

# Analysis of behavioral change techniques in community-led total sanitation programs

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## SUMMARY

*The lack of sanitation facilitates the spread of diarrheal diseases—a leading cause of child deaths worldwide. As of 2012, an estimated 1 billion people still practiced open defecation (OD). To address this issue, one behavioral change approach used is community-led total sanitation (CLTS). It is now applied in an estimated 66 countries worldwide, and many countries have adopted this approach as their main strategy for scaling up rural sanitation coverage. While it appears that many of the activities used in CLTS—that target community-level changes in sanitation behaviors instead of household-level changes—have evolved out of existing behavior change frameworks and techniques, it is less clear how these activities are adapted by different organizations and applied in different country contexts. The aims of this study are to (i) show which behavior change*

*frameworks and techniques are the most common in CLTS interventions; (ii) describe how activities are implemented in CLTS interventions by region and context; and (3) determine which activities program implementers considered the most valuable in achieving open defecation free (ODF) status and sustaining it. The results indicate that a wide range of activities are conducted across the different programs and often go beyond standard CLTS activities. CLTS practitioners ranked follow-up and monitoring activities as the most important activities for achieving an ODF community, yet only 1 of 10 organizations conducted monitoring and follow-up throughout their project. Empirical studies are needed to determine which specific behavioral change activities are most effective at ending OD and sustaining it.*

**Key words:** community-led total sanitation; sanitation; behavior change; open defecation

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## INTRODUCTION

Diarrhea is a leading cause of morbidity and mortality in developing countries, particularly for children it is estimated to cause roughly 800 000 annual deaths in children under the age of 5 (Liu *et al.*, 2012). The lack of improved facilities for the disposal of human feces, such as an improved pit latrine, and unhygienic sanitation practices, such as open defecation (OD), are major contributors to those deaths (Prüss-Üstün *et al.*, 2008). As of 2012, ~1 billion people practiced OD (WHO and UNICEF, 2014). The United Nations Millennium Development Goals

(MDGs), Target 7C, which is dedicated to water and sanitation, seeks to address this issue. It aims to halve the portion of the population without access to safe water and improved sanitation by 2015 (UN, 2013). The global community has made great strides in the area of drinking water; however, if current trends persist, the target for sanitation will fall short by more than half a billion people (WHO and UNICEF, 2014).

Since the advent of community-led total sanitation (CLTS) in late 1999 in Bangladesh, total sanitation programs have spread across the globe. Case studies and qualitative research have found CLTS to be an effective means of empowering

communities in attaining open defecation free (ODF) villages (Chambers, 2009; Harvey and Mukosha, 2009; Kidanu and Abraham, 2009; Sah and Negussie, 2009; Harvey, 2011; Whaley and Webster, 2011). There have, however, been critiques of CLTS programs in certain contexts (Engel and Susilo, 2014).

According to the 'Handbook on CLTS', total sanitation targets a multitude of hygiene behaviors, including ending OD, hygienic toilet use, hand washing at appropriate times, hygienic food and water handling, and safe disposal of feces (Kar and Chambers, 2008). These behavior changes are difficult to influence on an individual level, but CLTS aims to ignite community-wide behavior change and collective action to move the entire community toward improving sanitation together.

With the rapid and global uptake of CLTS intervention methods by various governments and non-governmental organizations (NGOs), programs have adapted certain elements of the traditional model used by Plan International (Noy and Kelly, 2009; Bawa and Ziyok, 2013; Mwanzia and Misati, 2013; Ogunjobi *et al.*, 2013). In a field context, CLTS interventions are often operating in tandem with other development programs from other non-profit organizations. Thus, maximizing behavior change is critical to contend with multiple interventions and competing objectives (Whaley and Webster, 2011).

Behavior change activities in a low- or middle-income country setting are frequently experimental, testing different combinations to find the most effective models (Briscoe and Aboud, 2012). Apart from a programmatic planning logic model, many field-level interventions lack a concrete behavior change framework behind their activities and believe that theory is irrelevant to practice (Aboud and Singla, 2012). Yet the programs that are generally most effective are based on a clear understanding of the targeted health behaviors and context (Rimer and Glanz, 2005). Moreover, they are created using strategic planning models and frequently improved through monitoring and evaluation. Theoretical frameworks of behavior change can play a vital role in all the aforementioned areas (Rimer and Glanz, 2005).

Although it is evident that CLTS has evolved out of multiple behavior change frameworks and techniques, it is less clear how these have been adapted and applied in different contexts. This study compares CLTS programs across 13 different countries. It aims to characterize specific behavior

change theories and techniques behind CLTS activities. The objectives are to (i) show which behavior change frameworks and techniques are the most common in CLTS interventions; (ii) deduce how activities are implemented in CLTS interventions, depending on region and context; and (iii) determine which activities program implementers considered the most valuable in achieving ODF status and sustaining it.

