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CASE STUDY

Becoming and remaining open defecation free: a case study in Eastern Uganda

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Abstract
Poor sanitation, including open defecation, presents risk for diarrhea, which is responsible for 7.1% of mortalities in children under age five each year in Uganda. Although the implementation of the Community-led Total Sanitation (CLTS) intervention is successful at ending open defecation, more than half of the investment in producing open defecation free (ODF) communities is lost during the maintenance phase. This case study sought to understand the barriers and facilitators to becoming ODF and maintaining ODF certification in a community located in Eastern Uganda. Individual interviews with CLTS practitioners and focus group discussions with community members gathered key findings suggesting recommendations for CLTS practitioners. These recommendations include providing access to latrine construction tools, offering instructions for locating durable materials, using supportive rather than punitive intervention methods, demonstrating the dangers of open defecation (OD) and the benefits of being ODF, stacking programs with integrated, holistic teachings and promoting successful community stakeholders as ambassadors. In addition to quality of life and public health benefits, this research suggests that social outcomes, such as self-efficacy, growth, and generativity resulting from a supportive, holistic effort, may well move communities beyond the maintenance phase to engage in future community development efforts promoting further advancement and flourishing.

Keywords Community-led total sanitation · Sustainable development · Maintenance · Open defecation free · Water, sanitation, and hygiene

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1 Introduction

Approximately two billion people, nearly one third of the world's citizens population, do not have access to basic sanitation facilities, primarily in third world countries. Approximately, 673 million people engage in open defecation (OD), or leaving feces exposed (World Health Organization [WHO], 2019). The practice of OD predisposes people to infectious diseases (Wolf et al., 2018), poor nutrition (Arriola et al., 2020), reduced mental well-being (Delea et al., 2019), and diarrheal disease (Njuguna, 2016), resulting in premature morbidity and mortality. Diarrheal disease alone is credited with 600,000 deaths in children under five each year (Wolf et al., 2018). In Uganda, it is reported that 22–23% of the population practices open defecation (Ofumbi, 2020; Uganda Ministry of Health, 2020). Additionally, diarrhea-related deaths in Uganda are among the leading causes of death in those under five—accounting for 7.1% of the under-five mortalities each year (Nantege et al., 2022).

Because OD occurs primarily in poverty-stricken areas of developing nations, governmental and non-governmental agencies, researchers, and the international development community have focused efforts in sanitation improvements. However, these efforts have generally demonstrated only modest improvements in reducing OD behaviors (Musoke et al., 2019; Waterkeyn et al., 2020). The greatest success comes from holistic, community development efforts (Mtika & Kistler, 2017). One such approach, Community-led Total Sanitation (CLTS), developed by Kamal Kar and Robert Chambers, has been utilized to increase latrine ownership and usage under certain conditions, thereby decreasing the practice of open defecation. A major goal of CLTS is to end OD and encourage proper water, sanitation, and hygiene practices, such as utilizing pit latrines and handwashing after relieving oneself.

CLTS programming promotes a non-subsidized, collective effort toward sanitation (Kar & Chambers, 2008). In the most holistic sense, CLTS programming includes efforts to influence a wide range of behaviors, including using latrines, washing hands, handling food and water safely, and disposing animal and human waste properly to promote healthy environments. The first phase of CLTS programming is pre-triggering: a practitioner visits a community, gathers information, and secures support from local government officials. The second phase, triggering, includes a community-wide meeting where facilitators conduct participatory exercises to evoke disgust, with the goal of motivating collective sanitary changes to end open defecation (Kar & Chambers, 2008). In the third phase, the post-triggering follow-up phase, practitioners conduct regular visits to train local leaders on latrine construction. Once a community has met the agreed-upon hygiene standards by demonstrating sustained use of constructed latrines, it is declared *open defecation free* (ODF) (Kar & Chambers, 2008). Although there has been success with behavioral change demonstrated by latrine construction and latrine usage in the short term, the post-ODF maintenance stage has proven problematic, and communities have slipped back into OD behaviors. In some cases, more than half of the investment in producing ODF communities is lost during the maintenance phase (Wijesekera & Thomas, 2015).

Community change leaders and researchers have focused efforts in pre-triggering (Novotný et al., 2018), triggering (Bateman & Engel, 2016; Brewis et al., 2019; Harter et al., 2020), and post-triggering transition management (Silvestri et al., 2018; van Welie & Romijn, 2018). Fewer, however, have considered the maintenance phase. The maintenance phase is a key part of public health models of behavioral change (e.g. Transtheoretical

Model) where individuals work to prevent a relapse of gains realized in earlier action stages (Norcross et al., 2011). In the case of CLTS or becoming open defecation free, the maintenance phase is a collective impact of all three phases within the larger, complex system (Valcourt et al., 2020). This holistic view asserts that long-term maintenance is strengthened only by considering the interplay of the CLTS phases. While researchers do not agree on the best ways to improve and maintain sanitation behaviors, most agree that context-specific research is necessary for an understanding of slippage behavior (Garn et al., 2017; Venkataramanan et al., 2018). Significant "slippage" or the return to open defecation and/or unhygienic behaviors during the maintenance or post-triggering phase is more common than desired (Njuguna, 2019). The sustainability of sanitation behaviors is in question and the influences vary across contexts (Garn et al., 2017; Novotný et al., 2018; Venkataramanan et al., 2018), suggesting that a situationally specific study is necessary for better intervention strategies for the maintenance of behaviors.

Thus, this case study sought to better understand the perceptions of community members and CLTS practitioners on the facilitators and barriers to becoming and remaining ODF. Given the need to better understand the interconnected phases of the CLTS process in a context specific method, the following questions were addressed:

RQ1. What are the stakeholder's perceived barriers and facilitators to becoming ODF in this village community?

RQ2. What are the stakeholder's perceived barriers and facilitators to remaining ODF and combatting slippage in the maintenance stage in this village community?

