ(6-10 ଶ୍ରେଣୀ)	03
		Senior Secondary (11 - 12th class) ଉଚ୍ଚ ମାଧ୍ୟମିକ(11-12)	04
		Graduation/College କଲେଜ/ମହାବିଦ୍ୟାଳୟ	05
		University ବିଶ୍ୱବିଦ୍ୟାଳୟ	06
		No male head ପୁରୁଷମୁଖ୍ୟନାହାଁତି	07

8	Educational status of FEMALE head? ଘରର ମହିଳା ମୁଖ୍ୟଙ୍କ ଶିକ୍ଷାଗତଯୋଗ୍ୟତା?	None (illiterate) ଅଶିକ୍ଷିତ	01
		Primary (1 - 5th class) ପ୍ରାଥମିକ(1-5 ଶ୍ରେଣୀ)	02
		Junior Secondary (6-10th class) ମାଧ୍ୟମିକ(6-10 ଶ୍ରେଣୀ)	03
		Senior Secondary (11 - 12th class) ଉଚ୍ଚମାଧ୍ୟମିକ(11-12)	04
		Graduation/College କଲେଜ/ମହାବିଦ୍ୟାଳୟ	05
		University ବିଶ୍ୱବିଦ୍ୟାଳୟ	06
9	Does your family own agricultural land ? ଆପଣଙ୍କ ପରିବାର ର ନିଜର ଚାଷ ଜମି ଅଛିକି?	Yes ହଁ	01
		No ନାଁ	02
9 A	Do you have income from this agricultural land?	Yes ହଁ	01
		No ନାଁ	02
10	Occupation of the MALE head ? Multiple choice ଘରର ମୁଖ୍ୟ(ପୁରୁଷ) କ'ଣପଣା ? ଏକ ରୁ ଅଧିକ ଉତ୍ତର ହେଇପାରେ, ପ୍ରତ୍ୟେକ ଉତ୍ତରକୁ ଗୋଲ ବୁଲାଇ	Farming in own land ନିଜ ଜମିରେ ଚାଷ	01
		Share cropping ଭାଗ ଚାଷି	02
		Labour/Mason ମୂଲିଆ/ରାଜମିସ୍ତ୍ରୀ	03
		Govt./Private job ସରକାରି/ବେସରକାରୀ ଚାକିରି	04
		Business (Small)	05

		ବ୍ୟବସାୟ(ଛୋଟ)	
		Business (big) ବ୍ୟବସାୟ(ବଡ଼)	06
		Unemployed ବେରୋଜଗାର	07
		No male head ପୁରୁଷ ମୁଖ୍ୟ ନାହାଁନ୍ତି	08
		Others (Specify) ଅନ୍ୟାନ୍ୟ(ବର୍ଣ୍ଣନା)	
11	Occupation of the FEMALE head ? Multiple choice ଘରର ମୁଖ୍ୟ(ମହିଳା) କି ପେଶା ? ଏକ ରୁ ଅଧିକ ଉତ୍ତର ହେଇପାରେ, ପ୍ରତ୍ୟେକ ଉତ୍ତରକୁ ଗୋଲ ବୁଲାଇ	Farming in own land ନିଜଜମିରେଚାଷ	01
		Share cropping ଭାଗଚାଷ	02
		Labour/Mason ମୂଲିଆ/ରାଜମିସ୍ତ୍ରୀ	03
		Govt./Private job ସରକାରି/ବେସରକାରୀ ଚାକିରି	04
		Business (Small) ବ୍ୟବସାୟ(ଛୋଟ)	05
		Business (big) ବ୍ୟବସାୟ(ବଡ଼)	06
		Unemployed ବେରୋଜଗାର	07
		Others (Specify)	

		ଅନ୍ୟାନ୍ୟ(ବର୍ଣ୍ଣନା)	
12	Other than male head, any other earning member in the family? ଘରର ମୁଖ୍ୟ ପୁରୁଷ/ମହିଳାଙ୍କ ବ୍ୟତୀତ, ଅନ୍ୟ କେହି ରୋଜଗାର କରନ୍ତି କି?	Yes ହଁ	01
		No ନାଁ	02
12 A	Does the female head has any earning source? ଘରର ମୁଖ୍ୟ ମହିଳାଙ୍କ ରୋଜଗାର କରନ୍ତି କି?	Yes ହଁ	01
		No ନାଁ	02
13	Total number of earning members in the family ? ସମୁଦାୟପରିବାରରେକେତେଜଣସଦସ୍ୟରୋଜଗାରକରନ୍ତି?		.....
14	Family Income/Month (adding up income of all earning members) ପରିବାର ର ମାସିକ ଆୟ/ରୋଜଗାର (ସମସ୍ତଙ୍କ ରୋଜଗାର ମିଶିକରି)	5000 ରୁକମ୍	01
		5000 ରୁ 10000 ଭିତରେ	02
		10000 ରୁ 20000 ଭିତରେ	03
		20000 ରୁଅଧିକ	04
14 A	Does your family has a regular income all through the year? ?	Yes ହଁ	01
		No ନାଁ	02
15	Does any member own the following items in your house? (observe, ask, and select) ମୁଁ ଏବେ କିଛି ପଢ଼ିବି, ଏହା ମଧ୍ୟରୁ କେଉଁ କେଉଁ ଜିନିଷ ଘରେ ଅଛି,ମୋତେ କହିବେ? (ଦେଖ, ପଚାର ଓ ଲେଖା)	Mobile ମୋବାଇଲ୍	01
		Television ଟିଭି	02
		Bicycle ସାଇକେଲ	03
		Motor cycle / Scooter ମୋଟରସାଇକେଲ/ସ୍କୁଟର	04

		Refrigerator ଫ୍ରିଜ	05
		Car/ Auto କାର/ଅଟୋ	06
		Truck/ Mini truck ଟ୍ରକ୍/ ମିନିଟ୍ରକ୍	07
		Water pump ପାଣିପମ୍ପ	08
		Tractor ଟ୍ରାକ୍ଟର	09
16	Who in your family had the final say to purchase a TV? ଆପଣଙ୍କ ପରିବାରରେ ଚିତ୍ତ କିଣିବା ପାଇଁ ଶେଷ ନିଷ୍ପତ୍ତି କାହାର ଥିଲା ?	Husband alone କେବଳପତି	01
		Respondent alone ଉତ୍ତରଦାତା	02
		Respondent & husband jointly ଉତ୍ତରଦାତା ଓ ପତିଉଭୟ	03
		Husband and someone else ପତି ଓ ଅନ୍ୟ କେହି	04
		Respondent & someone else ଉତ୍ତରଦାତା ଓ ଅନ୍ୟ କେହି	05
		Someone else ଅନ୍ୟ କେହି	06
		If someone else, Specify ଯଦି ଅନ୍ୟ କେହି, ବର୍ଣ୍ଣନା ...	
17	Do you or your spouse own a house? ଆପଣଙ୍କ ପତି ର ନିଜର ଘର ଅଛିକି?	Yes ହଁ	01
		No ନାଁ (If 'NO' go to Q 22)	02
18	Did you or your spouse build this house, or inherited?	Built self ନିଜେତିଆରି	01
		Inherited ବଂଶାନୁରତ / ପୈତୃକ	02

	ଆପଣଙ୍କେ ଏହି ଘର ତିଆରି କରିଛନ୍ତି ବା ପୁରୁଜାକର?	Someone else ଅନ୍ୟକେହି	03
		If someone else, Specify ଯଦି ଅନ୍ୟକେହି, ବର୍ଣ୍ଣନା ...	
19	In the past 3 - 5 years, has any 'major' additions to the existing house been made or upgraded? (changed the roof, built a new room, etc.) ଗତ 3-5 ବର୍ଷରେ, ଆପଣ ରହୁଥିବା ଘରେ କୌଣସି ଜରୁରୀ ପରିବର୍ତ୍ତନ ବା ଉନ୍ନତି/ତିଆରି କରିଛନ୍ତି କି (ଯେପରି କି ନୂଆ ଘର, ନୂଆ ଘର ଆଦି)?	Yes ହଁ	01
		No ନାଁ (If 'NO', go to Q22)	02
20	What major change you did to the house? କଣ ଜରୁରୀ ପରିବର୍ତ୍ତନ ବା ଉନ୍ନତି/ତିଆରି କରିଛନ୍ତି? Multiple answers (ଏକରୁ ଅଧିକ ଉତ୍ତର ହେଇ ପାରେ)	Improved the roof ଚାଳରୁଟାଲ, ଟିଣ, ଆଇବେଷ୍ଟ	01
		Changed the walls ମାଟି କାନ୍ଥରୁ ଲଟାକାନ୍ଥ	02
		Added new rooms ନୂଆ କୋଠା/ରୁମ୍/ନେଇଲୁ (ମାଟି ଘର)	03
		Added new rooms ନୂଆ କୋଠା/ରୁମ୍/ନେଇଲୁ (କୋଠା ଘର)	04
		Constructed a new house କୋଠା ଘର ତିଆରି କରିଛୁ	05
		Any other ଅନ୍ୟାନ୍ୟ	
21	Who in your family had the final say to upgrade the house, or make additions? ଆପଣଙ୍କ ଘର ତିଆରି ବା ଉନ୍ନତି କରିବା ପାଇଁ, ପରିବାରରେ କିଏ ଶେଷ /ଅନ୍ତିମ ନିଷ୍ପତ୍ତି ନେଇ ଥିଲେ?	Husband alone କେବଳ ପତି	01
		Respondent alone ଉତ୍ତରଦାତା	02
		Respondent & husband jointly ଉତ୍ତରଦାତା ଓ ପତିଉତ୍ତର	03
		Husband and someone else	04

		ପତିଓଅନ୍ୟକେହି	
		Respondent & someone else ଉତ୍ତରଦାତା ଓ ଅନ୍ୟକେହି	05
		Someone else ଅନ୍ୟ କେହି	06
		If someone else, Specify ଯଦି ଅନ୍ୟ କେହି, ବର୍ଣ୍ଣନା ...	
22	Do you own livestock or farm animals? ଆପଣଙ୍କର ପାଳନ୍ତା ପଶୁ ବା ଚାଷ ପାଇଁ ପଶୁ ଅଛନ୍ତି କି?	Yes ହଁ	01
		No ନାଁ If 'NO' Go to Q 25	02
23	In last 5 years, have you purchased a cow/ calf/ buffalo/ bull? ବିଗତ 5 ବର୍ଷମଧ୍ୟରେ, ଆପଣଗାଈ/ବାଛୁରୀ/ମଇଁଷି/ବଳଦ କିଣିଛନ୍ତିକି?	Yes ହଁ	01
		No ନାଁ If 'NO' Go to Q 25	02
24	Who in the family had a final say to purchase cattle or farm animals? ଆପଣଙ୍କ ପରିବାରରେ ଗାଈ ଗୋରୁ ବା ପଶୁ କିଣିବାରେ ଶେଷ ନିଷ୍ପତ୍ତି କାହାର ଥିଲା?	Husband alone କେବଳ ପତି	01
		Respondent alone ଉତ୍ତରଦାତା	02
		Respondent & husband jointly ଉତ୍ତରଦାତା ଓ ପତିଉତ୍ତର	03
		Husband and someone else ପତି ଓ ଅନ୍ୟ କେହି	04
		Respondent & someone else ଉତ୍ତର ଦାତା ଓ ଅନ୍ୟକେହି	05
		Someone else ଅନ୍ୟ କେହି	06
		If someone else, Specify ଯଦି ଅନ୍ୟ କେହି, ବର୍ଣ୍ଣନା ...	

25	Who in your family usually has the final say on - Determining your own health care? ଆପଣଙ୍କ ସ୍ୱାସ୍ଥ୍ୟ ଓ ଯତ୍ନ ସମ୍ବନ୍ଧୀୟ, ଶେଷ ନିଷ୍ପତ୍ତି ପ୍ରାୟତଃ ପରିବାରରେ କିଏ ନିଅନ୍ତି?	Husband alone କେବଳପତି	01
		Respondent alone ଉତ୍ତରଦାତା	02
		Respondent & husband jointly ଉତ୍ତରଦାତା ଓ ପତିଉତ୍ତର	03
		Husband and someone else ପତି ଓ ଅନ୍ୟ କେହି	04
		Respondent & someone else ଉତ୍ତରଦାତା ଓ ଅନ୍ୟ କେହି	05
		Someone else ଅନ୍ୟ କେହି	06
		If someone else, Specify ଯଦିଅନ୍ୟକେହି, ବର୍ଣ୍ଣନା ...	
26	Who in your family usually has the final say on - *Making large household purchases? ଘରର ଅଧିକ ମୂଲ୍ୟର ଆସବା ପତ୍ର କିଣିବା ପାଇଁ, ଆପଣଙ୍କ ପରିବାରରେ ଶେଷ ନିଷ୍ପତ୍ତି ପ୍ରାୟତଃ କିଏ ନିଅନ୍ତି?	Husband alone କେବଳପତି	01
		Respondent alone ଉତ୍ତରଦାତା	02
		Respondent & husband jointly ଉତ୍ତରଦାତା ଓ ପତିଉତ୍ତର	03
		Husband and someone else ପତି ଓ ଅନ୍ୟକେହି	04
		Respondent & someone else ଉତ୍ତରଦାତା ଓ ଅନ୍ୟକେହି	05
		Someone else ଅନ୍ୟକେହି	06
		If someone else, Specify ଯଦିଅନ୍ୟକେହି, ବର୍ଣ୍ଣନା ...	

