

From new evidence to better practice: finding the sanitation sweet spot

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A growing body of evidence shows that there is a strong causal link between exposure to poor sanitation and detrimental health, human capital, and economic outcomes. At the same time a number of recent impact evaluations of specific sanitation interventions show mixed results. This heterogeneity in findings raises the questions of whether and how the demonstrated benefits of improved sanitation can be consistently achieved through regular project implementation. This paper attempts to show that the benefits of improved sanitation can be consistently achieved through investing in interventions that address the drivers of latrine use and by divesting from interventions that do not address the drivers of latrine use.

Keywords: behaviour change, evidence, open defecation, policy, stunting, user preferences

A GROWING BODY OF EVIDENCE shows that there is a strong causal link between exposure to poor sanitation and detrimental health, human capital, and economic outcomes. At the same time a number of recent impact evaluations of specific sanitation interventions show mixed results. A Community-Led Total Sanitation (CLTS) project in Mali significantly reduced open defecation and stunting (Pickering et al., 2015). An intervention combining CLTS and subsidies in Bangladesh significantly reduced open defecation (Guiteras et al., 2015). Two separate interventions carried out under the Government of India rural sanitation programme (Total Sanitation Campaign) in Orissa and Madhya Pradesh had relatively small impacts on reducing open defecation and precisely zero impact on health or environmental outcomes (Patil et al., 2014; Clasen et al., 2014). This heterogeneity in findings raises the questions of whether and how the demonstrated benefits of improved sanitation can be consistently achieved through regular project implementation. In this context, 'regular' refers to an implementation process that can be carried out with the resources and effort reasonably expected to be available to NGOs and governments implementing programmes at national scale. 'Regular' is meant to be in contrast with high intensity implementation often found in small scale pilots and efficacy studies.

This paper then attempts to answer these two questions of *whether* and *how*. In summary, the answer to the first question is, yes. The answer to the second

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question is that the benefits of improved sanitation can be consistently achieved through investing in interventions that address the drivers of latrine use and by divesting from interventions that do not address the drivers of latrine use. This second answer sounds trivial but, as we argue in the following sections, is by no means simple. Indeed we are making the case that for an intervention to address the drivers of latrine use it needs to be based on sufficient knowledge (acquired through familiarity with the local context, or previous formative research) or, in the absence of such knowledge, to include a testing phase in which the impact of plausible alternative approaches is rigorously measured and compared.

We want to be clear that this paper reduces the breadth of the sanitation interventions to those that focus on reducing open defecation in rural areas because this is an area where a wealth of new evidence is available. Therefore, it is important to acknowledge that latrine use is an important but not the only sanitation behaviour that matters for health. Even staying within the rural area, important complementary behaviours are water management and animal excreta management. Then, in urban areas there are several behaviours regarding faecal sludge management (safe emptying of pits and septic tanks, safe transportation and treatment of sludge) that can be important for health. We also need to be clear what this paper does not attempt to do. It does not attempt to provide an in-depth review of the entire body of evidence about the effectiveness of sanitation interventions to improve health. Rather, we take an admittedly convenient sample of recent findings to illustrate the policy-relevant question of how to design a sanitation intervention that is likely to improve the health of the targeted population.

Historical context

This section is not meant as an exhaustive literature review on the impacts of water and sanitation interventions. Several formal reviews, going back to Esrey et al. (1991), Fewtrell et al. (2005) and more recently Dangour et al. (2013), summarize epidemiological trials and show positive and significant impact of WASH on reducing diarrhoeal diseases and positive but small impacts of WASH interventions on stunting.

At the same time, some of the strongest evidence about the effectiveness of water and sanitation interventions and improving health and human capital outcomes comes from rigorous historical studies, which establish causal relationships between sanitation and health, from both developed and developing countries. As early as 1991, Bateman and Smith find that improved neighbourhood-level sanitation in peri-urban areas was associated with reduced stunting. Cutler and Miller (2005) show that the introduction of water filtration and chlorination in United States cities in the early 20th century reduced total mortality by half and infant mortality by three-quarters. Watson (2006) shows that the sanitation interventions in Indian reservations in the United States from 1960 to 1998 have reduced infant mortality by half. An interesting observational (i.e. without

causal inference) study shows that the most important determinant of the 11cm average growth in height of European adult men from the mid-19th century to 1980 is the improved disease environment, which in turn is largely driven by exposure to faecal pathogens (Hatton, 2013).