2 Location and population sanitation profile

The Republic of Uganda is a landlocked, fertile, densely populated country located in East Africa (Central Intelligence Agency [CIA], 2020). The country is bordered to the west by the Democratic Republic of Congo, to the south by Rwanda and Tanzania, to the east by Kenya, and to the north by the Republic of South Sudan (CIA, 2020). Uganda is ranked fifth in the world for population growth and houses approximately 43,252,966 people living in 134 districts (CIA, 2020). Brief sanitation profiles of Uganda and Namutumba follow.

2.1 Uganda: sanitation profile

Uganda participates in the Water and Sanitation Program (WSP), a multi-donor funded program administered by the World Bank (CLTS Knowledge Hub, 2020). In partnership with WSP, the ministry of health implemented a 10-year sanitation and hygiene strategy to promote large-scale programming (including CLTS), identify solutions, and disseminate information to improve sanitation and hygiene (CLTS Knowledge Hub, 2020). While the country has seen improvements over the years in villages that are declared ODF, there is still a high average slippage rate reported—as high as 50% in some districts (Uganda Ministry of Health, 2020). According to Uganda's 2018–2019 Annual Health Sector Performance Report, the country demonstrated a reduction in latrine coverage from 83% in 2017–2018 to 77% in 2018–2019 (Uganda Ministry of Health, 2020). In addition, handwashing facilities also decreased from 36.5% in 2017–2018 to 36.2% in 2018–2019 (Uganda Ministry of Health, 2020). The Uganda Ministry of Health reports that the majority of the population or

58.4% use unimproved sanitation facilities and over 8.7 million (22.4%) still practice open defecation (Uganda Ministry of Health, 2020). More recent data suggest that as little as 20.7% of the population use safely managed sanitation services (Uganda Data Portal, 2023).

2.2 Namutumba district: sanitation profile

The Namutumba district is located in the eastern Busoga region and its headquarters is located approximately 56 miles northeast of Jinja the largest city in the region (Namutumba District, 2020). According to the 2014 census, Namutumba is the home to 422,771 people (Uganda Bureau of Statistics, 2017). The population is estimated to reach 700,000 plus by 2025 (Namutumba District, 2023). Little is available regarding detailed specifics of sanitation in the Namutumba district. According to the Uganda Bureau of Statistics (2017), 71.9% of those living in Namutumba use a borehole for their source of drinking water and 7% of households are without access to toilet facilities indicating there is still room for improvement in water and sanitation practices.

3 Methods

A qualitative case study method was used to understand perceived barriers and facilitators to becoming and remaining OD free. In consultation with the non-governmental organization (NGO), Kibo Group International, a community located in the Namutumba district was selected for this case. Kibo Group International worked with this village to develop the community holistically through CLTS, water, sanitation, and hygiene (WASH), safe kitchen building, health education, life skills education, and community economic development initiatives.

The community in the Namutumba district had been in the maintenance phase for over one year. By Kibo Group standards, this particular community is considered a small to mid-sized village, representing approximately 60 residences. Each residence is estimated to include eight to 16 family members. The village houses approximately 480 to 960 individuals. Kibo Group's records reported that the community reached the 100% mark for ODF certification early 2020. However, the effort was not without struggle. At the third evaluation, Kibo Group found that some of the early constructed latrines had collapsed and the percentage dropped from 100 to 89.9% ODF. The sanitation committee worked to ensure that the residents reconstructed the collapsed latrines.

3.1 Participant selection

Participants from this particular Namutumba community were selected using a combination of purposive and snowball sampling techniques (Saldaña & Omasta, 2018). The original purposefully selected individual, the water committee chairperson, was deliberately selected because of the direct insight into the CLTS intervention and membership of that community. After the purposive selection, the remaining participants were selected using the snowball sampling technique where each was asked to recommend a neighbor or other community member that had also been a part of the intervention (Saldaña & Omasta, 2018).

3.2 Procedures

Before research began, the study was approved by Abilene Christian University's Institutional Review Board (IRB), the Uganda Christian University Research Ethics Committee (REC), and the Kibo Group. Upon the IRB and REC approvals, the proposal was submitted to the Uganda National Council for Science and Technology (UNCST) where final approval was gained and official registration was completed. To maintain ethical integrity, informed consent was obtained from all participants, and mechanisms were implemented to ensure privacy, confidentiality, and conflict-of-interest accountability. To protect the privacy and confidentiality of participants, no identifiable names, titles, or distinguishing characteristics were used in any communication, report, writing, or presentation that resulted from this work. In addition, names and distinguishing characteristics were not used in the storage or analysis of data. Transcriptions and interview files were not distributed to anyone in any form and remain secure on a password-protected and touch-ID secured MacBook Pro computer. To prevent coercion or undue pressure, it was made clear that no financial or nonfinancial benefit or harm would result for those who chose to or chose not to participate in this study. This assurance was gained through clear and thorough communication of the interview protocol. Informed consent was gained before any interview or focus group discussion was held. Lastly, to discourage any conflicts of interest, transparent debriefings with the second author guided the analysis of and reporting of results.

To best address the sample units, two interview guides were used, one for practitioners and one for community members. These instruments differed primarily in terms of perspective but asked similar questions (see Table 1).

Individual interviews were conducted with CLTS practitioners via videoconferencing in October 2021. No translation service was needed as the practitioners speak English with ease. The first author traveled to the community in December 2021 to conduct the focus group discussions. The three focus group discussions were each 90 min and facilitated by the first author and a local interpreter, who translated informed consent, then the focus group questions from English to Lusoga, the native language, and then back to English. The interpreter translated comments/questions from Lusoga to English for further clarification. Focus group discussions were audio recorded, and the translator helped with the translation of the transcript from Lusoga to English.

Fifty-three% or 32 of the 60 community homes were represented by a family member that met the participant criteria and participated in a focus group discussion. During the iterative research process, the first focus group identified the key facilitators and barriers from the village community perspective. During the second focus group discussion it became clear that ideas were repetitious and themes were already emerging pointing to a state of code saturation where the researcher had "heard it all" (Hennink et al., 2017, p.1). The additional and final focus group discussion was beneficial by providing more examples to add to the depth of understanding contributing to meaning saturation where the researcher began to "understand it all" (Hennink et al., 2017, p.1). Given the time and funding constraints, the significant representation of village homes, and the repetitious discussion of issues, researchers determined that saturation had been reached and that there was no significant benefit to hosting more focus group discussions. Finally, in further support the focus group discussions reinforced the key ideas gathered from the practitioner in-depth interviews.