		No large purchases କିଛିବଡ଼ଜିନିଷକିଣାହେଇନି	07
27	Who in your family usually has the final say on - Making household purchases for daily needs? ଘରର ପ୍ରତିଦିନିଆ ଖର୍ଚ୍ଚପାଇଁ, ଆପଣଙ୍କ ପରିବାରରେ ଶେଷ ନିଷ୍ପତ୍ତି ପ୍ରାୟତଃ କିଏ ନିଅନ୍ତି?	Husband alone କେବଳପତି	01
		Respondent alone ଉତ୍ତରଦାତା	02
		Respondent & husband jointly ଉତ୍ତରଦାତାଓପତିଉଭୟ	03
		Husband and someone else ପତିଓଅନ୍ୟକେହି	04
		Respondent & someone else ଉତ୍ତରଦାତାଓଅନ୍ୟକେହି	05
		Someone else ଅନ୍ୟକେହି	06
		If someone else, Specify ଯଦିଅନ୍ୟକେହି, ବର୍ଣ୍ଣନା ...	
28	Who in your family usually has the final say on - *Visiting family and relatives? ପରିବାର ଓ ବନ୍ଧୁବାନ୍ଧବଙ୍କ ଘରକୁ ଯିବା ପାଇଁ, ଆପଣଙ୍କ ପରିବାରରେ ଶେଷ ନିଷ୍ପତ୍ତି ପ୍ରାୟତଃ କିଏ ନିଅନ୍ତି ?	Husband alone କେବଳପତି	01
		Respondent alone ଉତ୍ତରଦାତା	02
		Respondent & husband jointly ଉତ୍ତରଦାତାଓପତିଉଭୟ	03
		Husband and someone else ପତିଓଅନ୍ୟକେହି	04
		Respondent & someone else ଉତ୍ତରଦାତାଓଅନ୍ୟକେହି	05
		Someone else ଅନ୍ୟକେହି	06

		If someone else, Specify ଯଦିଅନ୍ୟକେହି, ବର୍ଣ୍ଣନା ...	
29	Who in your family usually has the final say on - *Deciding what to prepare for daily meals? *ପ୍ରତିଦିନର ଖାଦ୍ୟ ପ୍ରସ୍ତୁତି ପାଇଁ, ଆପଣଙ୍କ ପରିବାରରେ ଶେଷ ନିଷ୍ପତ୍ତି ପ୍ରାୟତଃ କିଏ ନିଅନ୍ତି?	Husband alone କେବଳପତି	01
		Respondent alone ଉତ୍ତରଦାତା	02
		Respondent & husband jointly ଉତ୍ତରଦାତାଓପତିଉଭୟ	03
		Husband and someone else ପତିଓଅନ୍ୟକେହି	04
		Respondent & someone else ଉତ୍ତରଦାତାଓଅନ୍ୟକେହି	05
		Someone else ଅନ୍ୟକେହି	06
		If someone else, Specify ଯଦିଅନ୍ୟକେହି, ବର୍ଣ୍ଣନା ...	
30	Do you have your own tube well at home? ଆପଣଙ୍କ ନିଜର ଟିବେଲ ଅଛି କି?	Yes ହଁ	01
		No ନାଁ (If 'No' SKIP to Q32)	02
31	Who in your family had the final say to install a tubewell? ଟିବେଲ ବସେଇବା ପାଇଁ ଆପଣଙ୍କ ପରିବାରରେ ଶେଷ ନିଷ୍ପତ୍ତି କାହାର ଥିଲା?	Husband alone କେବଳପତି	01
		Respondent alone ଉତ୍ତରଦାତା	02
		Respondent & husband jointly ଉତ୍ତରଦାତାଓପତିଉଭୟ	03
		Husband and someone else ପତିଓଅନ୍ୟକେହି	04
		Respondent & someone else ଉତ୍ତରଦାତାଓଅନ୍ୟକେହି	05

		Someone else ଅନ୍ୟକେହି	06
		If someone else, Specify ଯଦିଅନ୍ୟକେହି, ବର୍ଣ୍ଣନା ...	
32	Do you have any type of latrine at home? ଆପଣଙ୍କ ଘରେ କୌଣସି ପ୍ରକାର ପାଇଖାନା ଅଛି କି?	Yes ହଁ	01
		No ନାଁ (If 'NO', GO TO 48)	02
33	How was the latrine built? ପାଇଖାନା ଚି କେମିତି ତିଆରି କରିଛନ୍ତି?	Self financed ନିଜ ପଇସାରେ ବନେଇଛନ୍ତି	01
		By govt. ସରକାର ବେଇଥିବା ପାଇଖାନା	02
		Govt. subsidy + self finance ସରକାରି ସବସିଡି + ନିଜପଇସା	03
SEC B : ASK HOUSEHOLDS WITH A LATRINE (ପାଇଖାନାଥିବାଘରମାନଙ୍କୁଏହିପ୍ରଶ୍ନପଚାରନ୍ତୁ)			
34	Who in your family had the final say to build a latrine? ପାଇଖାନା ତିଆରି କରିବା ପାଇଁ ଆପଣଙ୍କ ପରିବାରରେ ଶେଷ ନିଷ୍ପତ୍ତି କାହାର ଥିଲା?	Husband alone କେବଳପତି	01
		Respondent alone ଉତ୍ତରଦାତା	02
		Respondent & husband jointly ଉତ୍ତରଦାତାଓପତିଉଭୟ	03
		Husband and someone else ପତିଓଅନ୍ୟକେହି	04
		Respondent & someone else ଉତ୍ତରଦାତାଓଅନ୍ୟକେହି	05
		Someone else ଅନ୍ୟକେହି	06
		If someone else, Specify ଯଦିଅନ୍ୟକେହି, ବର୍ଣ୍ଣନା ...	

<p>35 Who in your family had the final say to identify the location/site of the latrine?</p> <p>ପାଇଖାନାର ଜାଗା ନିର୍ଦ୍ଧାୟ କରିବାରେ, ପରିବାରରେ ଶେଷ ନିଷ୍ପତ୍ତି କାହାର ଥିଲା?</p>	Husband alone କେବଳ ପତି	01
	Respondent alone ଉତ୍ତରଦାତା	02
	Respondent & husband jointly ଉତ୍ତରଦାତା ଓ ପତିଉଭୟ	03
	Husband and someone else ପତି ଓ ଅନ୍ୟ କେହି	04
	Respondent & someone else ଉତ୍ତରଦାତା ଓ ଅନ୍ୟ କେହି	05
	Someone else ଅନ୍ୟକେହି	06
	If someone else, Specify ଯଦି ଅନ୍ୟକେହି, ବର୍ଣ୍ଣନା ...	
<p>36 Who in your family had the final say to purchase raw materials for latrine construction?</p> <p>ପାଇଖାନା ପାଇଁ ସାମଗ୍ରୀ କିଣିବା ପାଇଁ, ପରିବାରରେ ଶେଷ ନିଷ୍ପତ୍ତି କାହାର ଥିଲା?</p>	Husband alone କେବଳ ପତି	01
	Respondent alone ଉତ୍ତରଦାତା	02
	Respondent & husband jointly ଉତ୍ତରଦାତା ଓ ପତି ଉଭୟ	03
	Husband and someone else ପତି ଓ ଅନ୍ୟ କେହି	04
	Respondent & someone else ଉତ୍ତରଦାତା ଓ ଅନ୍ୟ କେହି	05
	Someone else ଅନ୍ୟ କେହି	06
	If someone else, Specify ଯଦି ଅନ୍ୟ କେହି, ବର୍ଣ୍ଣନା ...	

<p>37 Who in your family had the final say in arranging mason for building latrine?</p> <p>ପାଇଖାନା ତିଆରି କରିବା ପାଇଁ ରାଜମିସ୍ତ୍ରୀ ଯୋଗାଡ଼ ପାଇଁ କିଏ ପରିବାରରେ ଶେଷ ନିଷ୍ପତ୍ତି ନେଇଥିଲେ ?</p>	Husband alone କେବଳ ପତି	01
	Respondent alone ଉତ୍ତରଦାତା	02
	Respondent & husband jointly ଉତ୍ତରଦାତା ଓ ପତି ଉଭୟ	03
	Husband and someone else ପତି ଓ ଅନ୍ୟ କେହି	04
	Respondent & someone else ଉତ୍ତରଦାତା ଓ ଅନ୍ୟ କେହି	05
	Someone else ଅନ୍ୟ କେହି	06
	If someone else, Specify ଯଦି ଅନ୍ୟ କେହି, ବର୍ଣ୍ଣନା ...	
<p>38 Who spent money to build latrine?</p> <p>ପାଇଖାନା ତିଆରି କରିବାରେ, କିଏ ପଇସା ଖର୍ଚ୍ଚ କରିଥିଲେ?</p>	Husband alone କେବଳପତି	01
	Respondent alone ଉତ୍ତରଦାତା	02
	Respondent & husband jointly ଉତ୍ତରଦାତା ଓ ପତିଉଭୟ	03
	Husband and someone else ପତି ଓ ଅନ୍ୟ କେହି	04
	Respondent & someone else ଉତ୍ତରଦାତା ଓ ଅନ୍ୟ କେହି	05
	Someone else ଅନ୍ୟ କେହି	06
	If someone else, Specify ଯଦି ଅନ୍ୟ କେହି, ବର୍ଣ୍ଣନା ...	

39 For whom was the latrine mainly built? (multiple answers possible) ମୁଖ୍ୟତଃ କାହା ପାଇଁ ପାଇଖାନାଟି ତିଆରି ହୋଇଥିଲା? (ଏକରୁ ଅଧିକ ଉତ୍ତର ଚିହ୍ନଟ କରନ୍ତୁ)	Female head ଘରରମୁଖ୍ୟମହିଳା	01
	Daughter in law ବୋହୂ	02
	Other females ଅନ୍ୟମହିଳାସଦସ୍ୟା	03
	Male head ଘରରମୁଖ୍ୟପୁରୁଷ	04
	Other Males ଅନ୍ୟପୁରୁଷସଦସ୍ୟା	05
	All HH members ଘରରସମସ୍ତସଦସ୍ୟା	06
	Children ଛୁଆ	07
	Old & aged family members ବୃଦ୍ଧଓବୟସ୍କସଦସ୍ୟାଙ୍କପାଇଁ	08
SECTION C : LATRINE FUNCTIONALITY STATUS (ପାଇଖାନା ଚଳାଚଳ ଅବସ୍ଥା)		
40 Is the latrine functional ? ପାଇଖାନାଟି ବ୍ୟବହାର ଯୋଗ୍ୟ/ ଚଳାଚଳ ଅବସ୍ଥାରେ ଅଛି କି?	Yes ହଁ	01
	No ନାଁ (If 'No', then go to 44 after Physical Verification)	02
40A How was the latrine was built ?	Self financed	01
	Govt. Subsidy	02
	Other -	04
	If other specify	
41 Is the latrine currently in use? ବର୍ତ୍ତମାନ ପାଇଖାନାଟି ବ୍ୟବହାର ହେଉଛି କି?	Yes ହଁ (If 'Yes', then ask Q 42, and END THE SURVEY)	01
	No ନାଁ (If 'No', then go to 43, and END THE SURVEY)	02

42	Do family members, regularly use the latrine?	Yes ହଁ	01
		No ନାଁ	02
SECTION D : LATRINE NON FUNCTIONALITY STATUS (ପାଇଖାନା ଅଚଳ ଅବସ୍ଥା)			
44	Why is the latrine not functional/not completed? ପାଇଖାନାଟି କାହିଁକି ଅଚଳ ଅବସ୍ଥାରେ ଅଛି?		
47	Who in the family is responsible to make the latrine functional? ପାଇଖାନା ଉପଯୋଗୀ କରିବା ପାଇଁ, ଘରର କେଉଁ ସଦସ୍ୟର ଦାୟିତ୍ୱ?	Husband/other males ପତି & ଅନ୍ୟ	01
		Female head ମହିଳା ମୁଖ୍ୟ	02
		Both Males and females jointly ଉଭୟ ଧରଣ ଓ ପତି ଉଭୟ	03
SECTION E : ASK HOUSEHOLDS WITHOUT A LATRINE (ପାଇଖାନା ନଥିବା ଘରମାନଙ୍କୁ ପଚାରନ୍ତୁ)			
48	Were you motivated /encouraged by anyone to build a latrine? କେହି, ପାଇଖାନା ତିଆରି କରିବା ପାଇଁ ଉତ୍ସାହିତ କରିଛନ୍ତି କି?	Yes ହଁ	01
		No ନାଁ	02
50	Reasons - why a latrine was not built? କେଉଁକାରଣଯୋଗୁ, ଆପଣ ଏପର୍ଯ୍ୟନ୍ତ ପାଇଖାନାଟିଏ ବନେଇନାହାନ୍ତି ?		
51	Would you ever build a latrine? ଆପଣ ଭବିଷ୍ୟତରେ ପାଇଖାନା ତିଆରି କରିବେ କି?	Yes ହଁ	01
		No ନାଁ	02
		Not sure / Can't say ଜଣାନାହିଁ	03
52	If ever you build a latrine, then, who in the family would have the final say to build the latrine? ଯଦିବି କେବେ ପାଇଖାନା ତିଆରି କରନ୍ତି, ତେବେ ଆପଣଙ୍କ ପରିବାରର କେଉଁ ସଦସ୍ୟ ଶେଷ ନିଷ୍ପତ୍ତି ନେବେ?	Husband alone କେବଳ ପତି	01
		Respondent alone ଉଭୟ ଦାତା	02
		Respondent & husband jointly	03

	ଉତ୍ତରଦାତା ଓ ପତି ଉଭୟ	
	Husband & someone else ପତି ଓ ଅନ୍ୟ କେହି	04
	Respondent & someone else ଉତ୍ତରଦାତା ଓ ଅନ୍ୟ କେହି	05
	Someone else ଅନ୍ୟ କେହି	06
	If someone else, Specify ଯଦି ଅନ୍ୟ କେହି, ବର୍ଣ୍ଣନା ...	
Any other comments or remarks :		

Impact of Indian Total Sanitation Campaign on Latrine Coverage and Use: A Cross-Sectional Study in Orissa Three Years following Programme Implementation

Sharmani Barnard, Parimita Routray, Fiona Majorin, Rachel Peletz, Sophie Boisson, Antara Sinha, Thomas Clasen*

Department of Disease Control, Faculty of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, London, United Kingdom

Abstract

Background: Faced with a massive shortfall in meeting sanitation targets, some governments have implemented campaigns that use subsidies focused on latrine construction to overcome income constraints and rapidly expand coverage. In settings like rural India where open defecation is common, this may result in sub-optimal compliance (use), thereby continuing to leave the population exposed to human excreta.