Causal evidence is also available from developing countries. Spears (2012), Hammer and Spears (2016), and Spears and Lamba (2015) show that the Total Sanitation Campaign – a country-wide rural sanitation intervention carried out by the Indian Government – has led to significant reductions in infant mortality and stunting, and respectively, to increases in children’s cognitive ability. Dickinson et al. (2015) carried out an experimental trial of a CLTS intervention in Orissa and found that it led to an increase in children’s nutritional status (as measured by mid-upper arm circumference) and also to a decrease in time spent for sanitation purposes. Geruso and Spears (2017), using variation in exposure to neighbourhood-level open defecation induced by the differences in the demand for latrines between Muslim and Hindu households in India, show that a 10 percentage point reduction in the fraction of neighbours defecating in the open is associated with a decline in infant mortality of 2.7 to 2.9 infants out of 1,000. Furthermore, Lawson and Spears (2016) show that early life exposure to poor sanitation conditions is causally linked to decreased wages during adulthood. Outside of India, Coffey and Geruso (2017), using differential improvement in sanitation across regions of Nepal between 2006 and 2011, show that cohorts of children exposed to worse community sanitation developed lower haemoglobin levels and displayed higher anaemia incidence. In addition, Vyas et al. (2016) show that the large reduction in infant stunting between 2005 and 2010 in Cambodia can be explained almost entirely by the reduction in open defecation.

As noted by Schmidt (2014) it is difficult to measure health impacts of sanitation intervention because of:

- Selection bias: intervention is targeted at specific locations that would be different from those who are not targeted, even in the absence of the intervention.
- Response bias: because a sanitation intervention obviously cannot be blinded, beneficiaries may provide answers that are biased by the expectation that the intervention should increase latrine usage and reduce diarrhoea.
- Time constraints on implementation driven by the timeline of the research study.

We do believe that the recent evidence we cite below overcomes the barriers mentioned in Schmidt’s editorial. By using the random assignment of villages to intervention or control groups, the studies overcome the selection bias. By using directly observed rather than self-reported outcomes such as observed use of latrines, and accurately measured height of children, the studies limit the response bias. As to the time constraints on implementation, it is worth noting that in the four studies discussed below the timing of the endline measurement of outcomes was agreed *ex ante* between the research and implementing organizations, based on what the implementing organization thought to be a sufficient time to observe change in outcomes.

Discussion of new evidence

This section looks at the evidence that has recently emerged about the impact of specific sanitation interventions. While providing a fully modelled theoretical framework is beyond the scope of this paper, we do feel it useful to start with a basic conceptual framework.

Conceptual framework

We propose to think of the decision to invest in and use a latrine as being determined by a number of factors that can be categorized along two dimensions: behaviour – hardware and private – public. Figure 1 is an attempt to depict this categorization graphically.

For example, the *private behavioural* factors include individual beliefs about latrine usage. As shown in Geruso and Spears (2017) and Gupta et al. (2014), individual beliefs, including beliefs about purity and pollution, have an influence on latrine usage in rural India. Other commonly reported drivers of latrine usage include privacy, status, and safety. The *public behavioural* factors relate to the interlinked nature of the decision to invest in and use latrines. The usage of preventive health technology, such as latrines, which benefit not only the adopter but also those living in the same environment, is considered in microeconomic theory to have *positive externalities*. The health benefits from one’s own investment in/usage of latrines will not be fully realized if there are still some households who defecate in the open in the same environment. Thus, individual households that are motivated by potential health gains from toilet use may avoid adoption of improved sanitation because their neighbours fail to invest/use. Behaviour change campaigns (also referred to as information education communication (IEC) campaigns) aimed at encouraging investment in and use of latrines have been the typical policy response that

