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Sustainability of Open-Defecation Free Status Achieved through Community-Led Total Sanitation and Hygiene in Arsi Zone, Ethiopia

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Master of Public Health

Global Health

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Abstract

Sustainability of Open-Defecation Free Status Achieved through Community-Led Total Sanitation and Hygiene in Arsi Zone, Ethiopia

By: Samantha Marie Lopez

Ethiopia has a nationally mandated sanitation plan aimed at reducing the prevalence of open defecation behavior through the use of Community-Led Total Sanitation and Hygiene (CLTSH). It is important to understand in what ways and to what extent, CLTSH as an intervention is effective in improving sanitation long term in the communities where it has been implemented. **Purpose:** The objectives of this thesis are to: 1) Determine the current status of open-defecation behavior, latrine ownership, and latrine usage behavior in Dodota and Sire woredas in rural Ethiopia. 2) Identify factors for further study that may explain the differences (if any) in open-defecation behavior, latrine ownership, and latrine usage behavior in different communities in Dodota and Sire woredas. 3) Complete spatial analysis to determine patterns of the indicators of latrine ownership, open-defecation behavior, and latrine usage behavior; as well as the corresponding factors thought to be related to those behaviors. **Results:** The proportion of households displaying evidence of open defecation ranged from 0 to 31% in woredas surveyed. Additionally, spatial analysis shows a sharp divide between Dodota and Sire in OD behavior and the amount of follow-up received from Health Extension Workers. **Recommendations:** CLTSH implementing organizations should conduct process evaluations and post-implementation follow-ups to assess fidelity to CLTSH and understand its impact in the short and long term. Organizations should also consider moving from unimproved sanitation facilities towards safely managed sanitation. Policy makers should include supplemental interventions to CLTSH in WASH policy to achieve national sanitation goals.

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Definition of Terms

CBO	Community-Based Organization
CLTSH	Community-Led Total Sanitation and Hygiene
CRS	Catholic Relief Services
CSP	Charities and Societies
CU5	Children Under Five
DEFF	Design Effect
DHS	Demographic Household Survey
EPRDF	Ethiopian People's Republic and Democratic Front
NGO	Non-Governmental Organization
GIS	Geographic Information System
HAD	Health Development Army
HC	Health Center
HEP	Health Extension Program
HEW	Health Extension Worker
HH	Household
HHH	Head of Household
ICT4D	Information and Communication Technology for Development
JMP	Joint Monitoring Programme
KII	Key Informant Interview
MCS	Meki Catholic Secretariat
MDG	Millennium Development Goals
OD	Open Defecation

ODF	Open Defecation Free
SAS	Statistical Analysis Software
SDG	Sustainable Development Goals
SLTS	School-Led Total Sanitation
TSC	Total Sanitation Campaign
UAP	Universal Access Plan
UNICEF	United Nations International Children's Emergency Fund
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization
WSP	Water and Sanitation Program

Chapter 1: Introduction

Around the world, billions of people lack access to basic water, sanitation, and hygiene (WASH). This includes lack of access to clean drinking water, latrines that safely separate waste from human contact, and means to have clean hands, body, and environment. Inadequate WASH is associated with numerous diseases, including life-threatening diarrheal illnesses such as cholera, and the blindness-causing, bacterial infection trachoma.

In particular, sanitation, or access to and use of latrines of any type, is important in the fight against these enteric illnesses. Over 892 million people worldwide still practice open defecation [1, 2] as currently estimated by the World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF). Several countries have made it a priority to improve access and usage of latrines as a way to end the practice of open defecation. Ethiopia is one of these nations, where over 80% of the nation's population lived in rural areas and baseline latrine access was under 10% less than 20 years ago. The remaining 90% of the Ethiopian population that had no access to a latrine used open-defecation. Open defecation is where a person defecates behind bushes, trees, or in fields, streams, and other waterways, thereby exposing communities to the harmful pathogens contained in human fecal matter. Since the current Ethiopian government took power in the early 1990s, a variety of actors in the WASH sector, both governmental and non-governmental, have performed interventions aimed at improving sanitation and decreasing open defecation in Ethiopia.