Methods: We conducted a cross-sectional study to investigate latrine coverage and use among 20 villages (447 households, 1933 individuals) in Orissa, India where the Government of India's Total Sanitation Campaign had been implemented at least three years previously. We defined coverage as the proportion of households that had a latrine; for use we identified the proportion of households with at least one reported user and among those, the extent of reported use by each member of the household.

Results: Mean latrine coverage among the villages was 72% (compared to <10% in comparable villages in the same district where the Total Sanitation Campaign had not yet been implemented), though three of the villages had less than 50% coverage. Among these households with latrines, more than a third (39%) were not being used by any member of the household. Well over a third (37%) of the members of households with latrines reported never defecating in their latrines. Less than half (47%) of the members of such households reported using their latrines at all times for defecation. Combined with the 28% of households that did not have latrines, it appears that most defecation events in these communities are still practiced in the open.

Conclusion: A large-scale campaign to implement sanitation has achieved substantial gains in latrine coverage in this population. Nevertheless, gaps in coverage and widespread continuation of open defecation will result in continued exposure to human excreta, reducing the potential for health gains.

Citation: Barnard S, Routray P, Majorin F, Peletz R, Boisson S, et al. (2013) Impact of Indian Total Sanitation Campaign on Latrine Coverage and Use: A Cross-Sectional Study in Orissa Three Years following Programme Implementation. PLoS ONE 8(8): e71438. doi:10.1371/journal.pone.0071438

Editor: Abdisalan Mohamed Noor, Kenya Medical Research Institute - Wellcome Trust Research Programme, Kenya

Received: January 15, 2013; **Accepted:** July 1, 2013; **Published:** August 21, 2013

Copyright: © 2013 Barnard et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Funding: This work was supported by the Bill & Melinda Gates Foundation; International Initiative for Impact Evaluation; SHARE Research Consortium. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Competing Interests: The authors have declared that no competing interests exist.

* E-mail: thomas.clasen@lshtm.ac.uk

Background

An estimated 2.5 billion people lack access to improved facilities for the disposal of human excreta, such as a basic pit latrine [1]. Globally 1.1 billion people, including an estimated 638 million in India alone, still practice open defecation [1]. Seven out of ten people who are without improved sanitation live in rural areas. Projections make clear that current progress will fall short of meeting the MDG sanitation target to halve the portion of the population without access to improved sanitation by 2015 [1].

Faced with this challenge, governments, non-governmental organizations (NGOs) and others have undertaken large-scale efforts to expand sanitation coverage. The most ambitious of these is the Governments of India's Total Sanitation Campaign (TSC), recently revised and renamed the Nirmal Bharat Abhiyan, which was first implemented in 1999 [2]. The TSC is a low-subsidy

regime that aims to generate household involvement and demand responsiveness for the building of individual household latrines in below poverty line (BPL) households [3]. It also uses information, education and communication strategy in rural areas designed to generate demand, elicit greater community involvement and encourage use of latrines [4].

The TSC has been largely effective in increasing latrine coverage. According to Government of India records, almost 90 million individual household latrines have been built as a result of the campaign [5]. In addition to the subsidies, the TSC operates a scheme called the Nirmal Gram Puraskar that provides community incentives to Gram Panchayats (local governments) for achieving full open defecation free status [6]. Recent changes under the Nirmal Bharat Abhiyan reforms extend the subsidies beyond BPL households to specified groups. However, most

households that are above the poverty line do not qualify for subsidies and must build their own latrines. Perhaps as a result, latrine coverage in villages usually falls well short of 100% [6,7].

While work continues on achieving sanitation coverage, programme implementers also face the challenge of securing their use by householders. Achieving consistent and widespread use is a common problem for top-down, subsidy-driven sanitation campaigns. It is one impetus for community-led total sanitation, an approach that emphasizes the adverse impact of any non-compliance and uses community-wide mobilization and behaviour change strategies in lieu of subsidies in an effort to achieve lasting open defecation free status [8]. However, securing such compliance is a particular challenge in rural India where open defecation is the norm; two-thirds of the estimated 1.1 billion people who practice open defecation worldwide reside in India [1]. Unlike improved water supplies that are readily embraced in rural settings, achieving latrine use within a population requires changes in private behaviours based on deeply held cultural practices [9]. In a recent assessment of a 5-year water, sanitation and hygiene promotion programme in the southern Indian state of Tamil Nadu, investigators reported a substantial increase in latrine coverage, from 15% to 48%; however, even among households that had built a latrine, 39% of adults and 52% of children were reported to continue the practice of open defecation [10].

Achieving both coverage and use, however, are essential in order to realise the health benefits associated with improved sanitation. Even a comparatively small number of non-users can contaminate the environment with faecal pathogens, causing direct exposure to faecal pathogens through contact and indirect exposure via mechanical vectors (flies) and contaminated drinking water [7,11]. Microbiological evidence and modeling based on quantitative microbial risk assessment suggests that high levels of coverage and use are necessary to minimize exposure and prevent disease [12–14].

Our research group is undertaking a cluster randomized, controlled trial to assess the impact of the TSC as implemented by Water Aid and its NGO partners in a coastal district in Orissa (Odisha), a state in Eastern India where open defecation is still widespread and faecal-oral diseases are common [15]. While the study will document the impact of the intervention on latrine coverage and use, it will only follow the population for 21 months following a 12-month implementation period. In order to explore the impact of such an intervention over a longer period, we undertook this cross-sectional study in non-study villages in the same district where the TSC was implemented at least three years previously.

Methods

Study area and village selection

The study was conducted in June and July 2012 among 20 villages in Puri District, a rural region located on the coast of the East Indian state of Orissa. Villages were eligible for inclusion in the study if the TSC was undertaken by an implementing partner NGO of WaterAid India at least three years prior to the study. Participating villages were selected randomly from a list of 35 eligible villages provided by implementing partners of WaterAid India.

Household selection and enrollment

All households in the selected villages were eligible for inclusion in the study. Sampled households were selected randomly following a sampling strategy used for the Extended Program on Immunization (EPI) [16]. A pen was spun in a central location in

the village to determine the direction in which the enumerator would sample households. Every second household was sampled until the enumerator reached their quota of households or until they reached the boundary of the village. If the boundary was reached prior to meeting the quota, the enumerator returned to the central location repeat the process. Three enumerators were asked to sample at least seven households per villages, though the aggregate number depended in part on logistics. Households were enrolled if they consented to participate after receiving complete details of the study. Non-consenting households or households where no adult was present at the time of the visit by an enumerator were replaced by the next household on the list.

Survey tool and procedure

The main study tools consisted of surveys and spot checks of latrines by trained enumerators using Oriya, the local language. Separate surveys for households with and without access to latrines were developed, translated, piloted and back-translated to confirm accuracy. Each survey included questions on basic demographics, size of household, whether the household had a BPL card, type of household construction, religion, highest level of education of female and male heads of household, and distance to nearest water source. They were also asked about exposure to sanitation promotion messages as part of the TSC implementation. Surveys were conducted with the consenting female head of household, or in her absence, a male or female over 18 years.

Assessing coverage and use

Household latrine coverage was assessed using the question “does your household have a latrine?” Those that answered affirmatively were classified as having a latrine. In households with a latrine, enumerators visually examined the latrine and assessed its functionality [17–18]. Latrines were considered “functional” if they met the following criteria: walls over 1.5 meters, some type of closure over the entry for privacy, an unbroken and unblocked toilet pan and a functional pan-pipe-pit connection. Households that had a latrine were asked if the latrine was used by any member of the household. Those that responded affirmatively were further asked to report the age, gender and place of defecation of each member of the household.

Data Entry and Analysis

Data was entered using EPIData 3.1 and analysed using STATA 12. Bivariate analysis of associations between risk factors and outcome variables was conducted using chi square tests. Logistic regression was then performed to examine the strength of association between covariates with a p value <0.05. To investigate the association between the covariates and latrine coverage and the association between the covariates and latrine use, multivariable models were built using a hierarchical conceptual framework [19–20]. To avoid an excess number of variables and unstable estimates in the subsequent model, only variables with a p-value of <0.10 were kept in the subsequent model analysis [20]. In order to adjust for clustering within villages, generalized estimating equations with robust standard errors were used in multivariate analysis.

Ethics

The study was approved by the ethics committees of the London School of Hygiene and Tropical Medicine and Xavier Institute of Management Bhubaneswar. Surveys and observations were undertaken only after obtaining informed written consent using a prescribed information sheet. No compensation was paid

to study participants. In order to ensure anonymity, no names were recorded during data collection and the analysis was done using household codes.

Results

Sampled Population

Table 1 provides information on the 20 villages included in the study, including year of TSC implementation. Villages were located within 5 different blocks in the Puri district. Four NGOs had implemented the TSC in the study villages 3 to 8 years prior to our study (mean 5.3 years).

A total of 447 households were sampled from these 20 villages, representing a mean of 22.5 households sampled per village (range = 18 to 26). This yielded data on 1933 individuals who lived in households that had a latrine. The median number of people per household was 5 (95% CI 5,6) with a range from 1 to 30 people per household (data not shown). The majority of households (68%) either presented a BPL card or claimed to have one. Most (79%) households had heard of a program promoting latrine construction, though fewer (31%) had heard of Village Water and Sanitation Committee (VWSC) members or (20%) had heard of VWSC meetings.

Latrine coverage and characteristics

Latrine coverage among villages ranged from 38% to 95%, with a median of 75% and a mean of 72% (95% CI = 64,80) (Table 1).

In Orei, a village certified as open defecation free, coverage was 90%.

Of the 321 latrines in the study villages, 150 (47%) met the functionality criteria (walls over 1.5 meters, some type of closure over the entry, an unbroken and unblocked pan and a functional pan-pipe-pit connection) (Table 2). More than half (65%) were built with TSC subsidy of cash or materials and most (88%) were pour flush latrines. Few of the latrines sampled had a broken or blocked pan (11%) or non-functional pan-pipe-pit connection (7%), though many (44%) lacked a closure over the entry for privacy.

In multivariable analysis, the variables that were significantly ($p < 0.05$) associated with having a latrine were: type of household construction, having heard of a latrine promotion program and having heard of VWSC members (Table 3). Households made of Pucca (concrete) had almost 4 times the odds of having a latrine than Kucha (mud and dung) households (aOR = 3.57 95% CI = 2.25,5.65, $p < 0.001$). Households who had heard of a program promoting latrine construction (aOR = 2.07 95% CI = 1.17,3.66, $p = 0.012$) and those who were aware of VWSC members (aOR = 2.07 95% CI = 1.03,4.15, $p = 0.04$) had more than double the odds of having a latrine than those who had not.

Latrine use

Of the 126 households (28%) that did not have a latrine, informants reported that all members of the household practice

Table 1. Village, year of implementation, implementing partner, coverage and use.

Village	Year of TSC Implementation	No. Households Sampled	% Latrine Coverage	% Reported Latrine Use for households and individuals with a latrine	
				Households*	Individuals**
Banakhandi	2007–08	25	64	69	56
Banilo	2007–08	21	95	70	50
Bagalei	2008–2009	26	58	63	47
Begunia	2006–07	25	72	58	43
Nagapur golapur	2006–07	27	48	86	65
Dahangaria	2006	20	55	82	56
Orei***	2006–07	21	90	63	61
Bhanapur	2005	21	86	44	36
Hantapada sasana	2004	22	68	67	59
Panidola	2007	20	60	67	46
Ganeswarpur	2006–07	22	95	90	72
Hatasahi	2006	22	86	74	56
Bantalsingh deuli	2007	22	86	74	69
Swainkera	2007	21	90	47	33
Paridobandha	2007	22	86	26	11
Mathasahi	2007	24	58	13	10
Goudasahi	2007	23	78	56	28
Pradhansahi	2007	18	44	0	0
Baliapatana	2007	24	38	75	21
Tandikera	2008	21	86	89	76
Total/Mean		447	72	61	47

*Percentage of households that reported at least one member used the latrine sometimes.

**Percentage of household members that were reported to be using the latrine all of the time.

***Awarded Nirmal Gram Puraskar and open defecation free status.

doi:10.1371/journal.pone.0071438.t001

Table 2. Latrine Characteristics.