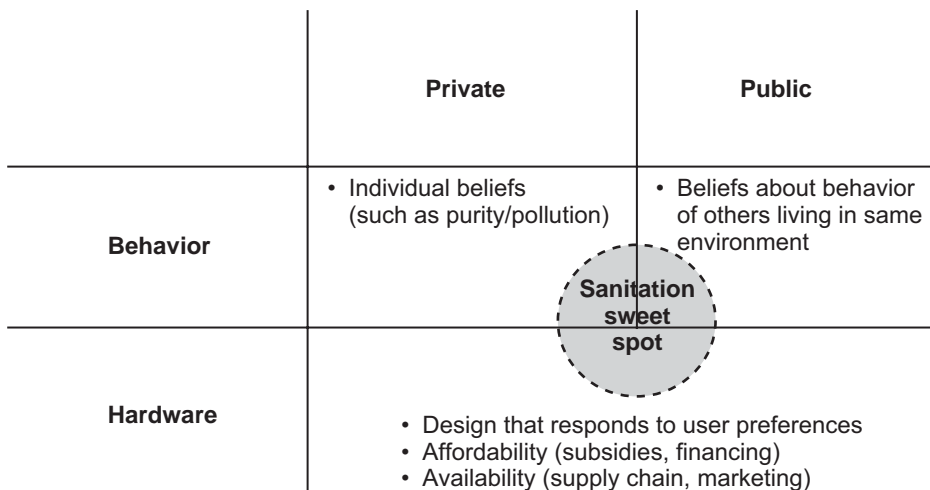


Figure 1 Decision to invest in and use a latrine

addresses these factors. In particular, total sanitation approaches, like Community Led Total Sanitation (CLTS), encourage collective action to move communities from open defecation to open defecation-free (ODF) status through sharing or new latrine construction. Once ODF status has been attained, this collective behaviour change can be maintained through social sanctions developed and implemented by community members, although the user experience and service level afforded by the facility itself is believed to play a big role in sustained use as well.

The importance of the factors related to sanitation *hardware/technology* in the decision to invest in and use latrines cannot be overlooked. A number of studies and business cases (Routray et al., 2015; Gupta et al., 2014; Quicksand Design Studios, 2011; Water and Sanitation for the Urban Poor, 2011) reveal the importance of latrine design elements such as pit size, water availability, ventilation, lighting, privacy and safety consideration, and menstrual hygiene management, for the decision to use the latrine. It is worth noting that design elements matter differently in different contexts. In some places pit size is a binding constraint and in others it may not be. The affordability and availability of latrines (or the sanitation service provision) can obviously be limiting factors in the decision to invest in and use latrines. The typical policy response to address affordability has been the provision of subsidies or financing (i.e. providing access to loans). Similarly, sanitation marketing (encompassing not just marketing but broader supply side interventions including design, business development services for sanitation entrepreneurs, and training of masons in the construction of sanitation infrastructure) has been the response to address availability issues.

As we will discuss in the following section, a successful sanitation intervention that is able to significantly increase the investment in and usage of latrines will need to take into consideration the relative importance of factors from all three cells of this framework – in other words, to hit the sanitation sweet spot.

New evidence

We now move on to discuss in detail four recently peer-reviewed, published studies regarding the impacts of particular sanitation interventions. It is important to note that these studies are effectiveness (as opposed to efficacy) trials, in that the implementations are done at a level of quality and intensity that is representative for regular project implementation. For transparency, we note that these four studies were funded by grants from the Water, Sanitation, and Hygiene Program at the Gates Foundation, where we are both employed. We do not claim these are the be all and end all of sanitation impact evaluations. We also do not claim that these four studies are a representative sample for the body of evidence on the effectiveness of sanitation intervention. At the same time, their rigorous methods, geographic spread, and addressing the two main conceptual approaches (subsidies and collective action), make them, in our opinion, a relevant sample to answer the questions we raised in the introduction: whether and how the demonstrated benefits of improved sanitation can be consistently achieved through regular project implementation. For ease of reference, Table 1 provides a summary of the four studies.

Table 1 Summary of four studies

Study	Methodology	Geography	Approach	Length of exposure	Baseline latrine usage (%)	Endline latrine usage (%)	Annualized rate of change in latrine usage (%)	Change in height-for-age
(Pickering et al., 2015)	Single arm RCT	Mali	CLTS	18 months	35	65	20	0.16 SD increase
(Clasen et al., 2014)	Single arm RCT	India: Orissa	Subsidies and CLTS-like mobilization campaign	21 months	9	36	15.4	No change
(Patil et al., 2014)	Single arm RCT	India: Madhya Pradesh	Subsidies and CLTS-like mobilization campaign	6 months	17	27	20	No change
(Guiteras et al., 2015)	Multi-arm RCT	Bangladesh	Combined: CLTS, subsidies, marketing	12 months	49	62	14	Not measured

CLTS in Mali

This study (Pickering et al., 2015) is an impact evaluation of a CLTS intervention in Mali. The intervention was carried out by the Government of Mali with technical support from UNICEF. The impact evaluation used a cluster-randomized controlled trial method whereby 121 villages were randomly allocated either to the CLTS treatment arm (61 villages) or the control arm (60 villages). Outcomes of interest were measured at baseline in April–June 2011. The CLTS intervention was carried out from September 2011 to June 2012. The endline was collected in April–June 2013.