## BACKGROUND

### Community-led total sanitation

CLTS is a sanitation behavior change intervention that was developed by Kamal Kar in Bangladesh in the late 1990s (Kar and Chambers, 2008). It was developed in response to unsustainable supply-driven sanitation programs. Traditionally, CLTS activities are intended for small, rural villages with socially and culturally homogenous populations (Kar and Chambers, 2008). The guiding principle of CLTS consists of empowering communities to take their own initiative and come up with their own solutions to become open defecation free (ODF) (Kar and Chambers, 2008). While, providing monetary or hardware subsidies go against its core principle (Kar and Chambers, 2008).

Its approach is inspired by participatory rural appraisal (PRA), yet it is more forceful in highlighting the disgust associated with OD (Noy and Kelly, 2009). The approaches and methods are intended to enable 'local people to share, enhance and analyze their knowledge of life and conditions, to plan and to act' and believe 'that people will solve their own problems best in a participatory group process' (Chambers, 1994; WHO and UNDP/World Bank Water and Sanitation Program, 1997). CLTS is distinct from other approaches due to its emphasis on 'shame' and 'disgust' to trigger behavior change (Noy and Kelly, 2009).

### CLTS aims to end OD

While sanitation can encompass a multitude of behaviors, CLTS uses OD as its main entry point for broader livelihood and health changes (Kar and Chambers, 2008). With CLTS, success is measured by achieving ODF status, not by the construction of latrines (Noy and Kelly, 2009). To achieve the ODF status, CLTS uses four distinct steps: *pre-triggering*, where a community

is selected; *triggering*, in which community appraisal, observation and analysis are facilitated; *post-triggering*, where follow-up and support are provided to communities that responded well to the triggering activities; and post-ODF follow-up to address issues related to the sustainability of CLTS interventions (Kar and Chambers, 2008).

During triggering, the facilitator aims to stimulate a 'collective sense of disgust and shame among community members as they confront the crude facts about wide-scale OD and its negative impacts on the entire community' (Kar and Chambers, 2008). In an attempt to ignite the disgust in the community, facilitators are instructed to use the crudest word for human feces in the local language, generally translated to 'shit' in English (Kar and Chambers, 2008). Triggering consists of a number of activities that have been highlighted in the CLTS guidelines described below. Details of triggering activities can be found in the Supplementary data.

CLTS guidance materials provide some detail on follow-up and monitoring (Kar, 2010). Immediate follow-up and encouragement throughout the process are recommended for communities with strong ignition moments and active natural leaders; CLTS guidelines recommend a more reserved approach for communities that did not respond strongly to triggering exercises. Communities are encouraged by being told that if they achieve ODF status, outsiders and other villages will come to see their success (Kar and Chambers, 2008).

### CLTS in practice

Due to rapid uptake by communities and immediate success seen in some CLTS interventions, it has been quickly adopted by NGOs and national governments looking to start sanitation interventions (Chambers, 2009; Harvey and Mukosha, 2009; Kidanu and Abraham, 2009; Sah and Negussie, 2009; Harvey, 2011; Kar and Milward, 2011; Mwanzia and Misati, 2013; Ogunjobi *et al.*, 2013). Sanitation planners and program implementers in South Asia, Southeast Asia and the Pacific, Latin America and the Caribbean, and the Middle East have been trained, and workshops and trainings have spread throughout these regions (Kar and Chambers, 2008). With so many regions and countries come different cultural norms and behaviors that should be taken into account when designing or adapting sanitation interventions.

With the rapid expansion of CLTS interventions across the world, there have been many departures from traditional CLTS. For instance, some implementers are complementing CLTS activities with subsidies and latrine construction (Noy and Kelly, 2009; Bawa and Ziyok, 2013; Ogunjobi *et al.*, 2013). Additionally, projects have tested CLTS in urban settings (Gupta, 2012; Mwanzia and Misati, 2013). Nevertheless, in the programs included in this study, CLTS was mainly conducted in remote, rural settings. Yet CLTS is expanding to new contexts, including urban areas, giving implementers the opportunity to expand the traditional activities of CLTS to try to improve effectiveness and sustainability.

The context for each CLTS intervention, however, is unique, and it is difficult for public health practitioners in the field to detect commonalities among the various interventions implemented across the world. It has become difficult to recognize the behavior change frameworks and techniques used in these new interventions from the original intent. There is the potential that field-level implementers need more in-depth information to be able to implement CLTS interventions in new communities.