Covariate	Number (%)
Number of households with latrines	321 (72)
Received cash or materials from NGO for building of latrine	209 (65)
<i>When the latrine was built</i>	
Less than 3 years ago	81 (25)
3 to 10 years ago	166 (52)
More than 10 years ago	68 (23)
<i>Type of latrine</i>	
Pour flush pit latrine	282 (88)
Direct drop pit latrine	19 (6)
Other	20 (6)
<i>Height of latrine walls</i>	
Below 1.5 meters	114 (36)
Over 1.5meters	205 (64)
<i>Any type of closure over entry for privacy</i>	
No	142 (44)
Yes	178 (56)
<i>Any type of roof</i>	
No	153 (52)
Yes	143 (48)
<i>Pan condition</i>	
Broken/Blocked/Choked	32 (11)
Not broken	265 (89)
<i>Pan-pit pipe connection</i>	
Not connected	20 (7)
Connected and functional	285 (93)
<i>Number of pits</i>	
One	269 (87)
Two	41 (13)
<i>Pit covering</i>	
Pit open or mainly open	12 (4)
Pit visible and fully covered or buried	299 (96)
<i>Size of pit</i>	
Fewer than 3 rings	15 (5)
3 rings or more	190 (64)
Tank (no rings)	91 (32)
<i>Number of times pit has been emptied</i>	
Never	286 (91)
Once or more	29 (9)
<i>Latrine functional*</i>	
No	171 (53)
Yes	150 (47)

*Walls over 1.5 meters, some type of closure over the entry, unbroken and unblocked pan and a functional pan-pipe-pit connection.
NGO Non-Governmental Organizations.
doi:10.1371/journal.pone.0071438.t002

open defecation. Among the 321 households (72%) that had latrines, 62% reported that at least one member of the household was using the latrine (Table 1). However, less than half (47%) of the individuals at these households reported using them all of the time (Table 4). Of these, 54% were females. Even among these

households with latrines, 37% of householders were reported to always practice open defecation. Another 5% reported always defecating in the compound; these were mainly young children (Table 4). The remaining individuals were reported to either use the latrine “sometimes” or “usually” (usually was defined as more often than not) (Table 4).

The most common reasons why latrines were not in use was that individuals within households preferred open defecation (29%), the latrine was not complete (28%) or using a latrine was deemed inconvenient (20%). Other reasons for non-use were that the latrines lacked privacy (23%), were used for storage (22%), were broken (17%) or blocked (9%). Only one household ascribed non-use to water being too distant, and only 4% of households reported that it was too difficult to empty the pit.

In the multivariable analysis of latrine use, households that had built their latrines over 10 years ago had more than 4 times the odds of using their latrine (aOR = 4.59 95%CI = 1.82,11.60, $p=0.001$) (Table 5). Latrines with walls over 1.5 meters (aOR = 10.21 95% CI = 4.01,26.00, $p<0.001$), those with a pan that is not broken (aOR = 8.89 95% CI = 2.56,30.84, $p=0.001$) and those with a fully covered pit (aOR = 43.74 95% CI = 4.44,430.70, $p=0.001$) were also more likely to be in use. Latrines with any type of closure over the entry (door) were much more likely to be in use (aOR = 42.98 95% CI = 18.13,101.92, $p<0.001$) (Table 5). All of the households with a pan pipe-pit connection that did not function were not using their latrine. Latrines which had walls over 1.5 meters, a closure over the entry, an unbroken and unblocked pan and a functioning pan-pipe-pit connection (functional latrines) were more likely to be used than non-functional latrines (aOR = 25.59 95%CI = 12.07,54.26, $p<0.001$).

Perceived benefits of latrine use

When asked what the benefits of latrine use were, 66% suggested that there were health benefits associated with latrine use, 39% believed that latrines provided safety and security for women or girls and 27% felt they provided privacy (Figure 1). Of those reporting that there is no open space for defecation, 77% either did not have a latrine or were not using their latrine. No associations were found between the perceived benefits of having a latrine and latrine use.

Discussion

We undertook a cross-sectional study to assess latrine coverage and use in 20 villages where the TSC had been implemented at least three years previously. If high levels of both coverage and use are necessary to minimize exposure and optimize health impact, our results show deficiencies in both areas.

While the evidence suggests that the campaign was effective in increasing coverage, there were shortcomings. Almost half of the villages achieved at least 80% coverage. While there is no pre-intervention data from these villages, baseline data from a large trial in 100 villages in the same district showed pre-intervention coverage of 8.2% [15]. Given that the TSC extends only to BPLs and limited classes of other priority groups, this suggests that the campaign was effective in significantly increasing latrine coverage among this population. However, coverage was not universal, even in the village with open defecation free status. Moreover, 9 of the 20 villages sampled achieved less than 70% coverage, with 3 reaching less than 50%. This wide variation is consistent with findings from previous studies and demonstrates a need for more consistent implementation of the TSC [6,7,21]. There are also issues about the quality or longer-term robustness of the latrines;

Table 3. Multivariable regression analysis of factors associated with latrine coverage.

Coverage Multivariable Analysis				
Covariates	Household with latrine	Adj OR	95% CI	P value (Wald)
<i>Household construction</i>				
Kucha	58	1		
Semi-Pucca	67	1.71	1.08,2.73	0.023
Pucca	80	3.57	2.25,5.65	<0.001
<i>Heard of a program promoting latrines</i>				
No	57	1		
Yes	75	2.07	1.17,3.66	0.012
<i>Heard of VWSC members</i>				
No	66	1		
Yes	85	2.07	1.03,4.15	0.040

Denominators vary as not all respondents answered all questions.
doi:10.1371/journal.pone.0071438.t003

only 47% met basic criteria established for functionality. Finally, despite targeting the campaign to BPL households, coverage was associated with more costly home construction (pucca rather than kucha); there was also some evidence of an association between latrine construction and secondary education of the female head of household.

Securing consistent use of the latrines represents an even greater challenge. Of the 72% of households sampled that had latrines, more than a third (39%) were not being used by any member of the household. This figure is lower than that reported in similar studies [17,22,23] but higher than the 48% reported from Tamil Nadu [10]. Less than half (47%) of householders with access to their own latrines reported always using them for defecation. Consistent with previous research, more women used latrines exclusively than men though the difference (females 54% and males 46%) was not as large as has been seen elsewhere [24]. Well over a third of the members of such households reported never defecating in the latrines; another 8% reported using them only occasionally. Combined with the 28% of households that did not have latrines, it is clear that most defecation events in these communities are still practiced in the open and not in a latrine.

These results suggest that the TSC has not succeeded in substantially reducing exposure to human excreta in these villages. Under these circumstances, it is not clear whether the TSC would be capable of achieving health gains in these communities [7,11]. Even if only a few members of the community are defecating in the open, the risks to health remain substantially high [12,14,25].

Table 4. Reported place of defecation for individuals in households where there is a latrine $N = 1933$.

Place of defecation	Number (%)
Always use a latrine	904 (47)
Usually use a latrine	49 (30)
Sometimes use a latrine	150 (8)
Always open defecation	723 (37)
Always open defecation within the compound	106 (5)

doi:10.1371/journal.pone.0071438.t004

This may be particularly true if the refractory members of the community are more likely to be “super shedders” or if safe disposal of child faeces is poor, an important source of exposure [26].

However, the actual impact of sanitation on human health is complex, and the level of coverage and use that is necessary to prevent disease is not well understood [21]. A recent working paper that carefully and comprehensively analyzes datasets on TSC implementation and child health has found the campaign to be associated with significant reductions in child mortality and child stunting [7]. While such study designs are susceptible to unknown confounders and offer more limited potential for causal inference, it is possible that even sub-optimal levels of coverage and use can deliver favorable health outcomes.

The most common reason reported for not using a latrine was that people prefer open defecation. Open defecation is a cultural practice that is deeply engrained in communities in India [27–28]. In a study conducted in rural southern India, respondents reported that open defecation did not carry stigma and was hygienically preferable to using a latrine, since they were not accumulating faeces near the house [29]. While the TSC includes social mobilisation and information, education and communication activities that are aimed at overcoming the cultural practice of open defecation within communities [28,30], our results suggest that this aspect of the campaign may be sub-optimal. If so, this may be a structural deficiency in the TSC, as campaign implementers are compensated for building latrines (coverage) and not for securing their use. New technologies that discretely and objectively monitor latrine use [31] could be incorporated into the TSC in order to compensate programme implementers for securing sustained use. Restructuring the campaign to focus on longer-term use may also address some of the deficiencies in quality and sustainability of construction.

In June 2012, the Government of India revised the TSC and renamed it as Nirmal Bharat Abhiyan. Among other things, the revisions seek to secure 100% coverage in communities. The major revisions of the programme are (i) an increased focus on administration at the Gram Panchayat level, (ii) expansion to include above poverty line households as well as below poverty line households, (iii) an increase in the subsidy with greater flexibility on the latrine type, (iv) inclusion of the schools, and (v) additional

Table 5. Multivariable regression analysis of factors associated with latrine use.

Use Multivariable Analysis				
Covariates	Household reporting latrine use	Adj OR	95% CI	P value (Wald)
<i>When was the latrine built</i>				
Less than 3 years ago	48	1		
3 to 10 years ago	60	2.54	1.07,6.04	0.034
More than 10 years ago	90	4.59	1.82,11.60	0.001
<i>Height of latrine walls</i>				
Below 1.5 meters	30	1		
Over 1.5meters	81	10.21	4.01,26.00	<0.001
<i>Any type of closure over entry for privacy **</i>				
No	23	1		
Yes	94	42.98	18.13,101.92	<0.001
<i>Pan condition</i>				
Broken/Blocked/Choked	13	1		
Not broken	74	8.89	2.56,30.84	0.001
<i>Pit covering</i>				
Pit open or mainly open	8	1		
Pit visible and fully covered or buried	66	43.74	4.44,430.70	0.001
<i>Latrine Functional***</i>				
No	33	1		
Yes	95	25.59	12.07,54.26	<0.001

Denominators vary as not all respondents answered all questions. Use is based on reported use.

**Closure over entry and roof assessed in a model which excluded walls because no latrines without walls had a roof or door.

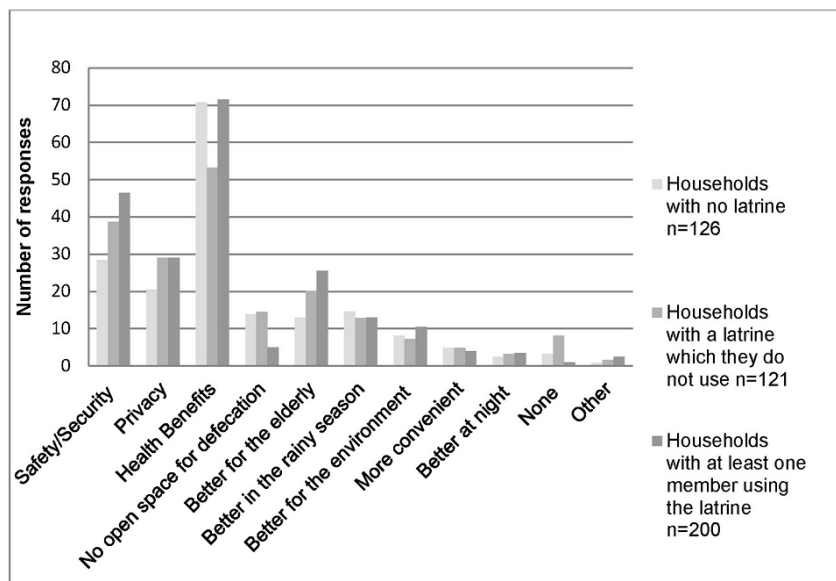
***A functional latrine is defined as a latrine which has walls over 1.5 meters, some type of closure over the entry, an unbroken and unblocked pan and a connected and functional pan-pipe-pit connection.

aORs for functional latrines assessed in a model which included village, household construction, pit covering and length of time since latrine has been built.
doi:10.1371/journal.pone.0071438.t005

management of the waste stream [2]. This shift in focus was inspired by the reported success of the Nirmal Gram Puraskar aspect of the TSC which provided monetary incentives to achieving open defecation free villages and promoted 100% latrine coverage in rural areas [6]. Our study included one village that had previously been awarded Nirmal Gram Puraskar status. Although coverage was relatively high (90%) in this village, use of latrines was well below optimal at 63%. It is not clear whether the revisions to the programme will be more successful in optimizing latrine use.

However, another reason for low use may be that the latrines are of poor quality. Of the 321 latrines that we sampled, only 150 (47%) met the criteria for functionality, including minimal wall height and a door or other closure to ensure privacy. This is lower than what has been reported in other studies [17,23]. Functional latrines were much more likely to be used; sufficient wall height, roofs, functional pans, buried or covered pits and doors or other closures to ensure privacy were all associated with higher levels of use. Overall, 95% of 'functional' latrines were in use, compared to only 33% of those that were not considered as 'functional'. On the other hand, latrines that householders wish to use are also more likely to be better constructed and maintained, and lack of latrine use may lead to lack of latrine functionality. The recent revisions to the campaign do not clearly address these construction deficiencies. While the increased subsidies and greater design flexibility may yield higher quality latrines, they may also attract more opportunistic implementers to the sector.

This study has several important limitations. First, like any cross-sectional design, the study offers few insights into temporal relationships between the TSC and latrine ownership and use. Second, the selection of villages included in the study was not random and the results cannot be generalized beyond the 20 villages included in the study. Though the villages were randomly selected from a list provided by the implementing organization, we cannot rule out the potential for selection bias. Third, the EPI sampling strategy has certain limitations [16], and the absence of village census data prevented us from using population proportional sampling or other methods that may have helped ensure the accuracy of our estimates of coverage and use within each community. Fourth, it is also possible that because the study was carried out in rainy season, use of latrines was higher than at other times in the year. There is also the potential for courtesy bias in self-reporting of latrine use [31] however; it is likely that both of these factors would exaggerate the actual level of use, rendering our estimates conservative. Future studies should attempt to use a range of methods to measure use, possibly including instrumented monitoring [31]. Finally, this study provides no evidence of the extent to which various levels of latrine coverage or use impact exposure to faecal pathogens or health outcomes such as diarrhoea, intestinal nematode infection, or stunting. These will be addressed in the trial that is due to be completed in late 2013 [15].