Table 1 Summary of questions

Interview and Focus Group Questions
Individual Interview questions for CLTS practitioners
• Describe the methods Kibo Group used to encourage the change in sanitation behaviors.
• Describe what the community did to encourage sanitation change.
• How many communities do you believe maintain ODF behaviors?
• Why do community members continue to engage in ODF behaviors especially when they have been taught about the negative consequences?
• During the triggering phase, what facilitated the community to stop OD? How do you know this?
• What were the barriers to stopping OD in the triggering phase?
• During the post-triggering phase, what facilitates the continuation of ODF behaviors? How do you know this?
• What are the barriers to stopping OD in the post-triggering phase? Why do community members return to OD?
• What do you suggest Kibo Group do to help communities continue ODF behaviors? To keep community members from slipping back to OD?
• What do you suggest village leaders or community members do to keep ODF status and to keep community members from slipping back to OD?
Focus Group questions for community members
• Describe the methods Kibo Group used to encourage the change in sanitation behaviors.
• Describe what the community did to encourage sanitation change.
• How many of you maintain ODF behavior? Does anyone choose OD in this group?
• Those neighbors that do choose OD, why do they choose OD especially when they have been taught about the negative consequences?
• During the triggering phase, what facilitated or convinced you to stop OD?
• During the triggering phase, what were the barriers that kept some from stopping OD? Or what difficulties existed?
• What has helped during the post-triggering phase to convince you to continue ODF behaviors?
• What has been (difficult or hard) during the post-triggering phase that convinced others to return to OD?
• What do you suggest for keeping community members from slipping back to OD?
• What do you suggest Kibo Group do to help community members from slipping back to OD?

3.3 Data analysis

As noted, the primary researcher recognized a significant level of repetition by the second focus group discussion. While there was iterative coding and reflective work throughout the research process, further scrutiny using the second author's review was utilized to promote rigorous and trustworthy results. To guide this effort, a step-by-step, thematic analysis adapted from Nowell et al. (2017) was followed. The first phase began with transcribing the data. After both authors engaged the transcripts and researcher reflective notes, initial codes were generated by triangulating the three embedded units. In Vivo coding captured phrases that seemed to stand out as if they should be bolded. A second coding pass analyzed the human actions that pointed to the CLTS processes and systemic interactions between each phase. Finally, emotion coding explored the "intrapersonal and interpersonal participant experiences and actions" (Saldaña & Omasta, 2018, p. 131). After several passes through the data, the third major phase included creating diagrams and visuals to make sense of the connections and ended with unified codes and overarching themes (see Table 2). In the fourth phase, the themes were scrutinized to ensure the code was supported by data. In the fifth phase, compelling theme names were chosen to represent the data (Nowell et al., 2017). This process was followed for each of the individual interviews and FGDs. Coding instructions and samples of coded text are provided to demonstrate efforts to unify the data (see Table 3).

4 Results and discussion

This context-specific study included conversations with community members, community leaders, and CLTS practitioners. The community conversations and individual interviews revealed recommendations for CLTS practice and research to support the maintenance of sanitation behaviors post-ODF certification.

There were two gender-exclusive focus groups discussions with community members. The male only group consisted of ten males whose ages ranged from 18 to approximately 75. The female only group consisted of 12 females ranging in age from 18 to approximately 60. The village community leaders included 10 leaders (seven female, three male) whose ages ranged from 18 to approximately 75. This focus group included the community mobilizers, water committee treasurer, government appointed village health team (VHT) member, water committee chairperson, water committee vice chairperson, pastor, borehole caretaker, and local council representative. Additionally, two CLTS practitioners, each with 10 years of experience with WASH interventions, participated in individual interviews via videoconferencing. The results, recommendations, and discussion follow.

Table 2 Summary of all themes, subtheme, and meta-themes

Themes, subtheme, and meta-themes
RQ1: Perceived barriers and facilitators to becoming ODF
• Limited access to durable construction materials and tools is a barrier to becoming ODF.
• Being supportive, not punitive facilitates becoming ODF.
• Understanding they were "eating shit" facilitates becoming ODF.
RQ2: Perceived barriers and facilitators to remaining ODF
• Limited access to durable construction materials and tools is a barrier to remaining ODF.
• Unity facilitates maintenance.
• Experiencing the benefits of being ODF facilitates maintenance.
• Access to clean water facilitates maintenance.
• Pride facilitates maintenance.
• Holistic teachings facilitate maintenance.
o Subtheme: There is no "quick and easy fix."
Metha-themes: Remaining ODF
• OD is no longer a problem.
• Generativity and desire for further growth are prevalent in the maintenance phase.