### Behavioral change theories in interventions

Theory aims to understand what variables are most important to behavior change and how the variables relate or interact. It also provides the potential to explain differences in behavior change across situations, populations and contexts (Painter *et al.*, 2008). Using theory is consistent with using evidence-based interventions in public health, and it provides a framework for studying problems, developing appropriate interventions and evaluating their successes and failures. It can also inform the implementer's thinking and offer insights that have the potential to translate into stronger programs (Rimer and Glanz, 2005). Therefore, it is necessary to identify the behavior change frameworks used across CLTS interventions to properly maximize effectiveness and sustainability of the intervention. Behavior change in any intervention is difficult to achieve and maintain, due to the personal, societal and cultural influences that govern human behavior.

CLTS concentrates on eliciting a community-level behavior change. Historically, however, behavior change theories and models have often been designed for an individual-level behavior change. Briscoe and Aboud (Briscoe and Aboud, 2012)

have illustrated the point that many behavior change techniques (BCTs) are based on individual-focussed interventions, such as using the subjective norm (that is, providing information about others' approval). When the intervention requires the entire community to change the subjective norm and create a new norm, the activity behind the behavior change theory may alter. Furthermore, the authors argue that many of the cognitive constructs behind behavior change theories are untested and untried in community settings (Briscoe and Aboud, 2012). In the past two decades, however, research has increasingly focussed on the idea that individual behavior, as well as values and beliefs, operate within a social context and interventions targeting a community-level change have been conducted. In Cuba, a community-level intervention that used a social discourse approach—not merely providing information or technological information—was found to be effective at changing how communities collectively responded to given risks (Tate *et al.*, 2003). A study of an intervention to affect social norms for reducing public littering found that norms appeared 'to function at the cultural/societal level, the situational level and the individual level'. The authors suggested that what is normative in a society, in a setting and within a person will, in each case, impact their action, but that 'the impact will be differential depending on whether the actor is focussed on norms of the culture, the situation or the self' (Cialdini *et al.*, 1990).

A comprehensive taxonomy of BCTs common in interventions was developed by Abraham and Michie (Abraham and Michie, 2008). This list of 26 common BCTs and their corresponding theoretical frameworks are frequently used in interventions. Corresponding behavior change theories and models often overlap in their BCTs. Despite differences in mode of delivery, setting and behavior-specific procedures, the taxonomy of BCTs is an extensive list that can be used in future programming. The authors note that target audience characteristics are essential to the behavior change theory effectiveness, and should be taken into account for program planning (Abraham and Michie, 2008).

## METHODS

A qualitative, semi-structured questionnaire was used to obtain information from individuals who work on CLTS programs for their organizations.

The sampling was purposive; only individuals who implement or have implemented CLTS programs recently were solicited. The individuals who were included in the analysis were from international NGOs that either raise their own funding directly from the public or request funding from donor organizations. E-mail solicitations were sent to 16 different individuals involved in CLTS programs in Asia, Africa and the Middle East. Ten individuals agreed to participate and completed the questionnaire. Six respondents were unavailable or did not respond.

The questionnaire was created using the taxonomy of BCTs by Abraham and Michie (Abraham and Michie, 2008). The taxonomy presents 26 different BCTs with corresponding behavior change frameworks (see Supplementary data, Table 2 for a glossary of the BCTs and activities). These were reduced to a set of 19 BCTs that could conceivably apply to the community-driven activities of CLTS, despite being based on individual-driven theoretical frameworks. Open-ended questions were first used to gather data on each program and determine which activities the CLTS practitioners used. Following the open-ended questions, a set of 17 dichotomous questions was developed, corresponding to six distinct different behavior change theories in the taxonomy, and three additional behavior change frameworks were also identified as they corresponded to some of the 19 BCTs. Implementers were asked whether each technique of a behavior change framework matched the activities they generally conduct in a CLTS intervention. The questionnaire contained an additional set of nine qualitative questions for program managers to specify the particular activities conducted in their CLTS model and qualitatively describe the communities and demographics chosen for interventions. Program managers were then asked to rank each CLTS activity they use in terms of general importance and sustainability of the intervention.

The survey was administered online via e-mail to each project director who agreed to participate after the initial e-mail solicitation. It was self-administered for the convenience of participants. Participants who needed further clarification were contacted either by e-mail or by Skype to define unclear questions. All surveys were coded and analyzed for trends in behavior change models and regional and demographic trends. The study was approved by the George Washington University Institutional Review Board.

## RESULTS

### Intervention description and characteristics

Individuals were interviewed from 10 organizations that had conducted CLTS activities in 13 different countries. Despite the variety of locations, cultures, regions and implementing organizations, nearly all CLTS interventions were conducted in rural villages with <2000 people in the population or <200 households; organizations more commonly conducted CLTS interventions in villages of 100 households. One individual said that their organization implemented CLTS in peri-urban areas, but the intervention activities did not differ from their rural intervention. Organizations that had been working for longer had the most triggered communities; but all the organizations included had experienced success with CLTS and were continuing to expand into new communities.