The intervention followed the standard CLTS approach, whereby communities (in this case villages) are ‘triggered’ through a series of group activities to raise awareness of the dangers and externalities of open defecation (i.e. the flies go from anyone’s poop to anyone’s food), and to make public commitments to end open defecation by a commonly agreed-upon date. Notably, on top of the standard CLTS approach, two additional motivational activities were also carried out to increase the strength of the commitments: (1) the commitments were videotaped and village mappings were transcribed and (2) groups of close-by triggered villages were all brought together to watch each other’s taped commitments and village maps. After triggering, villages are monitored through periodic visits (up to twice a week) by CLTS facilitators. Government officials award the open defecation-free status to a village once each household has a private latrine (with water and ash/soap) and no open defecation areas remain.

The CLTS intervention increased use of private latrines, reduced self-reported open defecation, and improved the quality of latrines. Use of a private latrine was 65 per cent in CLTS villages and 35 per cent in control villages. Self-reported open defecation rates fell by 70 per cent among adult women and men, by 46 per cent among children ages 5–10, and by 50 per cent among children under five. In addition to these improvements in self-reported measures, similar improvements were documented through direct observation: latrines in CLTS villages were three times more likely to have soap, five times more likely to have water, more than twice as likely to have a covered pit, and 31 per cent less likely to have flies present.

Regarding health and nutritional outcomes, there is evidence that the CLTS intervention had a positive and significant impact on growth outcomes among children less than five years of age. Children under five years old in CLTS villages were 0.16 standard deviations taller and 13 per cent less likely to be stunted than those in control villages.

Total Sanitation Campaign in Orissa

This study (Clasen et al., 2014) is an impact evaluation of a latrine construction and promotion intervention in the Indian state of Orissa, implemented under the Total Sanitation Campaign (TSC). The evaluation used a cluster-randomized controlled methodology with a parallel design (i.e. control villages received the intervention only after the completion of the endline data collection). One hundred villages from Puri district in Orissa were randomly allocated to either the intervention (50 villages) or the control (50 villages) arm of the evaluation.

The intervention consists of a subsidy for latrine construction and a social mobilization campaign. The latrine (a pour-flush latrine with a single pit and a Y-joint for diversion to a future second pit) construction subsidy, of approximately INR 2,200 (US\$33), covered the costs of three pit liner rings and cover plate, two bags of cement, one Y-connector, one connector pipe, one ceramic pan set, and one door. The cost for transporting the material to the village and 1.5 days of professional (i.e. a mason) construction labour were also included in the subsidy amount. Sand, bricks, stones, and two days of labour, approximately equivalent to INR 2,200 were to be covered by the household.

The mobilization campaign officially includes: meetings with community leaders to explain the intervention, a baseline assessment of the water, sanitation, and hygiene and socio-economic profile of the village, the formation of a Village Water and Sanitation Committee, and a combination of community-level events (similar to the CLTS triggering) and door-to-door household visits to encourage construction and use of toilets. Additional IEC activities could have included wall paintings, school rallies, and the formation of adolescent girls groups to disseminate sanitation messages. However, in the process evaluation that was conducted in parallel with the impact evaluation (Boisson et al., 2014) it was observed that the mobilization campaign was not implemented as intended:

- Hardly any of the households mentioned participating in community-level events.
- Half of the households knew about the committee.
- Two-thirds of the households reported a visit about sanitation, but the majority recall that only construction logistics and costs were discussed during these visits.

A fairly conclusive finding about the ineffectiveness of the mobilization campaign is in the perceived benefits of latrine use; both the intervention and control households mention the same perceived benefits: convenience when it rains, time savings, health benefits, and safety. Importantly, avoiding shame was almost never mentioned as a benefit of having toilets.

The results of the evaluation show that access to latrines increased significantly in the intervention villages, from 9 per cent at baseline to 63 per cent at endline (relative to the increase in control villages, from 8 per cent to 12 per cent). However, latrine use was lower than access: 36 per cent in intervention villages vs. 9 per cent in control villages. This discrepancy between access and use seems to indicate that the intervention was markedly less effective at changing behaviour than at building toilets.

Regarding environmental and health outcomes, the findings show no evidence that the intervention reduced exposure to faecal contamination or prevented diarrhoea, soil-transmitted helminth infection, or child malnutrition. Specifically, no changes were observed in:

- the faecal contamination level of water either at source or stored in the households;
- the faecal contamination level on the hands of mothers or children;
- the presence of flies;
- reported (7-day recall) diarrhoea;
- prevalence of intestinal worms;
- weight-for-age and height-for-age of under-5-year-old children.

Total Sanitation Campaign in Madhya Pradesh

This study (Patil et al., 2014) measured the effect of India's Total Sanitation Campaign in rural Madhya Pradesh on household access to and use of improved sanitation facilities, open defecation, as well as on environmental and health outcomes. This evaluation was carried out under the World Bank's Water and Sanitation Program (WSP) initiative: Total Sanitation and Sanitation Marketing (TSSM). WSP provided capacity building support to 10 districts of Madhya Pradesh to strengthen the implementation of the programme. The evaluation was carried out in two of these 10 districts, using a cluster-randomized controlled trial in 80 rural villages.