Table 3 Summary of themes, coding instructions, and samples of coded text

RQ1: Perceived barriers and facilitators to becoming ODF		
Overarching theme	*Coding instructions*	*Samples of coded text*
Limited access to durable construction materials and tools is a barrier to becoming ODF.	Barriers; struggles; fail; challenges; cost; weather; materials; tools (pickaxe); changes in motivation; construction; local materials; rate of implementation	"…helped us to use the materials that are local and available…" "…help to choose the best logs to construct on the mud floor…"
Being supportive, not punitive, facilitates becoming ODF.	Government/policeman; arrested; forcing; coerce; friendly (mukwano); encourage; home-to-home; affirm; appreciate; empower; relationship; build trust	"…came in a (mukwano) friendly way." "…those that resisted then, but practitioners came to help. Practitioners helped as a friend too."
Understanding they were "eating shit" facilitates becoming ODF.	Trigger; show it practically; ignite; danger; poison; ashamed; eating shit; eating feces; cooked rice on a plate; eyes were opened; food and feces	"…brought food and feces in a cavera [bag] and put it there…" "…told us of the dangers that might come when you are doing OD."
RQ2: Perceived barriers and facilitators to remaining ODF		
Overarching theme	*Coding instructions and subtheme*	*Samples of coded text*
Limited access to durable construction materials and tools is a barrier to remaining ODF.	Barriers; struggles; fail; challenges; cost; weather; materials; tools-pickaxe; changes in motivation; construction; local materials; collapse; rate of rebuilding	"…challenges come with weather…depending on soil type if its sandy soils those pit latrines are going to collapse or just sink in even when someone just dug it two days ago…" "rains come and it rains on the base that is dirt. So, it softens and collapses. So, that is a challenge."
Unity facilitates maintenance.	United; accountability; no one left behind; community; working together; keep visiting each other; love one another; neighbor	"I am safe when my neighbor is safe." "We are developing together. It is because Kibo taught this village how to work together and how to be united."
Experiencing the benefits of being ODF facilitates maintenance.	Changes in finances; businesses closed; health workers or inspectors no longer visit; confidence; sicknesses reduced; harvesting good fruits of their efforts; comfortable; safe; happy life	"We used to spend money but after they came the spending of monies in hospitals and poor hygiene-related diseases—the money is not spent on hygiene related health problems." "…that drug shop that was within, we don't know where it has gone. It is no longer in business."
Access to clean water facilitates maintenance.	Water from afar; personal hygiene; water-borne diseases; easier or simpler—no longer need to look for water	"Before the bore hole, we were getting water from afar. And we were sharing with frogs, animals, you know?" "The bore hole has helped hygienically; things are getting along well. After using that pit latrine, you need some water—which is available. Thank you because before it was hard from the bush…"
Pride facilitates maintenance.	Pride; proud; visitors impressed; examples; come and see; Guests expressed desire to be like this community	"There is community A and B. When (a visitor) from community B comes this way and they see this (referring to the healthy and safe community A), they see this and they ask 'Can these people come and also do the same (at community B)?'" "Even visitors when they come, they buy a plot in this village because of the way we have changed."

Table 3 (continued)

RQ1: Perceived barriers and facilitators to becoming ODF		
Holistic teachings facilitate maintenance.	Brought more teachers; more programs (stoves, chickens, nutrition, mvule tree etc.); time; individualized; takes time; follow up; one-on-one conversations *Subtheme*: There is no quick and easy fix.	"…brought this new thing of building a stove that uses less firewood and brought them the process until they all learned how to build one." "When Kibo came it brought many programs, many lessons. That we use the many things around us, like trees, keeping chickens, goats and other things that help us in our daily lives—even like gardening." "It takes time to dig, it takes time to construct, it takes time to replace." "…walked in all homes, teaching people…"
Meta-themes: Remaining ODF		
Overarching theme	*Coding instructions*	*Samples of coded text*
OD is no longer a problem.	Understand/know the value; in their blood; do not need to be reminded; grasped the importance; OD is no longer a problem (kicked etc.); don't want to waste time (sunk cost)	"But up to now, after they came, we know, we grasped the importance of the latrine. So, we no longer do open defecation because we know the importance of having a pit latrine and using it." "…told them the dangers that might come when you are doing OD. Since then, we kicked diarrhea from our village."
Generativity and desire for further growth are prevalent in the maintenance phase.	Still need a boost; request for more education; children and grandchildren; we are teachers; ambassadors; women of Kibo	"These people go and encourage those people… we are ambassadors now." "Please send us more programs so that we learn more—so that we develop more."

4.1 Themes from research question 1: perceived barriers and facilitators to becoming ODF

4.1.1 Barrier to becoming ODF

4.1.1.1 Limited access to durable construction materials and tools is a barrier to becoming ODF The main barrier to becoming ODF was also a barrier in maintaining ODF status. Many technical challenges, including soil, weather, construction materials, construction methods, and cost associated with digging and constructing a latrine were noted as a challenge to becoming ODF. However, these barriers did not inhibit the post-triggering action. The respondents reported being highly motivated to end OD and address the other hygiene-related deficiencies they had become aware of during triggering. While community members reported high motivation, they also acknowledge that it takes great effort to dig and construct a latrine. Most do not have the basic tools, such as a pick axe to ease the construction burden. Practitioners spoke of the pickaxe program and the provision of some tools as helpful support. One practitioner explained that they lack the budgeted funds to provide each home with digging tools, but that they do provide a few tools to the committee. The committee then creates a check-out system of sorts. The benefit of providing some tools, as described by one practitioner, is that the post-triggering effort can begin while village members are "ignited" or "catching the wave" of motivation. Figure 1 shows a community member using a pick axe to start his family's latrine.

Village focus group respondents appreciated that practitioners suggested ways to use items they have readily available around their homes. The practitioners "helped us use the materials that are local and available to do a better thing, because many of us had a latrine, but many were not roofed," stated one non-leader. The participants added a discussion of using local materials to replace those that they typically have to buy. They discussed the way practitioners insisted that a latrine be roofed with local grasses if iron sheets are not available to ensure the floor of the latrine does not collapse when the rain softens the foundation. This work suggests CLTS practitioners provide access to latrine construction tools and instructions for locating local, durable materials. This is a necessary, but not sufficient, step in becoming and remaining ODF. Practitioners should also carefully consider any barrier that lessens the individual or community motivation, creates a significant financial burden, or inhibits becoming or remaining ODF.

These findings are supported by past research that highlights the need for construction materials and methods for latrine construction (Venkataramanan et al., 2018). While practitioners vary greatly on the level of support regarding latrine construction techniques and guidance, most lean toward offering guidance and training (Venkataramanan et al., 2018). This work supports the notion that construction guidance, support, barrier removal, and affirmation facilitate both the change process and the maintenance of behaviors. For example, it's common practice among CLTS practitioners to not suggest precisely how to do something, but rather to motivate, and then let the community members take action as they see fit. It is likely that the continued support of the practitioners resulted in the motivation for a better life and this barrier did not stop this village from becoming ODF.