Individuals from the 10 organizations were also asked to give the timeline for their CLTS intervention that is how long their CLTS program lasted. Every organization indicated

that the triggering took from 1 to 3 h to complete. Similar to other reported CLTS programs, the interventions achieved the ODF status in a short amount of time, usually 6 months to a year. Follow-up was conducted by one organization for the lifetime of the project, but for the remaining programs was typically conducted on an *ad hoc* basis. The project timeframes and descriptions of the CLTS programs discussed by the individuals interviewed can be found in Table 1.

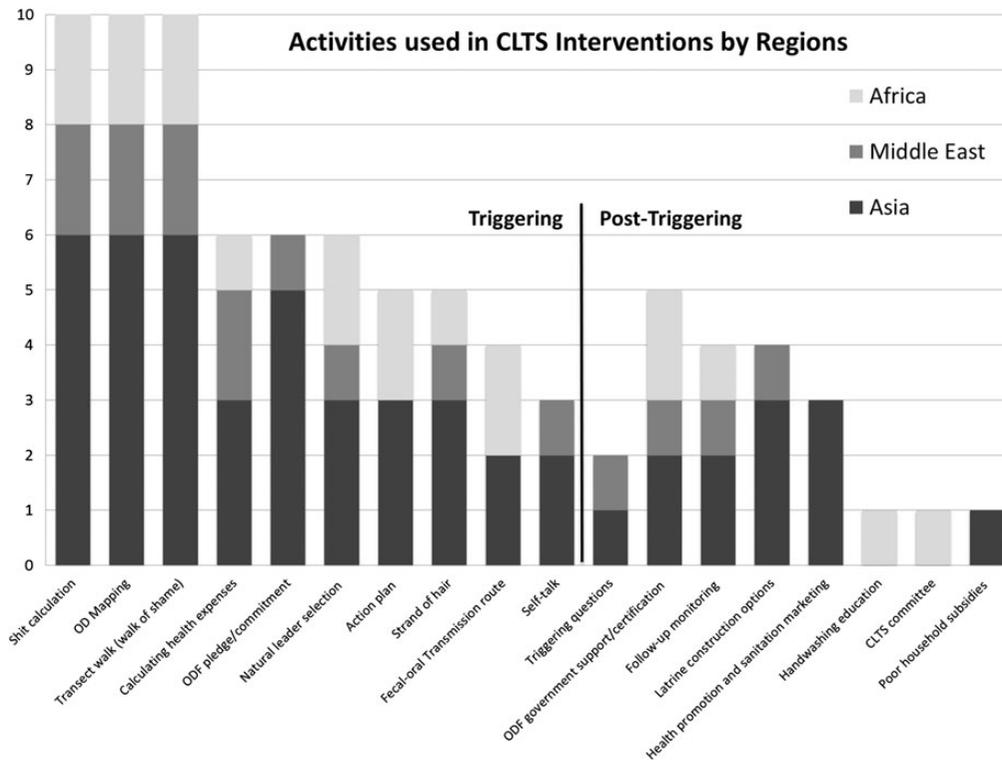
### CLTS activities

All of the individuals reported that their organizations included some of the activities found in CLTS guidance materials (2008), but often they included new activities or omitted activities based on observational experience during past interventions. In particular, triggering exercises were similar across all the organizations. All the activities that were listed can be found in Figure 1.

The CLTS programs listed 18 different activities. The 'Shit Calculation', which is a calculation by the community itself of the feces

**Table 1:** Description of CLTS programs included in the study

Program	Country(s)	Triggered villages	Community description	Population	Program time period
1	Indonesia, Philippines, Laos, Vietnam, Bangladesh and Nepal	~10 000	Small, rural communities	~200 households	3 months–1 year
2	Afghanistan	~1000	Small, rural villages, 18 districts/6 provinces throughout Afghanistan	~50–100 households	6 months
3	Senegal	108	Rural, small villages	~150–200 population	Indefinite
4	Madagascar	1076	Rural and peri-urban	110–150 population	3–6 months
5	East Timor	150	Rural, mostly mountainous	15–200 households	8 months
6	Indonesia	600	Rural	2000 population	N/A
7	Pakistan	5000	Rural areas, some populations are scattered (cluster the populations for the intervention)	100 households	6 months
8	Vietnam	600	Small villages, across 7 provinces in mountainous areas and river delta	200 population	1 year or longer
9	Cambodia	2000	Remote villages with low sanitation coverage, some communities are very crowded (no space to build a toilet), some places are flood prone areas with seasonal flooding	60–200 households	2–3 h triggering, follow-up is local
10	East Timor and Papua New Guinea	80	Small village, rural, subsistence farmers	100 population	3 months