Similar to the Orissa intervention, the Madhya Pradesh intervention consisted of subsidies for latrine construction and a CLTS-like mobilization campaign. TSC provided a subsidy of Rs 2,200 (US\$33) to below poverty line (BPL) households, and another government scheme (Nirmal Vatika) provided an additional Rs 2,000 (\$31) to both BPL and non-BPL households. The subsidies were specifically for improved latrine (an offset two-pit latrine with water sealed squat plate and a brick walled room) construction. The design of and capacity building for the mobilization campaign was supported by WSP and included CLTS elements: triggering based on shame and awareness of the health implications of open defecation. Unlike in the Orissa evaluation, a process evaluation was not carried in the Madhya Pradesh study, so we do not have detailed information about the content and execution of the community mobilization.

The findings of this evaluation show limited impact. While the intervention did increase exposure to CLTS activities from 16 per cent to 29 per cent and access to latrines from 22 per cent to 41 per cent, the increase in use of latrines was much smaller: from 17 per cent to 27 per cent. Similarly, reductions in reported open defecation were also modest, for men, women, and especially children: from 84 per cent to 75 per cent, from 83 per cent to 73 per cent, and from 89 per cent to 84 per cent, respectively. Strikingly, conditional on having access to (individual household) latrines, the fraction of households practising open defecation is *higher* in intervention than in control households (41 per cent vs. 28 per cent).

When interpreting these findings it is important to keep in mind the relatively short exposure period to the intervention. As the authors mention, the disbursement of TSC funds was provided to most (36 out of 39) intervention villages at least 4 to 5 months before the follow-up survey, which only offered time for latrines to be constructed and used for a short period of time. In the working paper version of this study, more details about the exposure time are described.

The information provided by TSC Block coordinator and GP secretary indicate that implementation of TSC activities was far slower than the original timeline. The program originally envisioned that implementation would be completed 18 months after our baseline survey. However ... 50 per cent [of treatment villages] (20/40) were triggered 1 month before the follow-up survey or later.

Given the small changes in use of latrines and open defecation, similar to the Orissa evaluation, no changes were observed in environmental and health outcomes: water quality, diarrhoeal diseases, enteric parasite infections, anaemia, and growth.

Community mobilization, subsidies, and marketing in Bangladesh

This study (Guiteras et al., 2015) is unlike the previous three. The study does not measure the impact of a predefined intervention (i.e. is not a single-arm RCT). Rather, the authors start from the premise that the drivers of sanitation behaviour and their relative importance are not fully understood *ex ante*. The authors posit that there are several potential drivers: lack of information, lack of coordination (i.e. I wait to invest in sanitation until my neighbour invests, my neighbour waits until I invest, and the outcome is that neither of us invests), poverty, and supply-side constraints. Therefore they designed the study to understand the relative importance of these different drivers. As a result, the study measures and compares the impact of several interventions, both in isolation and combined, in order to determine which intervention or combination of interventions is more effective (i.e. a multi-arm RCT) at increasing use of latrines. The study also differs from the previous three as it does not measure any health outcomes, but rather focuses on intermediate outcomes: use and ownership of hygienic latrines, and open defecation. Yet another difference is in the baseline rate of latrine use: in the sample used in this paper improved latrine usage was 49 per cent, higher than in the other three studies, as seen in Table 1. Thus, the goal of the studied interventions in the Bangladesh study can be thought of as reaching the remaining non-users of latrines.

The different interventions included in this study map to drivers of sanitation behaviour as follows: A CLTS-like community mobilization campaign called Latrine Promotion Program (LPP) was aimed at addressing the lack of information and coordination failure. Subsidies (of varying intensity) were aimed at addressing constraints in affordability. A marketing intervention providing information about where and how to purchase latrines and how to install them was aimed at addressing supply-side constraints.

The study design is a multi-arm RCT, schematically represented in Figure 2 (from the 'Supplementary Materials' section of the Guiteras et al. study). This design allows the separate identification of impact of individual interventions (LPP, supply-side) and of combined interventions (LPP+subsidy, LPP+subsidy+supply-side) relative to each other and relative to the control group. Notably, because the design does not have a subsidy-only arm, the separate identification of the impact of subsidy relative to the control group is not possible. However, by comparing the LPP with the LPP+subsidy arms, the additional impact of subsidies, conditional on LPP, can be identified.