*Denominators vary as not all respondents answered every question

**Multiple responses were permitted

Figure 1. Benefits of latrine use according to respondents. Regardless of whether a household had a latrine, or whether it was in use, the most commonly reported benefit of latrine use was health benefits, followed by safety and security. Households that had a latrine that was in use were less likely to be aware of whether there was no open space for defecation. Few households reported that using latrines were more convenient or better at night.

doi:10.1371/journal.pone.0071438.g001

Acknowledgments

The authors would like to thank the enumerators Munmun Dasmohapatra, Swarnalata Sahoo, Rajashree Nayak and Rajani Barik for their help in obtaining the data, and Dr Wolf Peter Schmidt for his support.

Author Contributions

Conceived and designed the experiments: S. Barnard PR FM RP S Boisson AS TC. Performed the experiments: S. Barnard PR FM. Analyzed the data: S. Barnard S. Boisson TC. Contributed reagents/materials/analysis tools: S. Barnard PR FM S. Boisson AS. Wrote the paper: S. Barnard PR FM RP S. Boisson AS TC.

References

- World Health Organization and UNICEF (2012) Progress on Drinking Water and Sanitation: 2012 Update. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Available: <http://www.unicef.org/media/files/JMPreport2012.pdf>. Accessed 1 September 2012.
- Government of India Ministry for Drinking Water and Sanitation (2012) Guidelines on Nirmal Bharat Abhiyan (NBA). Available: [http://ddws.gov.in/sites/upload_files/ddws/files/pdfs/Final%20Guidelines%20\(English\).pdf](http://ddws.gov.in/sites/upload_files/ddws/files/pdfs/Final%20Guidelines%20(English).pdf). Accessed 17 November 2012.
- Government of India (2012) Total Sanitation Campaign Sanitation for All: 2012. Ministry of Rural Development, Department of Drinking Water Supply. Available: <http://www.indiasanitationportal.org/sites/default/files/TSC.pdf>. Accessed 1 September 2012.
- WaterAid (2008) Feeling the Pulse: A Study of the Total Sanitation Campaign in Five States. Available: http://indiasanitationportal.org/sites/default/files/feeling_the_pulse_a_study_of_the_total_sanitation_campaign.pdf. Accessed 8 August 2012.
- Government of India, Ministry for Drinking Water and Sanitation, Physical Progress Report as per Information Received up to 18.11.12. Available: <http://tsc.gov.in/Report/Physical/RptPhysicalProgressStateWiseDistrictwise.aspx?id=Home>. Accessed November 18, 2012.
- TARU/UNICEF (2008) Impact Assessment of Nirmal Gram Puraskar Awarded Panchayats, Final Report. Vol 1: Main report. Available: http://www.indiawaterportal.org/sites/indiawaterportal.org/files/Impact%20Assessment%20of%20Nirmal%20Gram%20Puraskar%20awarded%20panchayats_TARU_2008.pdf. Accessed 8 August 2012.
- Spears D (2012) Policy Lessons from implementing India's Total Sanitation Campaign, in India Policy Forum, India International Centre. Available: http://www.ncaer.org/popuppages/EventDetails/IPF_2012/DeanSpears.pdf. Accessed: 28 November 2012.
- Kar K, Chambers R (2008) Handbook on community-led total sanitation. Institute of Development Studies at the University of Sussex. Available: <http://www.irc.nl/docsearch/title/163345>. Accessed 12 December 2012.
- Jenkins MW, V Curtis (2005) Achieving the 'good life': Why some people want latrines in rural Benin. *Social Science & Medicine*, 61(11): 2446–2459.
- Arnold BF, Khush RS, Ramaswamy P, London AG, Rajkumar P, et al. (2010) Causal inference methods to study nonrandomized, preexisting development interventions. *Proc Natl Acad Sci USA*;107(52):22605–10.
- World Health Organization (2006) Guidelines for the Safe Use of Wastewater, Excreta and Greywater in Agriculture and Aquaculture. World Health Organisation Press. Available: http://www.who.int/water_sanitation_health/wastewater/wwuvol2intro.pdf. Accessed: 18 December 2012.
- Marples RR, Towers AG (1979) A laboratory model for the investigation of contact transfer micro-organisms. *Journal of Hygiene*;82: 237–248.
- Gibson LL, Rose BJ, Haas CN (1999) Use of Quantitative microbial risk assessment for evaluation of the benefits of laundry sanitation. *Am J Infect Control*, 27(6): s34–S39.
- Emerson PM, Bailey RL, Walraven GE, Lindsay SW (2001) Human and other faeces as breeding media of the trachoma vectors *Musca sorbens*. *Medical and Veterinary Epidemiology*, 15: 314–320.
- Clasen T, Boisson S, Routray P, Cumming O, Jenkins M, et al. (2012) The effect of improved rural sanitation on diarrhoea and helminth infection: design of a cluster-randomized trial in Orissa, India. *Emerg Themes Epidemiol*;9(1):7.
- Bostoen K, Chalabi Z (2006) Optimization of household survey sampling without sample frames. *Int J Epidemiol*, 35(3): 751–755.
- Montgomery MA, Desai MM, Elimelech M (2010) Assessment of latrine use and quality and association with risk of trachoma in rural Tanzania. *Trans R Soc Trop Med Hyg*, 104(4): 283–289.
- Diallo MO, Hopkins DR, Kane MS, Niandou S, Amadou A, et al. (2007) Household latrine use, maintenance and acceptability in rural Zinder, Niger. *Int J Environ Health Res*. 17(6):443–52. PubMed PMID:18027197.

19. Peletz R, Simuyandi M, Sarenje K, Baisley K, Kelly P, et al. (2011) Drinking water quality, feeding practices, and diarrhea among children under 2 years of HIV-positive mothers in peri-urban Zambia. *Am J Trop Med Hyg*, 85(2): 318–326.
20. Victoria CG, Huttly SR, Fuchs SC, OIinto MTA (1997) The Role of Conceptual Frameworks in Epidemiological Analysis: A Hierarchical Approach. *International Journal of Epidemiology*, 26(1): 224–227.
21. Clasen TF, Bostoen K, Schmidt WP, Boisson S, Fung IC, et al. (2010) Interventions to improve disposal of human excreta for preventing diarrhoea. *Cochrane Database Syst Rev*.(6):CD007180.
22. O'Loughlin R (2006) Follow-up of a low cost latrine promotion programme in one district of Amhara, Ethiopia: characteristics of early adopters and non-adopters. *Tropical Medicine and International Health* 11:1406–1415.
23. Anteneh A (2010) Assessment of the Impact of Latrine Utilization on Diarrhoeal Diseases in the Rural Community of Hulet Ejju Enessie Woreda, East Gojjam Zone, Amhara Region. *Ethop. J. Health Dev*, 24(2).
24. Ziegelbauer K, Speich B, Mäusezahl D, Bos R, Keiser J, et al. (2012) Effect of Sanitation on Soil-Transmitted Helminth Infection: Systematic Review and Meta-Analysis. *PLoS Med* 9(1): e1001162. doi:10.1371/journal.pmed.1001162.
25. Feacham RG, Bradley DJ, Garelick H, Mara DD (1983) *Sanitation and Disease: Health Aspects of Excreta and Wastewater management*. John Wiley and Sons, Chischester, 501pp.
26. Stephens TP, McAllister TA, Stanford K (2009) Perineal swabs reveal effect of super shedders on the transmission of *Escherichia coli* O157:H7 in commercial feedlots. *J Anim Sci* 87:4151–4160.
27. Government of India, Millennium Development Goals India Country Report 2010–2011 (2012) Central Statistical Organization, Ministry of Statistics and Programme Implementation. Available: http://mospi.nic.in/mospi_new/upload/mospi_annual_report_2010-11.pdf. Accessed 15 November 2012.
28. Asian Development Bank (2009) *India's Sanitation for All: How to Make it Happen*: 18. Available: <http://www.adb.org/publications/indias-sanitation-all-how-make-it-happen>. Accessed 18 December 2012.
29. Banda K, Sarkar R, Gopal S, Govindarajan J, Harijan BB, et al. (2007) Water handling, sanitation and defecation practices in rural southern India: A Knowledge, Attitudes and Practices Study. *Trans R Soc Trop Med Hyg* 101(11): 1124–1130.
30. Obika AJM, Curtis V, Howard G (2002) *Social marketing for Urban Sanitation. Review of evidence and inception report* (revised edition). WEDC, Loughborough U.K.
31. Clasen T, Fabini D, Boisson S, Taneja J, Song J, et al. (2012) Making sanitation count: developing and testing a device for assessing latrine use in low-income settings. *Environ Sci Technol*. 20;46(6):3295–303.

Effectiveness of a rural sanitation programme on diarrhoea, soil-transmitted helminth infection, and child malnutrition in Odisha, India: a cluster-randomised trial



Thomas Clasen, Sophie Boisson, Parimita Routray, Belen Torondel, Melissa Bell, Oliver Cumming, Jeroen Ensink, Matthew Freeman, Marion Jenkins, Mitsunori Odagiri, Subhajyoti Ray, Antara Sinha, Mrutyunjay Suar, Wolf-Peter Schmidt



Summary

Background A third of the 2.5 billion people worldwide without access to improved sanitation live in India, as do two-thirds of the 1.1 billion practising open defecation and a quarter of the 1.5 million who die annually from diarrhoeal diseases. We aimed to assess the effectiveness of a rural sanitation intervention, within the context of the Government of India's Total Sanitation Campaign, to prevent diarrhoea, soil-transmitted helminth infection, and child malnutrition.

Methods We did a cluster-randomised controlled trial between May 20, 2010, and Dec 22, 2013, in 100 rural villages in Odisha, India. Households within villages were eligible if they had a child younger than 4 years or a pregnant woman. Villages were randomly assigned (1:1), with a computer-generated sequence, to undergo latrine promotion and construction or to receive no intervention (control). Randomisation was stratified by administrative block to ensure an equal number of intervention and control villages in each block. Masking of participants was not possible because of the nature of the intervention. However, households were not told explicitly that the purpose of enrolment was to study the effect of a trial intervention, and the surveillance team was different from the intervention team. The primary endpoint was 7-day prevalence of reported diarrhoea in children younger than 5 years. We did intention-to-treat and per-protocol analyses. This trial is registered with ClinicalTrials.gov, number NCT01214785.

Findings We randomly assigned 50 villages to the intervention group and 50 villages to the control group. There were 4586 households (24 969 individuals) in intervention villages and 4894 households (25 982 individuals) in control villages. The intervention increased mean village-level latrine coverage from 9% of households to 63%, compared with an increase from 8% to 12% in control villages. Health surveillance data were obtained from 1437 households with children younger than 5 years in the intervention group (1919 children younger than 5 years), and from 1465 households (1916 children younger than 5 years) in the control group. 7-day prevalence of reported diarrhoea in children younger than 5 years was 8.8% in the intervention group and 9.1% in the control group (period prevalence ratio 0.97, 95% CI 0.83–1.12). 162 participants died in the intervention group (11 children younger than 5 years) and 151 died in the control group (13 children younger than 5 years).

Interpretation Increased latrine coverage is generally believed to be effective for reducing exposure to faecal pathogens and preventing disease; however, our results show that this outcome cannot be assumed. As efforts to improve sanitation are being undertaken worldwide, approaches should not only meet international coverage targets, but should also be implemented in a way that achieves uptake, reduces exposure, and delivers genuine health gains.

Funding Bill & Melinda Gates Foundation, International Initiative for Impact Evaluation (3ie), and Department for International Development-backed SHARE Research Consortium at the London School of Hygiene & Tropical Medicine.

Copyright © Clasen et al. Open Access article distributed under the terms of CC BY-NC-ND.