**Fig. 1:** Activities conducted in CLTS programs by region.

produced in the community, ‘OD Mapping’ and the ‘Transect Walk’ (also known as the ‘walk of shame’), where a walk through the community to observe visible feces, were conducted by every intervention. The most frequently used techniques occur notably during the triggering phase of the intervention. Other activities such as ‘hand washing promotion’ and ‘creating a CLTS committee’ are encouraged by the CLTS Handbook, but they did not appear to be typical CLTS activities and were only used in the interventions conducted in Africa. One intervention in Asia said they provided direct subsidies to poor households to build latrines, which is contrary to CLTS guiding principles. Activities that could be interpreted as departures from traditional CLTS practices included (i) developing a community action plan; (ii) providing explicit latrine construction options; (iii) giving subsidies for poor households and (iv) engaging in health promotion activities. Most of these activities were focussed on the post-triggering phase to create long-term sustainability. Figure 1 provides details of which activities are specific to which regions.

Program managers were asked to rank the activities in terms of importance, both for sustaining improved sanitation and for habit formation. The most recommended activity for habit formation and sustainability was follow-up or monitoring activities. The CLTS Handbook suggests post-triggering follow-up meetings with natural leaders and communities to provide support and encouragement (Kar and Chambers, 2008). Other long-term activities such as hygiene promotion, sanitation marketing and rewards for the ODF status ranked very low on overall importance.

The second most recommended CLTS activity was ODF verification and declaration. Triggering activities, specifically the ‘shit calculation’ and disgust activities, were ranked as very important for sustainability. There is, however, debate about the ethics and effectiveness of using disgust, shame and fear in CLTS, and public health programs more broadly (Engel and Susilo, 2014; Lupton, 2014). In the case of shame, research has shown that it can lead to withdrawal and avoidance behavior or can facilitate behavior change, or potentially both depending on

situational factors (Hooge *et al.*, 2011). Research on the use of disgust in a hand washing intervention found that it was effective for men, but was not for women (Judah *et al.*, 2009). Recent guidance on CLTS promotes more positive framing of activities—dignity rather than shame, for example—yet training guides continue to emphasize shame and disgust as important motivating factors (Kar, 2010).

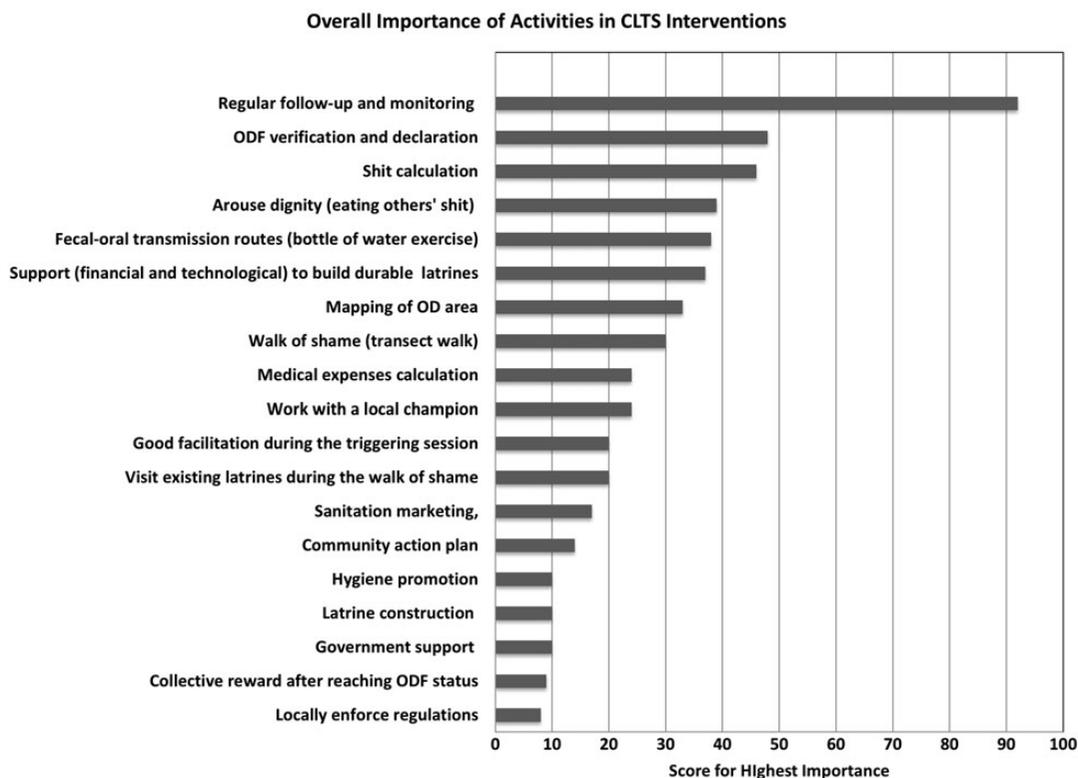
Strong facilitators during triggering were seen as valuable for sustainability, but were not mentioned for habit formation, and therefore did not rank highly overall. Habit formation activities included having strong local government support and ODF certification support. Financial incentives and building assistance were also mentioned as supportive activities for habit formation. See Figure 2 for the overall rankings by implementers of activity importance.