The findings show that LPP (information and community mobilization) by itself did not impact the use of a hygienic latrine. The combined LPP+subsidy intervention increased use of hygienic latrines from 49 per cent to 62 per cent. Furthermore, the combined LPP+subsidy intervention decreased open defecation from 40 per cent to 31 per cent. The supply-side intervention did not have an impact on use or OD, relative to control, and the combined LPP+subsidy+supply-side intervention had no additional impact, relative to LPP+subsidy.

In addition to these basic findings, the study also informs an important debate about the role of subsidies. One side of the debate believes that subsidies create dependency and negatively impact the behaviour of those who do not receive them, as it is hypothesized that they would 'hold out' on investing in a latrine in anticipation of future subsidies. The other side of the debate believes that one's decision to invest

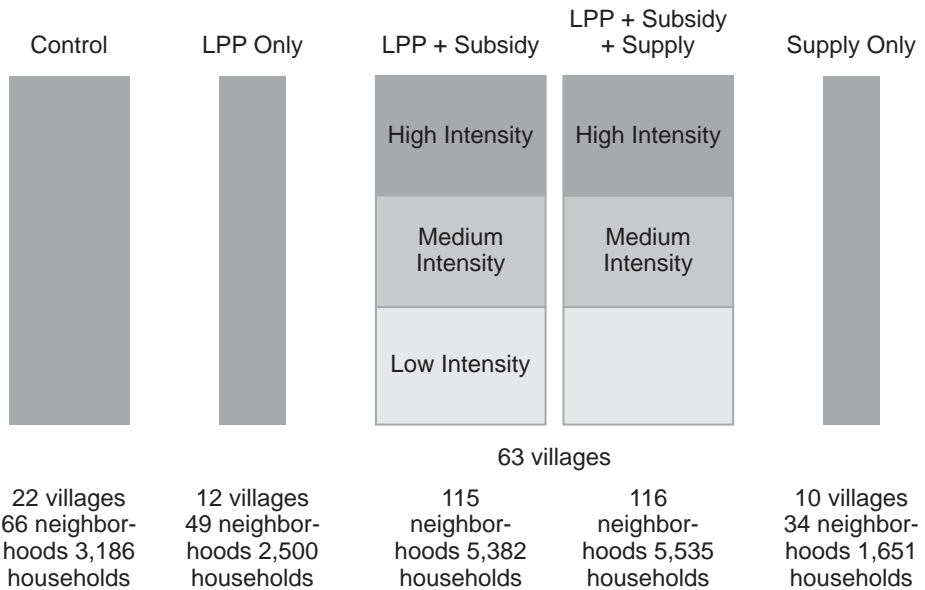


Figure 2 Design of the Bangladesh study

Source: Guiteras et al. (2015)

in a latrine is, in part, driven by the beliefs about the decision taken by one's peers/neighbours. In this case, those who did not receive the subsidy would be more likely to invest if more of their neighbours were investing. The findings support the latter side of the debate. First, it is shown that the subsidy lottery losers, in the LPP+subsidy arm, are just as likely (i.e. not significantly different) to invest in a latrine as eligible households in the LPP arm (where the lottery was not offered). Second, subsidy lottery losers in high intensity villages (i.e. with greater number of lottery winners) are more likely to invest relative to subsidy lottery losers in low intensity villages.

Discussion

How can such diverse findings be interpreted and reconciled? One natural reaction expressed by Luby (2015) as a commentary following the publication of the Orissa and Madhya Pradesh studies, is to start questioning the effectiveness of sanitation interventions to improve health. Another natural reaction expressed by Haddad and Spears (2015) is to identify a measure of programme implementation quality, specifically the achieved reduction in open defecation (and specifically *not* the achieved increase in sanitation coverage) and to make the case that only high quality interventions improve health. Yet another, more technical, interpretation is to check whether the relationship between implementation quality and health outcomes is constant across different programmes. Gertler et al. (2015) do precisely this and show that the relationship is indeed constant across several studies (including the Madhya Pradesh and Mali studies discussed here). Specifically, the authors find that the relationship between open defecation and child height is linear and predicts

that moving from 100 per cent OD to ODF increases height-for-age by 0.44 SDs. Notably this finding is highly consistent with the relationship between OD and height from population level estimates in Spears (2013) and Hathi et al. (2017).