4.1.2 Facilitators to becoming ODF

4.1.2.1 Being supportive, not punitive, facilitates becoming ODF All respondents noted that supportive ways facilitated success. Most specifically, respondents appreciated affirming approaches to sanitation efforts in stark contrast to traditional governmental approaches, which are fear-based and firm. One of the practitioners explained, "We tell them that 'We are not here to arrest. We are here to discuss, to have a dialogue, to see how we can change, to see how we can come out of this problem that we've all realized we are in.'" Focus group participants also appreciated the contrasting strategies and each one noted it again and again. Two comments from the non-leader group included: "They came in a friendly way," and "They walked in all homes, teaching people." The leadership focus group shared the same sentiments when one respondent offered that "The practitioners came to help. The practitioners helped as a friend, too." In short, the intentional use of positive, supportive approaches rather than a punitive or shaming approach built community and motivated action amongst these community participants.

The effectiveness of supportive versus punitive measures is not often studied. There is some outcomes research, however, that demonstrates that supportive facilitation methods can contribute to the consistent use of latrines. In a comparative study of CLTS methods used in Cambodia and Ghana, Tribbe et al. (2021) found that many Cambodian leaders

Fig. 1 A community member digs a latrine using a pick axe provided by Kibo Group. *Note*: This image was taken from the Kibo Group image archives. To maintain respondent anonymity the image is not from the community interviewed

used top-down high-pressure tactics (e.g., threatened to withhold marriage certificates and subsidized latrine materials if latrines weren't constructed in a certain time frame, and even dug latrine pits without family's consent) while others employed a lower pressure, casual and collaborative leadership approach. Ultimately, the high-pressure Cambodian efforts resulted in inconsistent use of latrines (Tribbe et al., 2021). Leaders were more successful in persuading households to construct latrines when they took a more casual rather than an aggressive approach. Additionally, Tribbe et al. (2021) noted a Ghanaian CLTS effort marked with high CLTS facilitator collaboration and follow-up, including facilitators even sleeping in the community for four days following triggering to educate the households on the construction and use of latrines resulted in the consistent use of latrines. The work highlighted positive facilitator involvement as pivotal to success. Tribbe et al. (2021) concluded, "In Cambodia, the focus should shift away from imposing top-down sanitation targets that encourage community leaders and NGOs to employ aggressive strategies, and instead equip community leaders with strategies to maintain latrine use" (p. 19).

4.1.2.2 Understanding they were "eating shit" facilitates becoming ODF While triggering is a pre-maintenance step of the CLTS process, it became clear that triggering is also instrumental in the continued decision to remain ODF. Most specifically, the fecal-to-oral demonstration served to visually incite the realization that the villagers were "eating shit." [1] This understanding compelled actions to become ODF that continued to resonate in the maintenance phase. One practitioner spoke of triggering by stating the following:

> We have to show it practically so that people can see it is dangerous in their lives. We can get a specimen from any of these homes—fecal matter in the open. So, I pick it up and take it to the meeting point.. to demonstrate how feces and how flies will be able to move germs from the feces to the food that people eat.

One non-leadership respondent, referring to the transfer of feces to food, offered the following: "You may not know that you are eating feces. The practitioners told us that when you leave your food uncovered you are eating poison."

Practitioners can support ODF behaviors with vivid and observable triggering and post-triggering activities. Being able to observe the feces-to-oral process through the "eating shit" visual dramatically impacts the effort to become and remain ODF. Additional visual demonstrations could include information on costs associated with medical expenses as well as the relative advantages of being ODF to better understand what life can be like. In line with the previous finding, all of this should be portrayed in a positive way and can even include humor. Figure 2 demonstrates a lighthearted triggering session where the Kibo Group practitioner puts on a pair of gloves. The practitioner is handling a human stool sample to demonstrate the fecal-to-oral transmission discussed above.

While no study evaluates the relative effectiveness of different triggering techniques (Venkataramanan et al., 2018), the finding in this study is similar to a finding from a study in Mali, West Africa in which Alzúa et al. (2020), found that 87% of respondents recalled

[1] The fecal-to-oral demonstration used by Kibo Group involves the practitioner placing a bowl of white rice on a table in the middle of the community meeting. The practitioner also places a stool sample (collected from that community) near the table and sprinkles paprika on the fecal sample. The community watches as the practitioner continues to teach their lesson. By the end of the lesson, the white rice is covered with red from the paprika covered feces establishing the transfer of fecal matter from the legs of insects to food.

Fig. 2 Kibo Group practitioner uses supportive actions, humor, and vivid demonstrations to motivate. *Note*: This image was taken from the Kibo Group image archives. To maintain respondent anonymity the image is not from the community interviewed

the vivid demonstration of flies moving from a feces sample to food and water (i.e., triggering). As a result, 92% of triggered households decided to build a latrine during the triggering event (Alzúa et al., 2020).

Triggering is a critical facilitator of becoming ODF (Kar & Chambers, 2008), but it is important to note that there is a great debate over triggering and post-triggering techniques, with many expressing concerns over the human-rights implications related to the shaming or disgust-inducing triggering activities (Engel & Susilo, 2014; Ficek & Novotný, 2019; Galvin, 2015). The effective use of disgust as an emotional motivator within the context of this case study was most likely tied to the supportive, not punitive, actions of the practitioners following the triggering event.

In a Uganda Plan International intervention in the Tororo District, participants noted that many community members do not consider feces to be dangerous at all (Ficek & Novotný, 2019). The Uganda Plan International participants also reported sensitivity to the matter of shaming and use of disgust but simultaneously noted the effectiveness of these emotions in the Ugandan context (Ficek & Novotný, 2019). This finding departs slightly from the emotions of pride and dignity as more "universal motivators that triggered communities" (Venkataramanan et al., 2018, p. 13). In this case context, disgust did trigger becoming ODF and pride was one outcome of the community's effort that notably aids in maintenance of ODF behaviors. Pride as a facilitator to maintenance is discussed more below.