### Behavior change theories in CLTS

Despite differences between the interventions and traditional CLTS, the similarity of activities

created overlap between different behavior change theories. There were 19 unique BCTs presented to program managers as potential frameworks used for activities in the intervention. All of the behavioral change techniques were identified by at least one program manager as part of their CLTS interventions. Descriptions of each BCT and corresponding behavior change theories and frameworks used in this study and a list of responses can be seen in Table 2.

The prevalence of BCTs used across CLTS interventions showed that program planners mostly used techniques that corresponded to the Transtheoretical Model (TTM), Social Cognitive Theory (SCT) and Health Belief Model (HBM), all of which are theoretical frameworks designed for individual-driven behavior change. The TTM was the most wide-reaching framework and broken down into nine corresponding techniques. However, no one intervention used an entire behavior change framework, in terms of all its corresponding techniques. This may have positive or negative consequences on the sustainability of the intervention. Supplementary data,



**Fig. 2:** Perceived importance of activities in CLTS interventions by program implementers.

**Table 2:** Description of CLTS behavioral techniques used among the 10 programs analyzed

Technique description	Behavioral theory/Framework <sup>a</sup>	Example of activity	Number of interventions
Facilitate the observation of non-expert others' performance	Social Comparison Theory	Using Natural Leaders	10
Provide information about the consequences of community-wide OD	Theory of Reasoned Action Theory of Planned Behavior Social Cognitive theory Health Belief Model Transtheoretical Model	Calculation of medical expenses	9
Provide information about others' approval	Theory of Reasoned Action Theory of Planned Behavior IMBS model <sup>b</sup>	Transect walk or walk of shame	9
Encourage the community to decide to act or set general goals	Theory of Reasoned Action Theory of Planned Behavior Social Cognitive Theory IMBS model	Any triggering activity such as OD mapping	5
Provide <i>general</i> information about health risks resulting from OD	IMBS model Health Belief Model Transtheoretical Model	Help individuals visualize the fecal-oral route of disease	8
Identify barriers that prevent them from becoming ODF and plan ways of overcoming them	Social Cognitive Theory Transtheoretical Model	Poor household subsidies	9
Praise or reward community members for effort or performance without this being contingent on a standard of performance	Social Cognitive Theory Health Belief Model Transtheoretical Model	Clapping for individuals who actively participate during CLTS activities	7
Provide instruction on how to become ODF or instructions for preparatory behaviors	Social Cognitive Theory Health Belief Model	Latrine construction options	8
Create a detailed plan of what the community will do	Control Theory	Action plan creation	7
Review or reconsider previously set goals or intentions with the community	Control Theory	Moving beyond ODF to other sanitation activities, i.e. hand washing education	6
Provide data about or evaluate the performance in relation to a set standard	Control Theory	Achieving ODF status	4
Praise, encourage or provide material rewards that are explicitly linked to the achievement of ODF status	Operant Conditioning Health Belief Model Transtheoretical Model	ODF certification	9
Agree on a formal contract specifying the commitment to becoming ODF	Operant Conditioning	ODF pledge	7
Contact the community again after the main part of the intervention is complete	Transtheoretical Model Health Belief Model	Follow-up monitoring	8
Prompt consideration of how others could offer a community member help or social support	Social Cognitive Theory	CLTS committees	9
Indicate how a person in the community may be an example to others and influence their behavior	Transtheoretical Model	Natural leader selection	9

Continued

Table 2: Continued

Technique description	Behavioral theory/Framework <sup>a</sup>	Example of activity	Number of interventions
Encourage the use of self-instruction and self-encouragement	Social Cognitive Theory	Self-talk	9
Prompt the community and members of the community to provide self-motivating statements and evaluations of their own behavior	Transtheoretical Model	Triggering questions	5
Help identify situations likely to result in re-adoption of OD practice or failure to maintain ODF and plan to avoid or manage these situations	Transtheoretical Model	Poor household subsidies	6

<sup>a</sup>Adapted from Abraham and Michie (Abraham and Michie, 2008).

<sup>b</sup>Information-motivation-behavioral skills model.

Figure 3 shows the prevalence of each theoretical framework. They were calculated based on corresponding BCTs used in CLTS interventions, as identified by program administrators.