Introduction

An estimated 2.5 billion people have no access to improved sanitation.¹ 71% of these people live in rural areas, as do more than 90% of the 1.1 billion who practise open defecation.¹ Even in areas with moderate sanitation coverage, levels of subnational inequity are high.² India represents a particular challenge, accounting for roughly a third of the world's population without improved sanitation and two-thirds of the population practising open defecation.³ There and elsewhere, governments

have supported large-scale campaigns to improve coverage of household sanitation, which is often the sole indicator used to measure progress. Poor sanitation is associated with various infectious diseases, including diarrhoea, soil-transmitted helminth infection, trachoma, and schistosomiasis.⁴ Diarrhoea accounts for the largest share of sanitation-related morbidity and mortality, causing an estimated 1.4 million deaths annually,⁵ including 19% of all deaths of children younger than 5 years in low-income settings.⁶ Furthermore, evidence

Lancet Glob Health 2014;
2: e645–53

Published Online
October 10, 2014
[http://dx.doi.org/10.1016/S2214-109X\(14\)70307-9](http://dx.doi.org/10.1016/S2214-109X(14)70307-9)

See [Comment](#) page e619

Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA (Prof T Clasen PhD, M Freeman PhD); Faculty of Infectious and Tropical Diseases, London School of Hygiene & Tropical Medicine, London, UK (T Clasen, S Boisson PhD, P Routray PhD, B Torondel PhD, M Bell MSc, O Cumming PhD, J Ensink PhD, A Sinha MSc, W-P Schmidt PhD); Department of Civil and Environmental Engineering, University of California-Davis, Davis, CA, USA (M Jenkins PhD, M Odagiri MSc); Xavier University, Bhubaneswar, India (S Ray PhD); School of Biotechnology, KIIT University, Bhubaneswar, India (M Suar PhD)

Correspondence to:
Prof Thomas Clasen, Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA 30322, USA
tclasen@emory.edu

See Online for podcast interview with Thomas Clasen

has linked poor sanitation with stunting, environmental enteropathy, and impaired cognitive development—long-term disorders that aggravate poverty and slow economic development.⁷

Although historical efforts to improve sanitation were voted by readers of the *British Medical Journal* as the most important medical advance since 1840,⁸ evidence of the health effect of household sanitation in low-income settings is not strong. Investigators of systematic reviews report that improved sanitation can reduce the prevalence of diarrhoeal diseases by 22–36%.^{9–12} However, the studies included in these reviews were observational or small-scale trials and of poor methodological quality; most combined household sanitation with water supplies or hygiene. Investigators of recent systematic reviews reported household sanitation to be protective against soil-transmitted helminth infection and trachoma; however, these had the same shortcomings as previous reviews.^{13–15} Another review¹⁶ identified no intervention studies of the effect of household sanitation on child anthropometry, although ecological analyses have linked open defecation with stunting in India¹⁷ and other low-income countries.¹⁸

We did this study to assess the effectiveness of a rural household sanitation intervention to prevent diarrhoea, soil-transmitted helminth infection, and child malnutrition. We aimed to investigate the effect of the intervention as actually delivered by an international implementer and its local partners working in India within the context of the Total Sanitation Campaign—the largest sanitation initiative in the world so far.¹⁹

Methods

Study design and participants

We did this cluster-randomised controlled trial between May 20, 2010, and Dec 22, 2013, in 100 rural villages in Puri, a coastal district of Odisha (formerly Orissa), India. Trial design, setting, and characteristics of the study population have previously been described.²⁰ Briefly, included villages were spread across seven of the 11 blocks (an administrative subdistrict) of the Puri District. Agriculture is the main source of income in Odisha and half of households are classified as living below the poverty line, according to the Government of India.²¹ India ranks among the lowest of states nationally in terms of access to household-level latrines, with 14·1% coverage in rural settings.²² Furthermore, Puri District is not covered by any regular deworming programme.

We selected study villages from a list of 385 villages that had not been covered by the Total Sanitation Campaign. Villages were eligible if they had sanitation coverage of less than 10%; had improved water supply; and if no other water, sanitation, or hygiene (WASH) intervention was anticipated in the next 30 months. Households were eligible if they had a child younger than 4 years or if a pregnant woman lived there. We also enrolled households with a new baby born during the surveillance phase. We did

a baseline survey between September and October, 2010, to obtain information about household demographic characteristics; socioeconomic status; water, hygiene, and sanitation conditions; and diarrhoea prevalence.

The study was reviewed and approved by the ethics committee of the London School of Hygiene & Tropical Medicine (London, UK), and by Xavier University and Kalinga Institute of Medical Sciences, KIIT University (both in Bhubaneswar, India). Written informed consent was obtained from the male or female head of household before baseline data collection.

Randomisation and masking

A member of staff who was involved in neither data collection nor intervention delivery randomly assigned villages (1:1), with a computer-generated sequence, to undergo either latrine promotion and construction in accordance with the Total Sanitation Campaign or to receive no intervention (control). Randomisation was stratified by administrative block to ensure an equal number of intervention and control villages in each block. Randomisation achieved a good balance of socioeconomic and water and sanitation-related characteristics.²⁰ Masking of participants was not possible because of the nature of the intervention. However, households were not told explicitly that the purpose of enrolment was to study the effect of a trial intervention, and the surveillance team was different from the intervention team.

Procedures

The intervention consisted of latrine promotion and construction, in accordance with the Government of India's Total Sanitation Campaign, which combines social mobilisation with a post-hoc subsidy. Implementation was coordinated by WaterAid India (part of WaterAid, an international non-governmental organisation [NGO] working in sanitation) and United Artists Association (an Odisha-based NGO). Six local NGOs were contracted to deliver the intervention in intervention villages in collaboration with local government. Implementation was undertaken between January, 2011, and January, 2012. The Government of India provided subsidies (INR 2200 [US\$44] in January, 2011) for the construction of latrines that met specified criteria in below-poverty-line households. The latrine design consisted of a pour-flush latrine with a single pit and Y-joint for a future second pit. Each participating below-poverty-line household was to be provided with a latrine and households contributed sand, bricks, and labour. The subsidy did not cover the cost of full walls, door, and roof. A detailed assessment of the implementation process has been reported elsewhere.²³

We measured compliance with the intervention with a survey done at the midpoint of the follow-up period. The survey recorded latrine presence and functionality, reported latrine use, and global positioning system (GPS) location of latrines and households. We defined latrine functionality on the basis of the following

elements: existence of a roof; latrine not used for storage; pan not broken, not blocked, and not full of leaves or dust; and pit completed. We confirmed present latrine use on the basis of several indicators: smell of faeces, wet pan except when rainy, stain from faeces or urine, presence of soap, presence of water bucket or can, presence of a broom or brush for cleaning, or presence of slippers.

We measured the effect of the intervention on environmental exposure to faecal pathogens through typical transmission pathways by testing for the presence of faecal indicator bacteria in source and household drinking water, on children's and mothers' hands and on children's toys, and by monitoring fly density. 20% of participating households were randomly selected at each visit for testing of source and household microbial drinking water quality. Samples were collected from sources and storage vessels with sterile 125 mL Whirl-Pak bags (Nasco Ft, Atkinson, WI, USA), transported in a cooler to the laboratory, and processed within 4 h of collection with the membrane filtration technique and a portable incubator, in accordance with standard methods.²⁴ Samples were tested for thermotolerant coliforms—an indicator of faecal contamination.²⁵ To assess hand contamination, we obtained hand rinse samples²⁶ from mothers and children younger than 5 years from a subsample of 360 households (about six households from 30 intervention and 30 control villages) and assayed them for thermotolerant coliforms. Furthermore, we provided sterile balls to children younger than 5 years from the same 360 households, encouraged them to play with the toys in their household settings for 1 day, rinsed them in 300 mL of sterile water, and assayed the water for thermotolerant coliforms.²⁷ Finally, we monitored density of synanthropic flies (*Musca domestica* and *M. sorbens*) by installing 24 h fly traps for 3 consecutive nights in food preparation areas of a subsample of 572 households from 32 intervention and 32 control villages.

Household visits were done every 3 months between June, 2011, and October, 2013. Because of delays in latrine construction resulting in the target coverage not being met until January, 2012, the first three rounds of diarrhoea surveys after the baseline survey were not included in the primary analysis, resulting in a total of seven rounds of data collection.

We measured prevalence of three common soil-transmitted helminth worms—*Ascaris lumbricoides*, *Trichuris trichiura*, and hookworm spp—by collecting stool samples from study participants aged 5–40 years (living in households with a child younger than 5 years). Baseline measurement was done in June and July, 2011, with subsequent sampling done after the last follow-up round. On the same day of collection, samples were transported to the laboratory and processed with the ethyl-acetate sedimentation method,²⁸ and eggs were quantified with microscopy. After baseline stool collection, one 400 mg dose of albendazole (200 mg for children), a

broad-spectrum anthelmintic, was given to individuals enrolled for stool sampling (except women in their first trimester of pregnancy), in accordance with WHO recommendations.

A baseline measure of weight (in children younger than 5 years) and recumbent length or height (in those younger than 2 years) was taken in January, 2012. The same children, and those born during the study, were measured again in October, 2013. Weight was measured with Seca 385 scales, with 20 g increments for weight lower than 20 kg and increments of 50 g for weight between 20 kg and 50 kg. We measured recumbent length of children younger than 2 years with Seca 417 boards with 1 mm increments. We measured height of children aged 2 years and older with a Seca 213 stadiometer. Back-checks on weight and height measurements were done in roughly 5% of households selected at random.²⁹

Statistical analyses

The primary outcome was 7-day prevalence of reported diarrhoea in children younger than 5 years. 7-day prevalence was recorded for all household members on the basis of reports from the primary caregiver.^{30,31} We defined diarrhoea with the WHO definition of three or more loose stools in 24 h.³² In secondary analyses, we stratified the primary analysis by age, household size, population density (defined as the number of people living within 50 m, on the basis of GPS survey) and below-poverty-line status.

The sample size was based on the proportion of days with diarrhoea (longitudinal prevalence) of children younger than 5 years. We assumed a mean longitudinal

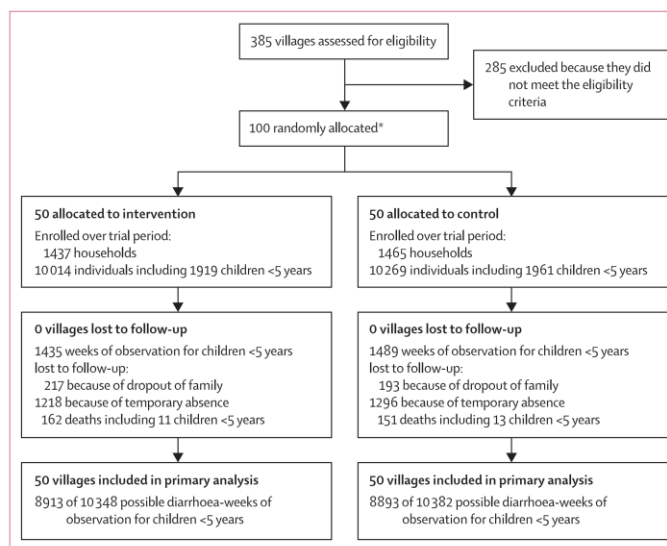


Figure 1: Trial profile

*Across seven blocks.

	Intervention villages	Control villages	Percentage point difference (95% CI)
Baseline			
Households with any latrine*	9% (8, 0–32)	8% (6, 0–27)	+1% (–2 to 4)
Post-intervention			
Households with any latrine	63% (18, 15–90)	12% (11, 0–47)	+51% (45 to 57)
Households with functional latrine	38% (17, 8–80)	10% (9, 0–37)	+28% (23 to 34)
Households with functional latrine and signs of present use	36% (16, 7–76)	9% (8, 0–37)	+27% (22 to 32)
Households with functional latrines by number of people in household			
<5	32% (16, 15–71)	6% (7, 0 to 26)	+25% (20–30)
5–8	41% (19, 6–82)	12% (11, 0 to 47)	+29% (23–35)
>9	51% (29, 0–100)	19% (22, 0 to 100)	+32% (22–42)
Households with functional latrines by BPL status*			
BPL card	47% (26, 0–100)	10% (18, 0 to 100)	+37% (28–46)
No BPL card	40% (21, 0–77)	17% (22, 0 to 100)	+23% (15–32)
People with access to functional latrine	46% (18, 6–81)	15% (12, 0–48)	+30% (24 to 37)

Data are mean proportion (SD, range). Values calculated from village-level data, based on 4585 intervention and 4895 control households surveyed at study midpoint. BPL=below poverty line. *Calculated with status data from baseline survey (973 intervention and 1001 control households with children <5 years).

Table 1: Latrine coverage at village level at baseline and post-intervention

	Denominator		Median bacterial colony or fly count		Effect size (95% CI)
	Intervention	Control	Intervention	Control	
Water quality					
Household water	2406*	2505*	60	60	1.06‡ (0.89–1.24)
Source water	1951*	1918*	1	1	1.08‡ (0.90–1.30)
Hand contamination					
Mothers	175†	177†	205.8	469	0.88‡ (0.49–1.58)
Children <5 years	172†	167†	107	107	0.85‡ (0.47–1.55)
Sentinel toy	164†	162†	1.5	3	0.83‡ (0.50–1.40)
Total synanthropic flies	288*	284*	12	13	0.73§ (0.46–1.16)

*Number of households. †Number of individuals. ‡Odds ratio from ordered logistic regression (categories 0, 1–10, 11–100, 101–1000, 1001–10 000, more than 10 000 colony forming unit per 100 mL of water, two hands, or toy). §Rate ratio from negative binomial regression (counts aggregated at village level).

Table 2: Effect of intervention on water quality, hand contamination, and flies (intention-to-treat analysis)

daily prevalence of 4% (SD 7.6) in this population, with the assumption of six follow-up visits per child.³⁰ We assumed a 25% reduction in diarrhoea prevalence as a figure of public health interest and in line with estimates from systematic reviews.^{9–12} With an assumed 25 children per cluster, an intracluster correlation of 0.025, a design effect of 1.6, and 10% loss to follow-up, 80% power and a p value of 0.05 resulted in 50 clusters per study group. This figure was confirmed with a simulation method developed for the sample-size estimation of complex trials.³³

We calculated prevalence ratios of diarrhoea and soil-transmitted helminth infection in intervention and control villages with log-binomial models (binomial

distribution, log-link). Village-level clustering was accounted for by generalised estimating equations with robust SEs. We converted height and weight into height-for-age and weight-for-age Z scores³⁴ and calculated mean differences in these scores with random-effects linear regression, adjusted for baseline values and accounting for village-level clustering. Negative binomial regression was used to calculate rate ratios of count data (soil-transmitted helminth eggs and flies), by aggregation of counts at village level, and with use of the number of samples in a village as exposure. Due to zero inflation and right truncation of bacterial counts of thermotolerant coliforms assays, we grouped these counts into log categories (0, 1–10, 11–100, etc, per 100 mL) and compared them between intervention and control groups with ordered logistic regression (with robust SEs to account for village-level clustering), which calculates the odds ratio of being in a higher category. Because only 33% of follow-up stool samples were from individuals who had also given a baseline sample, the analysis of worm infection focused on follow-up samples.