4.2 Themes from research question 2: Perceived barriers and facilitators to remaining ODF

4.2.1 Facilitators to remaining ODF

4.2.1.1 Unity facilitates maintenance A consistently noted concept for maintenance was the importance respondents placed on being unified in their efforts to remain ODF. Helping one another and being interdependent was prominent. This unification process begins with a community mapping activity during the triggering effort where each member locates their home on the map and discusses the location of open defecation sites and the impact that OD has upon each other (see Fig. 3).

The village stakeholders realized that if their neighbor was not using their latrine that they were also in danger. One practitioner stated, "The community has to embrace the idea of good sanitation behaviors. That is the determination and decision of the community. The recommendation of every member is to end open defecation." Later the practitioner added, "It is your responsibility to also get your neighbor to have a latrine. That is the only way you are going to feel safe. It starts from then—people feeling that I am only safe when my neighbor is safe." In response to a question about the decision-making process to change and maintain behaviors, one practitioner said, "that is there because there are neighbors who will say, 'Hey, we are going to help you. We are going to come, and we are going to help you. We are going to build this together.'" This practitioner continued to explain that if they realized that if a neighbor slipped back into OD that they were also in danger they would

Fig. 3 Community mapping process helps community see they all must be unified against OD. *Note*: This image was taken from the Kibo Group image archives. To maintain respondent anonymity the image is not from the community interviewed

"do it collectively" creating a situation where the community would "never go back." When asked what was difficult about maintaining the ODF behavior, one non-leader said, "We keep visiting one another…That's why we have maintained." When probed a bit further about what was meant by "working together and encouraging one another," this non-leader followed by stating that "you have to go to your friend with love and when you have love you help bring a pole or nails or you push the hand in the pocket [offering financial support] and help each other." Practitioners must understand that the process of becoming ODF and the unity created is an indirect result of the CLTS process. The unity built along the way and practiced throughout the early and middle phases continue into the maintenance phase and facilitate the sustainability of ODF behaviors.

This finding highlights that unity or social cohesion is a facilitator of maintenance is not surprising given the emphasis of CLTS as a community-driven, collective effort (Kar & Chambers, 2008). More recent research suggests that a community's social capital and psychosocial environment are linked to CLTS intervention success and the probability of individuals constructing and using a latrine (Cameron et al., 2015; Dickin et al., 2017; Harter et al., 2018; Kelly et al., 2017; Susilo et al., 2020). Harter et al. (2018) even asserted that "positive social context factors seem to be a prerequisite for a successful CLTS process" (p. 394). The notion of interdependence is further supported by a quantitative study in Mozambique in which Mosler et al. (2018) found that a positive feeling of cohesion, responsibility to the community, and inclusion was closely associated with the probability of rebuilding once a latrine collapses.

4.2.1.2 Experiencing the benefits of being ODF facilitates maintenance Another consistently noted idea from participants connected to maintenance was experiencing the benefits of the sanitation changes including financial benefit, health benefit, and quality of life benefit. The village stakeholders described the fact that the local pharmacy and clinic went out of business because they were no longer visiting regularly for medicines to address the hygiene-related illnesses they had previously suffered with. They discussed that visitors to this community openly expressed a desire to move there because of the clean environment. They added that they have experienced an improved quality of life related to personal hygiene. One non-leader stated: "Health workers from the district or subcounty go around to villages and inspect. They no longer come here. Kibo changed our ways from level one to reach level four or five. We know it is good." Additionally, one from the leadership group said, "We decided to do what we learned, and we no longer spend money on feces—these diseases that are related to filthiness—to poor sanitation." Another added saying, "But now, there are no more sicknesses. We are safe."

Experiencing the benefits of being ODF is similar to a finding reported by a study centered in Nepal. McMichael (2018) reported that one focus group participant stated, "It's so good because we have the toilet, we use the toilet, when guests arrive, they use the toilet, and we are happy now. It is so good compared to before" (McMichael, 2018, p. 30). McMichael (2018) stated, "There was civic pride and a sense of collective efficacy associated with transformation of sanitation practices. Communities were described as cleaner, more educated and modern, and having higher living standards" (p. 301).

4.2.1.3 Access to clean water facilitates maintenance Sanitation behavior maintenance is also dependent on proximity to clean water. In this case, following the ODF certification, practitioners worked with this community to dig a new borehole for a well. This act was often noted by the village stakeholders as supporting their efforts to continue with their holistic sanitation practices, including but not limited to using pit latrines, bathing, dish-washing, teeth brushing, and washing hands. One from the non-leadership grouping offered, "They brought clean water and we stopped sharing with frogs and cows so that the water we have is now clean."

When asked about an unexpected benefit of the CLTS program, a participant from the leadership group said, "First of all, we didn't expect to get a borehole.. but when we got that borehole, we are no longer passing water-borne diseases."

A basic finding in public health research is that health behaviors cluster, and one health behavior change, like becoming ODF, clusters with other sanitation behaviors (Noble et al., 2015; Rabel et al., 2019). Access to clean water facilitates other health behaviors which further support maintenance. In a study discussing CLTS practitioner impressions of CLTS methodologies, one Ugandan practitioner for Plan International noted that they realized that demand for water increases after inducing sanitation change (Ficek & Novotný, 2019). As a result, Uganda Plan International tries to focus on access to water as part of its follow-up activities (Ficek & Novotný, 2019). Additionally, Venkataramanan et al. (2018), in their comprehensive literature review of CLTS evidence and its quality, suggest that many programs either simultaneously address the water supply issue or quickly follow the CLTS intervention with a water supply project in efforts to ensure that gains from sanitation behavior change are not lost because of limited water supply.

4.2.1.4 Pride facilitates maintenance In this case pride facilitates maintenance and maintenance facilitates pride. Given all the effort and new understanding, participants continually expressed how proud they were of their work. This is especially true when discussing maintenance activity. They were proud to show their homes, latrines, and community to visitors. One non-leader said with a wide smile on his face, "We are now living a happy life." Another of the non-leader group said "health workers from district or sub-counties.. no longer come here. We know it is good." Still another in this non-leadership group advised other villages by stating, "Please do whatever these practitioners tell you. When you abide, you will be like us in our village." Another respondent in this non-leadership group stated, "So, if they come [to this village] and they see, they will admire." Fig. 4 shows a woman smiling with pride as she stands in front of her family's exceptional, newly built latrine.