## DISCUSSION

### CLTS intervention characteristics

CLTS programs had similar implementation site characteristics, regardless of country or region. These similarities across different programs were expected due to the nature of CLTS. As a community-driven intervention, the social pressures of small rural villages are required to move the community toward the *ignition moment* of CLTS. The smaller villages tended to be farming communities, and the message of the importance of sanitation was easily relayed from one community member to another. Pre-triggering effectively alerted most community members to future visits by the facilitator. One program manager pointed out that the smaller villages usually have clearly selected natural leaders to advance the process. Financial and physical assistance were frequently offered in small communities for members who could not afford to or were unable to build a latrine. The one organization that did work in peri-urban communities still focussed on small communities.

The short duration of CLTS interventions was expected, and this aspect of CLTS was considered the most valuable aspect of the intervention for program planners. Only one organization conducted follow-up for the lifetime of the project; 40% of the organizations conducted some monitoring or follow-up, but much of that was assigned to local leaders to keep the communities working toward ODF status. The speed with which organizations could achieve ODF status was qualitatively stated as the main motivator in choosing a CLTS intervention over other sanitation interventions and contributed to the lack of follow-up monitoring.

### CLTS activities

The activities used in the CLTS interventions were recommendations from the CLTS Handbook and included other activities based on organizational experience. The most common activities used across the programs were activities that fell within the triggering part of CLTS. For

example, every CLTS program conducted the transect walk, community mapping of OD areas and the ‘shit calculation’. Other common activities conducted in all regions included calculating health expenses and selection of natural leaders in the community. All of these activities are key triggering exercises in the CLTS guiding principles and were used qualitatively to prompt the communities toward the ignition moment.

Certain activities were used only in certain regions. Hand washing education and creating a CLTS committee in the community, for example, were only used in one West African country. Creating a CLTS committee is similar to selecting natural leaders, in that both are identified during the CLTS process for their activism and enthusiasm; but the CLTS committee is generally more permanent and may conduct some follow-up monitoring. This particular organization felt that a committee formation would help maintain the social pressure needed to sustain good sanitation in the area.

Health promotion, sanitation marketing and poor household subsidies were used only in one Asian intervention. These activities directly contradict the guiding principles, as listed in the Handbook on CLTS, either not to give direction on the type of sanitation and latrines for a community to construct, or to provide direct financial subsidies to communities for improved sanitation. Both of these activities were chosen, because the areas of implementation were prone to environmental hazards and required cement blocked latrines for any kind of sustainable sanitation. The latrine design in these areas needed to be more permanent rather than built out of locally sourced materials. Among the study respondents, health promotion and sanitation marketing consisted of recommending the type of latrine to use and general hygiene education after the CLTS intervention had ended. There are on-going efforts to combine CLTS and sanitation marketing programs to create financially sustainable markets that produce longer lasting, demand-driven sanitation infrastructure.

The majority of programs conducted the most activities during the triggering process. Of the 18 activities that were conducted by programs, 11 of them occurred during triggering, a process that lasted only a few hours. All of the organizations conducted 3 of the 11 activities. Most of the activities listed in the triggering section are referenced in the Handbook on CLTS, but much of the post-triggering consisted of activities that

were conducted based on the experience of the organizations (Kar and Chambers, 2008). Post-triggering had fewer activities, but they were considered vital to long-term sustainability of improved sanitation by program respondents. Only 50% of the programs received governmental support and ODF certification for the communities. Qualitatively, ODF certification was one of the activities that ignited the sense of pride that was vital for CLTS to work. Post-triggering activities tended to be conducted only in certain regions. These specific activities may lead to greater uptake and maintenance of improved sanitation for those specific locations and cultures, but a greater sample is needed from similar communities and interventions.

When ranking the value of activities, program implementers often ranked activities that they had not conducted in their intervention. Specifically, follow-up monitoring and support were mentioned by every organization as being important for both sustainability of the intervention and habit formation of the hygiene behavior. Follow-up and monitoring activities ranked as the overall most important activities for CLTS. Yet only 4 out of the 10 interventions conducted any type of follow-up. Only one organization of the four continued monitoring and follow-up throughout the lifetime of the project. As this organization has just begun implementing CLTS in communities, follow-up and monitoring may become less frequent.

The CLTS activity considered by respondents to be most important for achieving sustained behavior change was ‘regular follow-up and monitoring’—twice as important as any other activity. Regular follow-up and monitoring was considered important by almost every organization, despite the fact that only 40% of the organizations conducted follow-up or monitoring. ODF verification and declaration was the second most important activity for sustainability, yet it was only conducted by 50% of the organizations. Of the three activities that all organizations did, only the ‘shit calculation’ ranked in the top five most important activities. Two of the top five activities were also post-triggering activities, which were rarely practiced.

The range of activities conducted by these different organizations was vast and went beyond the extent of guidance materials on CLTS (Kar, 2010). Activities tended to differ in organizations that were well established, had developed experiential evidence and were able to modify their

program plan accordingly. NGOs that had more recently begun CLTS activities had not yet triggered enough communities to build experience and make changes to the activity plan. These new programs often followed the lead of other CLTS interventions in that area.