Our own interpretation and reconciliation is focused on the implications for sanitation policy of these seemingly divergent findings. We claim that a strong predictor of implementation quality is the knowledge about the drivers of sanitation behaviour. In the case of the Mali intervention, it seems that between the government and UNICEF technical support team there was a good understanding that social cohesion in rural Malian communities would make an intervention based on community mobilization such as CLTS likely to succeed. In such communities the commitments made during triggering are more likely to bind because renegeing would likely incur strong social sanctions. Interestingly, data collected by the same research team regarding social cohesiveness appears to confirm this hypothesis (Alzua et al., 2014). They found that contributions to public goods in the sample villages, as measured through observing behaviour in a Public Goods Game (a behavioural experiment in which members of a group have a choice between contributing their endowment to the group or keeping it for themselves), are much higher than the average. Seventy-one per cent of Malian villagers chose to contribute to the public good which is much higher than the 35 per cent average across a number of communities in several countries (Henrich et al., 2004). Therefore, the implementation based on this existing knowledge led to a large increase in latrine use and reduction in OD, and hence to an increase in children's height.

The interventions in Orissa and Madhya Pradesh, focused mostly on latrine construction and effectively very little on behaviour change, do not appear to have been based on good knowledge about the drivers of sanitation behaviour. Formative research done by Population Services International (PSI) in Bihar (Singh et al., 2013) indicates that user preferences regarding the design of the toilet (particularly the preference for deep pits), a poorly functioning sanitation supply chain, and a complicated subsidy disbursement mechanism are all important drivers of sanitation behaviour. Furthermore, formative research (Gupta et al., 2016) carried out in five Indian states (Rajasthan, Madhya Pradesh, Haryana, Uttar Pradesh, and Bihar) shows how traditional beliefs about purity and pollution embedded in the Indian caste hierarchy lead to a preference for open defecation. Routray et al. (2015) present corroborating findings from Orissa about the drivers of sanitation behaviour and, particularly, the reasons why individuals chose not to use latrines constructed under the TSC programme. *Hardware factors* such as a latrine's lack of roof and/or door, small pits, small cubicle, and very importantly lack of water needed for anal cleansing and post-defecation bathing are cited as drivers of latrine non-use. *Behavioural factors* are also cited as drivers of latrine non-use. For example:

- Open defecation was viewed by women as one of the very few opportunities to socialize with other women.
- Beliefs around impurity and pollution required rituals for purification and cleansing post-defecation, using water.
- Beliefs that faeces are impure lead to the practice of containing faeces in the latrine pit in the house being viewed a 'sin'.

Neither the latrine construction approach, nor the behaviour change in the Orissa and Madhya Pradesh interventions target any of the factors identified in these critical pieces of formative research. As such, these were unlikely to succeed.

Finally, the Bangladesh intervention exemplifies that even if all the required knowledge about drivers of behaviour is not available at the start, an intervention can still be successful if it includes an evaluation of several plausible alternatives to drive behaviour change. Specifically, the debate around the effectiveness of subsidies, community mobilization, and supply-side constraints did not have a clear winner, but the evaluation embedded in the intervention showed that combining community mobilization with subsidies was the most effective approach in this setting.

Conclusion and recommendation

We started with the questions of whether and how the demonstrated benefits of improved sanitation can be consistently achieved through regular project implementation. We showed that the answer to the first question is, yes. We also claimed that only through acquiring knowledge about the drivers of behaviour change either before or during implementation, can the benefits of sanitation be delivered through project implementation.

The studies we quoted here make it clear that the drivers of behaviour differ from place to place. A project that aims to change behaviour should thus be designed on the basis of knowledge about those drivers in the local context. Government offices or organizations supporting sanitation activities at the local level are likely to be important sources of information in the project design phase. Where data is available, comparing trends in sanitation access and use prior to and after an intervention can provide important information about the additive effect of the intervention, making it easier to judge the value for money provided by the selected approach. While the specific four interventions were focused on reducing open defecation in rural areas, we believe this recommendation can apply to a wider set of sanitation interventions.

As demonstrated by the Bangladesh study, even in the absence of sufficient knowledge to allow the design of a successful behaviour change programme it is possible to embed the testing of specific approaches in the design of a programme. We would argue that such a design needs to be in line with the ambition of the programme; investigating the effectiveness of an intervention that will be used at state level in Nigeria warrants more attention and resources than one that covers just one local government area for example. The decision tree shown in Figure 3 summarizes the steps in the project design phase that would lead to a high quality sanitation intervention.

At a policy level, the examples from the four studies show us that flexible, guiding sanitation policies are likely to be more appropriate than fixed, prescriptive policies. A national sanitation policy requiring that programmes identify and address constraints on the demand and supply side would leave more room for effective programme design than a national policy requiring the use of CLTS, for example, or a national policy prescribing the use of subsidies for toilet construction. Government investments in effective knowledge exchange and outcome monitoring are likely to be more useful in supporting the design of effective programmes than prescriptions about specific approaches used throughout the country.