Pride is associated with both becoming and remaining ODF. CLTS practitioners can use this emotion with success all throughout the intervention. In this study, it was most closely associated with remaining ODF. Two studies in Nepal (McMichael & Robinson, 2016; McMichael, 2018) indicate that appropriately used social pressures, including civic pride, affiliation with new norms, and collective action, are all drivers of sustained hygiene behavior. A more recent finding from a Malawi water, sanitation, and hygiene intervention notes the importance of social outcomes, such as self-esteem and civic pride, as they have a significant positive impact on both the individual and the wider community (Malolo et al., 2021). Research demonstrates that pride is most widely associated to triggering as a

Fig. 4 Community member smiles with pride as she poses in front of her family's newly built latrine. *Note*: This image was taken from the Kibo Group image archives. To maintain respondent anonymity the image is not from the community interviewed

universal motivator to becoming ODF (Venkataramanan et al., 2018) but in this particular case it was more closely associated with maintenance and the unified effort to remain ODF.

4.2.1.5 Holistic teachings facilitate maintenance A meta-theme, discussed below, emphasizes that OD is no longer a problem in this community. When asked about why and how this came to be, many noted the holistic program of CLTS (inclusive of handwashing, dishrack construction, and rubbish pit digging, etc.), but also the additional teaching and demonstrations by other Kibo Group program teachers that included tips on gardening, building chicken coops and raising chickens, constructing safer stoves from local materials that use less firewood, planting trees to support reforestation and their construction and reconstruction needs, and communicating with one another aiding conflict resolution. Respondents emphasized the inclusion of conflict resolution and communication skills: "They taught this village how to work together and how to be united. That's why when one goes to another, we welcome the ideas, and we don't respond negatively," said one of the respondents. These skills were commonly noted as respondents shared many stories of familial conflict and community conflict over latrine construction and participation in the program at large. These were all settled successfully, but conflict was discussed as a hindrance to quick progress.

Stakeholders discussed their appreciation for a holistic, sequencing of programs that act as additional phases to the original intervention. This effort demonstrates an emphasis on an intentional, longer-term effort that illustrates that there is no quick and easy fix for sanitation behavior change. Kibo Group uses a number of programs to facilitate maintenance, including a life skills program that teaches the importance of hygiene and other skills to youth (see Fig. 5). Robinson (2016), in his eight-country evaluation of CLTS in Africa, discussed the importance of sanitation marketing programs and a "second-phase" of interventions designed to provide advice on how to upgrade and improve sanitation as key suggestions for follow-up support during the post-ODF phases of the effort. As noted previously, health behaviors cluster (Noble et al., 2015; Rabel et al., 2019).

4.2.1.6 Subtheme: there is no quick and easy fix During the discussion about becoming ODF and holistic teaching or programming, a subtheme emerged featuring the necessity of one-on-one conversations and individualized solutions to address the micro-matters that arise. In short, there is no one-size-fits-all approach as each family unit's needs are unique. One practitioner stated, "It takes time to dig.. to construct.. to replace." The other noted that the entire curriculum, including CLTS, women's empowerment, life skills for youth, economic development, and health education can span several years. The practitioner concluded by stating, "Behavior change is a gradual process in a village."

Data also support the strong relationship between behavior change and frequent interactions through extensive teachings that can move beyond sanitation teaching. Holistic programming efforts lengthened the community intervention beyond sanitation and this supported maintenance. As a result, this study confirms that follow-up and frequent personal contact between communities and WASH facilitators for accountability over an extended period is a widely accepted solution to sustaining ODF behavior (Harter et al., 2019a, b; Hulland et al., 2015; Kafle & Pradhan, 2018; Odagiri et al., 2017; Tribbe et al., 2021;

Fig. 5 Kibo Group Life Skills program leader teaches the youth as part of stacked and holistic programming. *Note*: This image was taken from the Kibo Group image archives. To maintain respondent anonymity the image is not from the community interviewed

USAID, 2018; Venkataramanan et al., 2018). Holistic programming provides longer-term contact, however, as Venkataramanan et al. (2018) suggest, further research should seek to determine the most effective combination of stacking or sequencing of programs to benefit the collective WASH understanding.

4.3 Meta-themes: remaining ODF

When discussing maintenance of behaviors and pride in their community, two meta-themes emerged. These two themes underpin the effort to remain ODF but were not necessarily clear facilitators or barriers. In this case, the completion of the work became a part of the collective identity as a community that gets "it fully." For them, open defecation is no longer a problem. Further, when the community felt safe and comfortable, a sense to grow and share their learning became explicit.

4.3.1 OD is no longer a problem

The community reported there was "zero" slippage in large part because of triggering and considering the relative advantages of becoming ODF. When specifically asked, "Do you see many choosing to go back to open defecation?," one leadership focus group discussion respondent said, "In this village for sure, we don't have any." While triggering is a pre-maintenance step of the CLTS process, it was suggested that triggering is instrumental in the continued decision to remain ODF. One non-leader respondent said, "Before CLTS came we were practicing open defecation and we didn't have toilets. But up to now, after they came, we know—we grasp the importance of a latrine." In addition, one leader added to the lack of slippage discussion, by stating "…after these people came and told us the dangers that might come with OD, we have kicked diarrhea from our village." The other non-leadership group confirmed that there was no slippage, with one group member stating, "We have not had people respond negatively." Still, another from that focus group said the main reason this village has been so successful is that they "came in and taught us and we never let that go. We got it fully. It is in our blood. So, we don't need to be reminded to use our latrines."