In addition to the primary intention-to-treat analysis, we did a per-protocol analysis for village-level and household-level compliance for all health outcomes. For this purpose, a village was defined as compliant if 50% or more households had a functional latrine at the midpoint of follow-up. Households were defined as compliant with the protocol if they had a functional latrine at midpoint (intervention group) or not (control). To reduce the potential for bias inherent in per-protocol analyses, we adjusted for baseline diarrhoea. No per-protocol analysis was done for soil-transmitted helminth infection, as only a few baseline samples could be matched to follow-up samples, and baseline samples from five villages (four from the control group) were lost, making adjustments for baseline values unreliable. We did analyses with STATA (version 10).

This trial is registered with ClinicalTrials.gov, number NCT01214785.

Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

Figure 1 shows the trial profile. We randomly assigned 50 villages to the intervention group and 50 villages to the control group. There were 4586 households (24969 individuals) in intervention villages and 4894 households (25982 individuals) in control villages; 1437 households from the intervention group and 1465 households from the control group met the eligibility criteria and were enrolled for health surveillance (figure 1). For diarrhoea surveillance, 10014 individuals, including

1919 younger than 5 years were enrolled in the intervention at some point during surveillance, as were 10269 individuals (n=1961 younger than 5 years) in the control group. Baseline and follow-up weight-for-age Z-score measures were available for 1462 individuals (n=650 younger than 2 years) in the intervention group and 1490 individuals (n=637 younger than 2 years) in the control group. Baseline and follow-up height-for-age Z-score measures were available for 350 individuals (71% of children measured at baseline) in the intervention group and 337 (74%) children in the control group. The proportion of worm samples obtained at baseline was similar in the intervention and control groups (1521 [44%] of 3457 vs 1438 [43%] of 3344), and worm samples at follow-up were obtained from 2231 (52%) of 4255 in the intervention group and 2063 (47%) of 4379 in the control group.

In the intervention villages, the mean proportion of households with a latrine increased from 9% at baseline to 63% at follow-up (table 1). At follow-up, 11 of 50 intervention villages had functional latrine coverage of 50% or greater, and seven had coverage of less than 20%. In the control villages, mean household-level coverage increased from 8% at baseline to 12% at follow-up (table 1). At follow-up, two of 50 control villages had coverage with functional latrines greater than 30% (none had coverage of 50% or greater), and 41 had coverage of less than 20%. Because households with more individuals were more likely to have a functional latrine, the total proportion of the people with access to a functional latrine was higher than the household-level coverage (table 1). 1729 (63%) of 2732 households with any latrine in the intervention group reported that household members were using the latrine; of these, 1690 (98%) of 1724 reported that women were using it, 1364 (79%) of 1725 reported that men were using it, and 903 (79%) of 1140 households with children reported that children were using it.

The intervention had no effect on overall faecal contamination of water stored in the households of study participants (table 2). No evidence showed that latrine construction affected contamination of wells. We recorded a trend for reduced contamination of the hands of mothers and children younger than 5 years in the intervention group (12% and 15% reduction, respectively, in the odds of being in a higher category of contamination), and on the sentinel toy (17% reduction of odds), compared with participants in the control group; however, this finding was not significant (table 2). Similarly, there were numerically, but not significantly, fewer synanthropic flies in the intervention group than in the control group (table 2).

Reported 7-day diarrhoea prevalence in children younger than 5 years was 8.8% in the intervention group and 9.1% in the control group (figure 2), with a decline in late 2012, corresponding to the cold and dry season. No evidence showed that the intervention was protective against diarrhoea in children younger than 5 years, or against diarrhoea in all age groups (table 3). No effect of

the intervention was detected when the population was stratified by household size, population density, or below-poverty-line status (table 3). The per-protocol

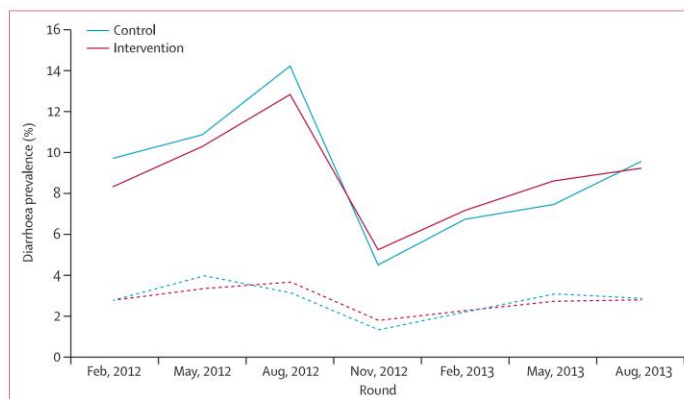


Figure 2: 7-day prevalence of diarrhoea in children younger than 5 years (solid lines) and individuals aged 5 years and older (dashed lines) over seven rounds of follow-up, by intervention status

	Denominator (individuals)		Diarrhoea prevalence*		Prevalence ratio (95% CI)
	Intervention	Control	Intervention	Control	
Intention-to-treat analysis					
By age					
Children <5 years	1919	1961	8.8%	9.1%	0.97 (0.83-1.12)
All ages	10 014	10 269	3.8%	3.7%	1.02 (0.88-1.18)
By household size†					
0-4 members	388	441	8.3%	8.3%	0.98 (0.74-1.30)
5-8 members	917	942	8.6%	10.0%	0.90 (0.76-1.07)
>9 members	614	578	9.2%	7.8%	1.09 (0.88-1.36)
By BPL status†					
Has BPL card	561	626	8.4%	8.7%	0.95 (0.77-1.18)
No BPL card	777	757	8.9%	7.8%	1.10 (0.90-1.36)
By population density (residents of all ages within 50 m radius)†					
0-100	637	655	9.3%	8.1%	1.07 (0.86-1.33)
101-200	669	611	9.7%	10.0%	0.93 (0.72-1.20)
>200	456	554	8.4%	8.8%	0.95 (0.76-1.18)
Per-protocol analysis‡					
Villages with functional latrine coverage ≥50%					
Crude	299	1409	8.6%	9.1%	0.92 (0.75-1.15)
Adjusted‡	299	1409	..	..	0.98 (0.78-1.24)
Households with functional latrine					
Crude	612	1211	7.5%	8.6%	0.90 (0.74-1.08)
Adjusted‡	612	1211	..	..	0.95 (0.79-1.13)

Table shows results from log-binomial models, clustering by village accounted for by use of generalised estimating equations. BPL=below poverty line. *Crude mean village-level prevalence of diarrhoea. †Children younger than 5 years. ‡Adjusted for baseline village-level prevalence of diarrhoea and baseline individual diarrhoea prevalence (calculated combining diarrhoea data from the baseline survey and the first two rounds that were done before October, 2011).

Table 3: Effect of the intervention on diarrhoea prevalence

	Denominator (individuals)		Mean Z-score, STH prevalence, or mean STH egg count		Effect size (95% CI)
	Intervention	Control	Intervention	Control	
STH infection					
Intention-to-treat analysis					
STH prevalence	2231	2063	16.0%	16.4%	0.97* (0.72 to 1.32)
STH egg counts per g	2151	2002	10.2	9.4	1.08† (0.62 to 1.88)
Hookworm prevalence	2231	2063	14.1%	15.6%	0.90* (0.66 to 1.22)
Hookworm egg counts per g	2151	2002	8.7	9.1	0.96† (0.54 to 1.68)
Prevalence of <i>Ascaris lumbricoides</i>	2229	2063	0.7%	0.3%	2.04* (0.38 to 10.91)
<i>A lumbricoides</i> egg counts per g	2150	2000	0.9	0.5	1.85‡ (0.07 to 48.75)
Prevalence of <i>Trichuris trichiura</i>	2229	2063	2.6%	0.6%	3.89* (1.38 to 10.92)
<i>T trichiura</i> egg counts per g	2149	2002	0.9	0.1	9.90† (1.98 to 46.62)
Weight-for-age Z score‡					
Intention-to-treat analysis					
Children <5 years at baseline	1462	1490	-1.48	-1.43	0.02§ (-0.04 to 0.08)
Children <2 years at baseline	650	637	-1.46	-1.32	-0.01§ (-0.12 to 0.09)
Per-protocol analysis (children <5 years at baseline)					
Villages with functional latrine coverage ≥50%	324	1490	-1.36	-1.43	0.10§ (0.003 to 0.20)
Households with functional latrine	683	1274	-1.32	-1.50	0.12§ (0.05 to 0.20)
Height-for-age Z score‡					
Intention-to-treat analysis					
Children <5 years at baseline	350	337	-1.56	-1.36	-0.10§ (-0.22 to 0.02)
Per-protocol analysis					
Villages with functional latrine coverage ≥50%	75	337	-1.45	-1.37	-0.04§ (-0.24 to 0.16)
Households with functional latrine	161	294	-1.42	-1.39	-0.06§ (-0.27 to 0.15)

STH=soil-transmitted helminth. *Log-binomial models, clustering by village accounted for by use of generalised estimating equations. †Random-effects linear regression. ‡We excluded children with Z scores greater than 5 or of 5 and lower. §Negative binomial regression of sum of village-level egg counts with number of samples in village as exposure.

Table 4: Effect of intervention on anthropometric measures and worm infection

analysis did not suggest an effect of the intervention on diarrhoea in children younger than 5 years, neither from village-level coverage nor from presence of a functional latrine in an individual household (table 3). The baseline mean village-level prevalence of diarrhoea was highly correlated with follow-up village-level prevalence (r^2 0.79 in children younger than 5 years).

The baseline total worm prevalence was similar between the groups (17.6% vs 17.0%). No evidence showed that the intervention reduced prevalence or egg counts of all soil-transmitted helminth infections, or of *A lumbricoides*, *T trichiura*, or hookworm (table 4). At follow-up, 576 (87%) of 662 prevalent soil-transmitted helminth infections were due to hookworm and 6963 (84%) of 8288 identified eggs were hookworm eggs.

The intervention had no effect on mean weight-for-age Z score in children younger than 5 years, or in those younger than 2 years, at baseline (table 4). Findings from

the per-protocol analysis suggest evidence for an increase in weight-for-age Z score in compliant villages and households (table 4). The primary analysis showed no effect on mean height-for-age Z score in children younger than 2 years at baseline, and the per-protocol analysis suggested no major effects (table 4).

162 participants died in the intervention group (11 children younger than 5 years) and 151 died in the control group (13 children younger than 5 years). The intraclass correlation coefficient for diarrhoea due to village-level clustering of diarrhoea (with exclusion of correlation due to repeated measurements) was 0.02 for children younger than 5 years and 0.01 for all age groups. The coefficients for weight-for-age and height-for-age Z score at follow-up were both 0.06. The coefficients for combined prevalence of soil-transmitted helminth infection was 0.09.

Discussion

Our findings show no evidence that this sanitation programme in rural Odisha reduced exposure to faecal contamination or prevented diarrhoea, soil-transmitted helminth infection, or child malnutrition. These results are in contrast with systematic reviews that have reported significant health gains from rural household sanitation interventions (panel).⁹⁻¹⁵ However, they are consistent with another trial of a sanitation project implemented within the context of the Total Sanitation Campaign in the Indian state of Madhya Pradesh.³⁵

Insufficient coverage and use of latrines seem to be the most likely causes for the absence of effect, because no evidence showed that the intervention reduced faecal exposure. Although mean coverage of latrines increased substantially in the intervention villages, more than a third of village households (on average) remained without a latrine after the intervention. About twice that many had no functional latrine that was used at the midpoint of the surveillance period. Latrine functionality is an objective measure of some use by the household; however, it cannot discern use by individual householders. Other evidence exists to show suboptimum use of latrines constructed as part of the Total Sanitation Campaign, particularly by men and children,^{36,37} and for the disposal of child faeces.³⁸ Although we detected no effect of the intervention at coverage of 50% or higher with functional latrines, that level of coverage and inconsistent use still represents high levels of continued open defecation and thus a substantial opportunity for continued exposure to faecal pathogens at the village level. Another possible explanation for our negative findings is that improvements in household sanitation alone are insufficient to mitigate exposure to faecal-oral pathogens. Hands can be contaminated by anal cleansing of oneself or a child that is not followed by handwashing with soap, and food can be contaminated during production or preparation. Animal faeces could also be contributing to the disease burden—a possibility that we

Panel: Research in context**Systematic review**

Before undertaking this trial, we did a systematic review of interventions to improve disposal of human excreta for prevention of diarrhoea.¹¹ We searched the Cochrane Infectious Disease Group Specialized Register; the Cochrane Central Register of Controlled Trials, published in The Cochrane Library; Medline; Embase; Lilacs; the metaRegister of Controlled Trials; and Chinese-language databases available under the Wan-Fang portal, the China National Knowledge Infrastructure. We aimed to identify randomised and quasi-randomised controlled trials comparing interventions for improvement of the disposal of human excreta to reduce direct or indirect human contact with no such intervention. Search terms, other search strategies, eligibility criteria, and other methods are described in the published review. 13 studies from six countries covering more than 33 400 children and adults in rural, urban, and school settings met the review's inclusion criteria. While the studies reported a wide range of effects, 11 of the 13 studies showed that the intervention was protective against diarrhoea. Almost all previous studies combined the sanitation with improvements in water supply, hygiene, or both; as such identification of the contribution of sanitation alone was not possible. Differences in study populations and settings, in baseline sanitation levels, water and hygiene practices, types of interventions, study methods, compliance and coverage levels, and case definitions and outcome surveillance restricted the comparability of results of the studies and rendered a meta-analysis inappropriate. The validity of most individual study results were further compromised by the non-random allocation of the intervention among study clusters, an insufficient number of clusters, scarcity of adjustment for clustering, unclear loss to follow-up, potential for reporting

bias, and other methodological shortcomings. Our review provided some evidence that interventions to improve excreta disposal are effective for prevention of diarrhoeal disease. However, this conclusion is based mainly on the consistency of the evidence of beneficial effects. The quality of the evidence is generally poor and does not allow for quantification of any such effect. Rigorous studies in various settings are needed to clarify the potential effectiveness of excreta disposal on diarrhoea. Other systematic reviews have shown sanitation interventions to be protective against diarrhoea.^{9-10,12}