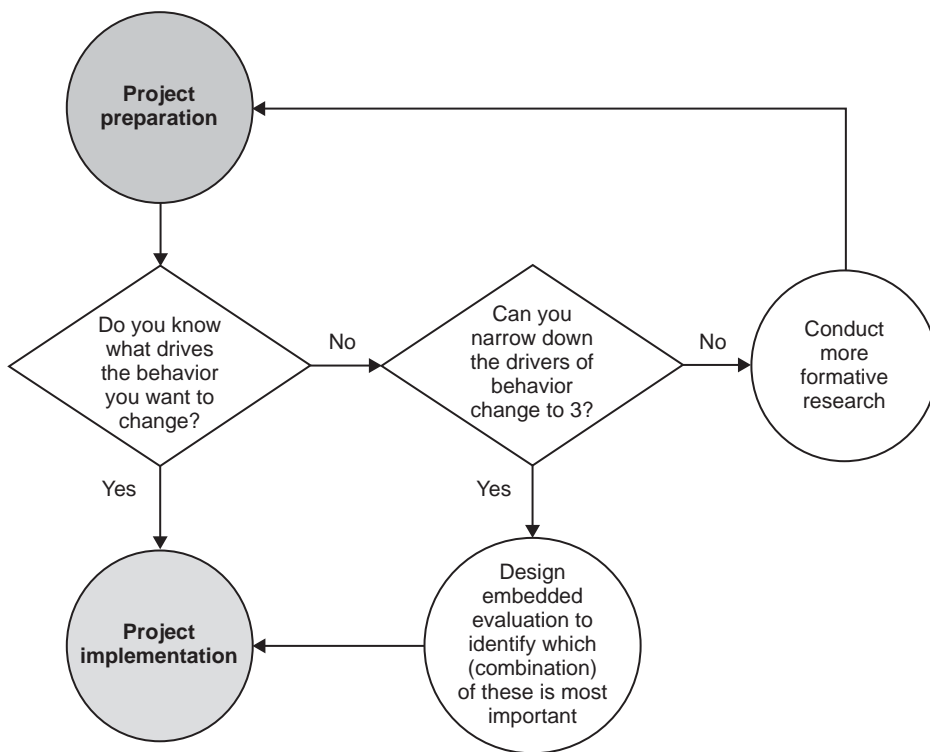


Figure 3 Proposed implementation decision tree

Although this is moving further away from the specific studies we started out with, we would like to end with the observation that ‘the devil is in the detail’. Investing in the decision on what to do is very important, as we have seen. However, equally (if not more) important is the decision on how to implement an intervention (represented by the bottom left circle in Figure 3). For example, the arm of the Bangladesh study that investigated the use of subsidies provided those subsidies in the form of a voucher that the recipient could exchange for a toilet at any hardware store. The project would then reimburse the hardware store owner when she turned in the vouchers. The vouchers can be targeted to those who are eligible, the process is a simple one for the recipient, and if she chooses not to install a toilet, no money changes hands. In contrast, the toilet subsidy provided through the India Swachh Bharat Mission (or its predecessors, the Nirmal Bharat Abhiyan and the TSC) are a good deal more complex to obtain. In some states, the money is provided to local NGOs, who build toilets with little regard for user demand or preferences. In others, the money is provided to households directly (sometimes in tranches), but only after they pre-finance the construction themselves, a requirement that is particularly onerous for the poorest, who are the targets of the programme. Utilization rates of the available funds can be very low as a result (Tremolet & Binder, 2013). In both cases, the *what* consists of a hardware subsidy for latrines. The *how* of implementation

is vastly different however and we would argue that differences in implementation drive differences in outcomes (and not only in this example of course).

Continuing to move away from the four specific examples, if an implementing agency (be it a development organization or government) wanted to follow the steps in Figure 3, how could they go about conducting the required formative research or formal evaluations? There are great examples of partnerships between implementing agencies and outside research agencies, including the partnerships that led to the four studies. Nevertheless, we believe that to ensure ownership and sustainability of the evidence-driven approach, implementing agencies need to develop their internal capacity to generate, interpret, and utilize evidence.

Making the observation that one size does not fit all, or that details matter is hardly rocket science; clearly we could have come up with the same conclusions even without spending millions of dollars and waiting long years for these studies to be completed. However, we do believe that having this strong evidence undeniably illustrates how starkly programme outcomes can differ based on the knowledge about drivers of behaviour change.

None of the four studies included components considering the hardware/technology side of the decision diagram we presented in Figure 1. A future white paper will consider the implications of design and financing on demand for sanitation.

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