In addition, both practitioners mentioned that they consider this community successful because they observed neighboring homes offering their latrines while rebuilding of a fallen latrine was in process. One stated the success this way, "Over time, people [here] never go back to open defecation because when one's latrine collapses the neighbors are willing to accept that home to use their latrine as they reconstruct. They'd rather sacrifice their latrine to be used than let their neighbor go back to open defecation." In short, triggering, the community effort, time sunk into building and rebuilding latrines, and community support are visible behavioral and community actions that demonstrate a deep-level change and the community commitment to remaining ODF.

While context-specific, this finding demonstrates that positive and long-lasting results are possible. The interconnectedness of the community, along with the supportive approach of practitioners presents a unique situation. Others agree that CLTS results vary based on the intervention methodologies, skills of the practitioners, and context-specific considerations (Kar & Chambers, 2008; Venkataramanan et al., 2018).

Regarding success measures, the narrative in research highlights the inconsistencies in measurement of slippage and the measurements used. A USAID (2018) report on the impact of CLTS stated that it is challenging in part because it is not clear what should be measured. Some accept the argument that CLTS is about the elimination of open defecation and choose to count toilets as an indicator or outcome that the community no longer openly defecates, while others assert the existence of a toilet does not capture the use or the end of open defecation (USAID, 2018). Still, other governing bodies, such as the Joint Monitoring Project, measure success by categories along the sanitation ladder. This work offers another alternative. Here, practitioners suggest the rate of rebuilding and reconstruction after a latrine collapse and/or the social or community behaviors supporting the rebuilding may be better behavioral measures or indicators of deep behavioral change supporting maintenance.

4.3.2 Generativity and desire for further growth are prevalent in the maintenance phase

Community members and leaders expressed a desire for continued growth and education, and they expressed their desire to help others with the knowledge they have gained. Regarding the desire to grow, one non-leader participant stated a desire for practitioners to return with more education to "learn more so that we develop even more." While others expressed a desire for "more skills" and "education." Interestingly, while there were numerous requests for more education when pressed further as to what they would like to see more of, the respondents found themselves unable to provide a specific idea on what they would need beyond the holistic teaching they had already received in the extended stackable programming implemented.

The leadership group expressed their generative orientation by noting how they already use their holistic knowledge to help others grow—demonstrating their pride in being ODF and desire to help others become a village that is exemplary like theirs. One community leader explained, "We are now teachers…when I go somewhere and I see a child with that belly [distended belly due to malnutrition], I will tell them 'You know that child is missing A, B, C." Another community leader added:

When neighbors, either neighboring villages or new neighbors, come and visit, I tell them, "This is what we do. We have stoves that don't take a lot of firewood. If you feel like you want, we can work together to build one for you. Women from this village, went 2.5 kilometers away from here to help a local primary school."

Given the pride and generativity associated with becoming and remaining ODF, successful community stakeholders and leaders could act as ambassadors to others who may be struggling to become or remain ODF. These successful community members were proud and wanted to help others. They can pass along their ideas for overcoming barriers and provide the village stakeholder perspective that would resonate best with other village community members.

Perhaps this finding is context-specific and because the village is a tight-knit community. Perhaps the desire for growth and generativity is directly related to supportive processes. Erikson and Erikson (1981) speak of generativity as striving to create, nurturing things that will outlast, and seeking to contribute to future generations. Developing generativity has several important benefits, including better health, positive relationships, greater productivity, greater fulfillment, increased community involvement (Erikson & Erikson, 1981). Notably, the things that create generativity, including a feeling of inclusion, pride in work, taking responsibility, making contributions, and feeling productive (Erikson & Erikson, 1981), were all findings in this study. Interestingly, this generativity was present in this community in Uganda, a developing nation, where most would assume there is little hope. From the

Table 4 Summary of recommendations for practitioners

Recommendations for practitioners
• Practitioners should provide access to latrine construction tools and instructions for locating local, durable materials. • Practitioners should facilitate in a supportive, not punitive, way to create unity and bring the community together. • Practitioners should show the dangers of OD and benefits of being ODF. • Practitioners should consider stacking programs and creating holistic programming. • Practitioners should consider promoting successful community stakeholders as ambassadors.

outside, one might also argue that basic needs were barely being met. However, the CLTS processes have helped with basic needs, the lowest level of Maslow's (1962) hierarchy of needs. Yet, generativity and desire for continued growth, akin to self-actualization, are high on Maslow's (1962) hierarchy. It may be that their basic needs were already met, or that the path to self-actualization was different depending on the cultural context, but there was a notable desire for growth in this community that is linked to remaining ODF.

5 Recommendations and implications

In addition to the recommendations for practice (see Table 4) discussed in more detail above, practitioners and scholars could benefit from research focused on understudied supportive intervention techniques. In addition, further study on social outcomes such as desire for growth, generativity, self-efficacy, and well-being are necessary. Finally, research focused on context-specific stakeholder advice and what makes this particular NGO's methods successful would benefit scholars and practitioners especially if the work centered on the reasons behind the maintenance of new behaviors.

These findings suggest that CLTS can have long-lasting results and that the way the intervention is facilitated in all phases can have dramatic results on the maintenance of ODF behaviors in the posttriggering phases. First, it is important to remove the barriers by providing instruction, offering construction tools, and promoting the use of longer lasting, local materials. Second, facilitating in a supportive manner facilitates becoming ODF. Not only is support important in the initial phases, the community mirrored the supportive approach with other community members in the posttriggering phases of becoming ODF. In this case, community members continue to exemplify support and unity throughout the maintenance phase. Third, taking the time to nurture relationships and provide the community stackable/holistic programming that addresses root causes rather than symptoms is critical for maintenance. These three practices ultimately empower communities to move beyond this one CLTS intervention for continued growth and generative efforts that considers not only future generations but neighboring communities demonstrating a desire for all to experience unity, pride, and the "happy life."

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Data availability Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Declarations

Conflict of interest Danette Cagnet is on the board of trustees of Kibo Group and receives no compensation as a member of the board. Kibo Group employees aided by coordinating travel but did not provide financial support in any way. Kristin Koetting O'Byrne has no competing interests to declare that are relevant to this work.

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