### CLTS and behavior change frameworks

Despite the variation in activities, the corresponding behavior change theories were similar across interventions. As Table 2 shows, all of the BCTs were used throughout the CLTS interventions. Yet there is an obvious distribution of these BCTs, with a majority of the interventions using some part of the TTM, SCT and HBM, based mostly on their triggering exercises.

Social Comparison Theory was used across several interventions. It was described as facilitating the observation of (non-expert) other's performance. Although there was only one corresponding technique for this behavior change theory, organizations identified multiple activities, such as visiting other ODF communities nearby, having community members observe others building a locally sourced latrine and the use of natural leaders as examples of how they used this theory. These activities were not listed as the most effective or important activities in CLTS.

TTM was used most frequently in CLTS interventions, followed by the SCT and HBM (see Supplementary data, Figure 3). The use of those frameworks was nearly double that of other theoretical frameworks due in part to the multiple techniques that could be used to design activities. SCT, for example, had seven distinct techniques that could be applied to CLTS activities, including providing instruction on how to become ODF or instructions for preparatory behaviors, which was done by 80% of the organizations, even though this directly conflicts with the guiding principles of CLTS. SCT overlapped with the Theory of Reasoned Action and the Theory of Planned Behavior, and TTM and HBM frequently overlapped with each other. Thus, the activities that organizations identified as using these theories could be based on multiple theoretical frameworks. However, it is important to note that no one organization used any theoretical framework in its entirety—it is unclear how this might affect sustained behavior change.

According to Aboud and Singla (Aboud and Singla, 2012), behavior change interventions are

more effective when combining multiple behavior techniques. The CLTS program implementers interviewed in this study all combined multiple behavior change frameworks through various activities to move communities toward improved sanitation. Organizations did not specifically identify behavior change frameworks behind the activities conducted. Interventions dabbled in techniques of multiple behavior change frameworks for their interventions. Frequently organizations identified only part of a behavior change theory, rather than using all of its corresponding techniques. There is potential to develop more evidence-based, comprehensive activities well founded in behavior change frameworks that could improve sustainability of the CLTS interventions for the long term. Program planners should continue to use a variety of BCTs, but the ability to identify the relevant theoretical frameworks behind those could improve long-term habit formation and behavior change sustainability.

### STUDY LIMITATIONS

This analysis used 26 BCTs described by Abraham and Michie (Abraham and Michie, 2008), which are typically oriented toward individual behavior change, not toward communities as a whole. Thus, this analysis likely inadequately addresses the more community-oriented behavior change models. However, we found that of the 26 techniques described by Abraham and Michie, 19 of them were relevant to CLTS. In addition, this qualitative study included a small sample size and did not involve random sampling; as such the results are not generalizable. Despite soliciting 16 CLTS program managers, only 10 participated in the study. Due to the limited number of respondents, regional distribution was weighted toward organizations in Asia that were more prepared to complete the questionnaire. The increased number of respondents in Asia made it difficult to draw complex conclusions about regional differences in CLTS interventions. Lastly, this study was limited to the perspectives of program managers; perspectives of community members would have been beneficial.

### CONCLUSION

This study of organizations implementing CLTS illuminated the variability across programs. All

CLTS interventions aimed for ODF communities through the swift improvement of sanitation standards, motivated by a community's mutual disgust and fear of illness. Many of the CLTS programs were successful at rapidly igniting communities to end OD. However, for those programs to achieve sustainable results, more emphasis may need to be placed on long-term solutions and activities that drive maintenance behaviors. Beyond maintenance behaviors, a study of 116 villages by PLAN Australia found that more support to upgrade basic latrine facilities is needed for those households and villages that have maintained their ODF status (Tyndale-Biscoe and Bond 2013).

Many of the newer organizations implementing CLTS interventions remained faithful to the guiding principles of CLTS. However, some organizations have evolved and included new activities aimed at creating a more sustainable intervention. Whether this developed from an increased knowledge of the targeted communities and cultures or from an understanding of the behavior change constructs that underlie this intervention is unclear.

This study of CLTS interventions found many needs for further research into various aspects of these programs. Differences between the regions of CLTS interventions need to be explored further to determine whether certain activities that diverge from standard practice were used because of their effectiveness in certain populations. New CLTS activities need to be categorized to establish when and how these activities should be used in new CLTS interventions. A study of CLTS activities, regardless of adherence to standard guidelines, is recommended to establish an exhaustive list of activities by region, culture and demographics for use by other CLTS programs. Research of this kind is needed to improve implementation and increase improved sanitation coverage. Finally, more research is needed on the perspectives of community members involved in CLTS programs. This type of research has the potential to characterize the social processes and the effects of network formation that can lead to sustained behavior change.

## SUPPLEMENTARY DATA

Supplementary data are available at *HEAPRO* Online.

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