Interpretation

Our findings raise questions about the health effect of sanitation initiatives that focus on increasing latrine construction but do not end open defecation or mitigate other possible sources of exposure. Although latrine coverage increased substantially in the study villages to levels targeted by the underlying campaign, many households did not build latrines and others were not functional at follow-up. Even householders with access to latrines did not always use them. Combined with other possible exposures, such as no hand washing with soap or safe disposal of child faeces, suboptimum coverage and use may have vitiated the potential health effect generally reported from improved sanitation. These results are consistent with those from another trial.¹⁵ Although the sanitation campaign in India has been modified to address some of these challenges, the programme still focuses mainly on the building of latrines—the main metric for showing progress towards sanitation targets. Although these efforts should continue, sanitation strategies can optimise health gains by ensuring full latrine coverage and use, ending open defecation, and minimising other sources of exposure.

are exploring in our substudy of microbial source tracking.²⁰ Exposure to rotavirus or zoonotic agents such as *Cryptosporidium* spp, both of which have been reported to be a major cause of severe to moderate diarrhoea in India, might only be partly prevented by sanitation.³⁹ Another explanation could be that the latrines themselves were ineffective at containing excreta; however, no evidence showed that latrines contaminated water sources. Additionally, the 14-month construction period and 18-month surveillance period might not be long enough to eliminate the risk of pre-intervention faeces in the environment. Some soil-transmitted helminth eggs and protozoan cysts can persist for extended periods outside a host, and some enteropathogenic bacteria can multiply in suitable environments.⁴⁰

All these possible explanations are important areas for further research. For now, however, increasing of village-level coverage and use would seem to be a priority. The levels achieved in our study are not unusual under the Total Sanitation Campaign and thus cannot be dismissed as an aberration.^{36,37,41} From 2001 to

2011, only two of 509 districts in India increased latrine coverage by more than 50%.²² Changes to the Total Sanitation Campaign (which has been renamed the Nirmal Bharat Abhiyan) increase and extend subsidies for construction beyond households below the poverty line to specified vulnerable groups.¹⁹ However, most households above the poverty line still do not qualify for subsidies and must build their own latrines. Although the Total Sanitation Campaign includes incentives through the Nirmal Gram Puraskar scheme to encourage village-wide open-defecation-free status, most villages do not qualify. Other approaches to rural sanitation, including community-led total sanitation, emphasise 100% latrine coverage in each village.

An important limitation of our study relates to the 18-month follow-up period. The potential health effect of rural sanitation (especially with regard to slow-reacting outcomes such as worm infection and stunting) might not be measurable within this time. This drawback raises questions about the feasibility of sanitation trials, especially because a more successful programme (eg,

using sanitation marketing and enhanced community mobilisation) might take 5–10 years to be implemented in areas with a low initial demand—a period during which investigators would encounter difficulties in withholding an intervention from a control group.⁴²

Although we recorded no evidence for bias caused by self-reported or carer-reported diarrhoea data, this possibility is a further limitation.³¹ The per-protocol analyses were adjusted for baseline values, but residual confounding is possible. Even with the potential for residual confounding, the per-protocol analysis showed no consistent effects in villages or households with higher compliance, except for weight-for-age Z score, which was not consistent with the absence of effect on height-for-age score. Compliance with the intervention might be related not only to child weight-for-age Z score at baseline, but also independently to the rate of decline in weight-for-age score in the first 2 years of life, which we noted in our study area.

Household sanitation could provide other benefits, including convenience, dignity, privacy, and safety. Latrine use was nearly five times higher for women than for men or children. However, our results show that the health benefits generally associated with sanitation cannot be assumed simply by construction of latrines. As efforts to expand sanitation coverage are undertaken worldwide, approaches need to not only meet coverage-driven targets, but also achieve levels of uptake that could reduce levels of exposure, thereby offering the potential for genuine and enduring health gains.

Contributors

TC, SB, MB, OC, JE, MF, MJ, AS, and W-PS contributed to the study design. SB, PR and BT managed the study. SB led the substudy of water quality, MO and MJ the substudy of hand contamination, BT the substudy of sentinel toys, and MB the substudy of flies. WS and AS coordinated the assessment of latrine coverage and use. WS was responsible for the analysis of health outcomes. TC, SB, and WS drafted the report. All authors contributed to redrafting the report.

Declaration of interests

We have no competing interests.

Acknowledgments

Funding was received from the Bill & Melinda Gates Foundation, the International Initiative for Impact Evaluation (3ie), and the Department for International Development-backed SHARE Research Consortium at the London School of Hygiene & Tropical Medicine (LSHTM). We thank the study participants; the Department of Rural Development of the State of Orissa and the Puri District Water and Sanitation Mission; WaterAid, United Artists Association and their collaborating implementers; Loyola Hospital and the Asian Institute of Public Health, Bhubaneswar; and our field staff, laboratory technicians, drivers, and data entry personnel. We appreciate the advice and assistance of Richard Hayes of the LSHTM in analysis of our results, and of Sandy Cairncross for comments on early drafts.

References

- WHO/UNICEF. Progress on sanitation and drinking-water: 2013 update. World Health Organization: Geneva, 2013.
- Pullan RL, Freeman MC, Gething PW, Brooker SJ. Geographical inequalities in use of improved drinking water supply and sanitation across sub-Saharan Africa: mapping and spatial analysis of cross-sectional survey data. *PLoS Med* 2014; **11**: e1001626.
- WHO/UNICEF. Progress on drinking-water and sanitation: 2012 update. World Health Organization: Geneva, 2012.

- Pruss-Ustun A, Bos R, Gore F, Bartram J. Safer water, better health: costs, benefits and sustainability of interventions to protect and promote health. World Health Organization: Geneva; 2008.
- Lozano R, Naghavi M, Foreman K, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012; **380**: 2095–128.
- Boschi-Pinto C, Velebit L, Shibuya K. Estimating child mortality due to diarrhoea in developing countries. *Bull World Health Organ* 2008; **86**: 710–17.
- Guerrant RL, DeBoer MD, Moore SR, Scharf RJ, Lima AAM. The impoverished gut—a triple burden of diarrhoea, stunting and chronic disease. *Nat Rev Gastroenterol Hepatol* 2013; **10**: 220–29.
- Ferriman A. BMJ readers choose the “sanitary revolution” as greatest medical advance since 1840. *BMJ* 2007; **334**: 1111.
- Esrey SA, Potash JB, Roberts L, Shiff C. Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma. *Bull World Health Organ* 1991; **69**: 609–21.
- Wolf J, Prüss-Ustun A, Cumming O, et al. Assessing the impact of drinking water and sanitation on diarrhoeal disease in low- and middle-income settings: systematic review and meta-regression. *Trop Med Int Health* 2014; published online May 8. DOI:10.1111/tmi.12331.
- Clasen TF, Bostoen K, Schmidt WP, et al. Interventions to improve disposal of human excreta for preventing diarrhoea. *Cochrane Database Syst Rev* 2010; **6**: CD007180.
- Engell RE, Lim SS. Does clean water matter? An updated analysis of water supply and sanitation interventions and diarrhoeal diseases. *Lancet* 2013; **381**: 544.
- Ziegelbauer K, Speich B, Maunz A, Bos R, Keiser J, Utzinger J. Effect of sanitation on soil-transmitted helminth infection: systematic review and meta-analysis. *PLoS Med* 2012; **9**: e1001162.
- Stocks ME, Ogden S, Haddad D, Addiss DG, McGuire C, Freeman MC. Effect of water, sanitation, and hygiene on the prevention of trachoma: a systematic review and meta-analysis. *PLoS Med* 2014; **11**: e1001605.
- Strunz EC, Addiss DG, Stocks ME, Ogden S, Utzinger J, Freeman MC. Water, sanitation, hygiene, and soil-transmitted helminth infection: a systematic review and meta-analysis. *PLoS Med* 2014; **11**: e1001620.
- Dangour AD, Watson L, Cumming O, et al. Interventions to improve water quality and supply, sanitation and hygiene practices, and their effects on the nutritional status of children. *Cochrane Database Syst Rev* 2013; **8**: CD009382.
- Spears D, Ghosh A, Cumming O. Open defecation and childhood stunting in India: an ecological analysis of new data from 112 districts. *PLoS One* 2013; **8**: e73784.
- Fink G, Gunther I, Hill K. The effect of water and sanitation on child health: evidence from the demographic and health surveys 1986–2007. *Int J Epidemiol* 2011; **40**: 1196–204.
- Hueso A, Bell B. An untold story of policy failure: the total sanitation campaign in India. *Water Policy* 2013; **15**: 1001–17.
- Clasen T, Boisson S, Routray P, et al. The effect of improved rural sanitation on diarrhoea and helminth infection: design of a cluster-randomized trial in Orissa, India. *Emerg Themes Epidemiol* 2012; **9**: 7.
- Government of India. Puri Fact-sheet. In District Level Household and Facility Survey (DLHS-3), 2007–08. India. Mumbai: International Institute for Population Sciences, 2008.
- Ghosh A, Cairncross S. The uneven progress of sanitation in India. *J Water Sanit Hyg Dev* 2014; **4**: 15–22.
- Boisson S, Peppin S, Ray S, et al. Promoting latrine construction and use in rural villages practicing open defecation: process evaluation in connection with a randomized controlled trial in Orissa, India. *BMC Res Notes* 2014; **7**: 486.
- APHA, AWWA, WEF. Standard methods for the examination of water and wastewater, 22nd edn. Washington, DC: American Water Works Association, 2005.
- WHO. Guidelines for drinking water quality, 4th ed. Geneva: World Health Organization, 2011.

- 26 Pickering AJ, Boehm AB, Mwanjali M, Davis J. Efficacy of waterless hand hygiene compared with handwashing with soap: a field study in Dar es Salaam, Tanzania. *Am J Trop Med Hyg* 2010; **82**: 270–78.
- 27 Vujcic J, Ram PK, Hussain F, et al. Toys and toilets: cross-sectional study using children's toys to evaluate environmental faecal contamination in rural Bangladeshi households with different sanitation facilities and practices. *Trop Med Int Health* 2014; **19**: 528–36.
- 28 Cheesbrough M. District laboratory practice in developing countries. Cambridge: Cambridge University Press, 2006.
- 29 Ulijaszek SJ, Kerr DA. Anthropometric measurement error and the assessment of nutritional status. *Br J Nutr* 1999; **82**: 165–77.
- 30 Schmidt WP, Genser B, Barreto ML, et al. Sampling strategies to measure the prevalence of common recurrent infections in longitudinal studies. *Emerg Themes Epidemiol* 2010; **7**: 5.
- 31 Schmidt WP, Arnold BF, Boisson S, et al. Epidemiological methods in diarrhoea studies—an update. *Int J Epidemiol* 2011; **40**: 1678–92.
- 32 WHO. The Treatment of diarrhoea: a manual for physicians and other senior health workers—4th rev. Geneva: World Health Organization, 2005.
- 33 Arnold BF, Hogan DR, Colford JM Jr, Hubbard AE. Simulation methods to estimate design power: an overview for applied research. *BMC Med Res Methodol* 2011; **11**: 94.
- 34 WHO. WHO Anthro software. Geneva: World Health Organization, 2008.
- 35 Patil SR, Arnold BF, Salvatore AL, et al. The effect of India's Total Sanitation Campaign on defecation behaviors and child health in rural Madhya Pradesh: a cluster randomized controlled trial. *PLoS Med* 2014; **11**: e1001709.
- 36 Arnold BF, Khush RS, Ramaswamy P, et al. Causal inference methods to study nonrandomized, preexisting development interventions. *Proc Natl Acad Sci USA* 2010; **107**: 22605–10.
- 37 Barnard S, Routray P, Majorin F, et al. Impact of Indian Total Sanitation Campaign on latrine coverage and use: a cross-sectional study in Orissa three years following programme implementation. *PLoS One* 2013; **8**: e71438.
- 38 Majorin F, Freeman MC, Barnard S, Routray P, Boisson S, Clasen T. Child feces disposal practices in rural Orissa: a cross sectional study. *PLoS One* 2014; **9**: e89551.
- 39 Kotloff KL, Nataro JP, Blackwelder WC, et al. Burden and aetiology of diarrhoeal disease in infants and young children in developing countries (the Global Enteric Multicenter Study, GEMS): a prospective, case-control study. *Lancet* 2013; **382**: 209–22.
- 40 Feachem RG, Bradley DJ, Garelick H, Mara DD. Sanitation and disease: health aspects of excreta and wastewater management. Chichester: John Wiley & Sons, 1983.
- 41 Pattanayak SK, Yang JC, Dickinson KL, et al. Shame or subsidy revisited: social mobilization for sanitation in Orissa, India. *Bull World Health Organ* 2009; **87**: 580–87.
- 42 Schmidt WP. The elusive effect of water and sanitation on the global burden of disease. *Trop Med Int Health*. 2014; **19**: 522–27.