This thesis discusses the follow-up evaluation of a sanitation intervention completed in the early 2010s in two communities in rural Ethiopia, aimed at creating sustainable sanitation change, known as Community-Led Total Sanitation and Hygiene (CLTSH). As CLTSH is currently Ethiopia's mandated national sanitation and hygiene intervention, it is important to

understand in what ways and to what extent (if any), CLTSH as an intervention is effective in improving sanitation [3-7] in the communities where CLTSH has been implemented.

Statement of Purpose / Objectives

In 2012, Catholic Relief Services Ethiopia (CRS Ethiopia) undertook, with the aid of partner agencies located within target communities, ongoing CLTSH interventions in Oromia region woredas, particularly within Arsi Zone. Woredas are the second smallest level of official government in Ethiopia (See Appendix D). In Dodota and Sire woredas, which are the focus of this follow-up, the partner agency was Meki Catholic Secretariat (MCS) [8, 9]. MCS and CRS set out to achieve 100% ODF status in these two woredas, in line with national goals for ODF status by implementing CLTSH interventions in each kebele within the woreda [3, 5]. CRS provided funding and technical assistance for the intervention, including the data collection and analysis for monitoring and evaluation purposes, while MCS implemented the intervention in coordination with the government-led Health Extension Program (HEP) and local leaders who would also complete follow-up post-intervention [9].

After the implementation of CLTSH, and as of 2015, all kebeles in Dodota and Sire were declared Open Defecation Free (ODF), according to the guidelines set forth by the Ethiopian National Government [3]. Signs were erected at health centers and health posts in kebeles declared ODF as a public marker of the achievement and were to be removed if the community lost their ODF status. Since that point, regular monitoring has been carried out by local health extension workers (HEW) and reported to district health centers (HC). As of the summer of 2017, kebeles were still reporting 100% ODF status in HC records, and the HCs and HPs retained their signs declaring publicly that the communities were 100% ODF.

During a 2015 study on nutritional status in Dodota and Sire, undertaken by CRS and MCS, staff noticed that not all households had latrines, which is the monitoring indicator currently collected by HEW to track ODF status. Other peer-reviewed studies on CLTSH have found that routine monitoring overestimates the true latrine usage behavior and that the ownership of a latrine does not lead to halting of OD behavior [6, 10-12].These observations were supported by 2015 Joint Monitoring Programme (JMP) reports that indicated nearly 32% of rural Ethiopian households still practiced OD, with 43% of households in Oromia practicing OD (the region containing Dodota and Sire)[1]. The JMP findings and CRS staff observations appeared to contradict the HC reports that their woredas are 100% ODF.

In order to fully understand the current state of sanitation in Dodota and Sire, this follow-up project involved the collection of qualitative, quantitative, and spatial data on sanitation and factors potentially associated with sanitation status. The development and implementation of this follow-up project was guided by input from CRS and MCS staff who had worked on the original 2012 intervention and a series of questions and objectives, which are listed below.

The specific objectives of this project were:

1. Determine the current status of open-defecation behavior, latrine ownership, and latrine usage behavior in Dodota and Sire woredas.
2. Identify factors for further study that may explain the differences (if any) in open-defecation behavior, latrine ownership, and latrine usage behavior in different communities in Dodota and Sire woredas.

3. Complete spatial analysis to determine patterns of the indicators of latrine ownership, open-defecation behavior, and latrine usage behavior; as well as the corresponding factors thought to be related to those behaviors.

Justification / Significance

The Ethiopian Government mandates CLTSH as the means to decrease open defecation nationwide. Due to a government proclamation, the Proclamation to Provide for the Registration and Regulation of Charities and Societies [13, 14], Ethiopian or foreign-based NGOs (Charities and Societies (CSPs) in the proclamation) must be registered in Ethiopia in order to operate. Further, in order to maintain their registration, CSPs must meet legal requirements and government standards [14-17]. This has given the Ethiopian government a level of control over CSPs, including foreign NGOs such as CRS, and has also allowed them to coordinate the intervention methodology being used in many charity and humanitarian sectors such as WASH (for example, the exclusive use of CLTSH).

Whether or not the coordination between NGOs and the Ethiopian government has an effect on the quality of interventions carried out by NGOs is unknown. Since CLTSH [3, 18, 19] is the primary sanitation intervention for Ethiopia, it is vitally important to see if it is an approach that does, in fact, lead to long-term behavior change. The Ethiopian government has recognized that sanitation is critical to improving the health of the nation. However, if the intervention methods used to improve sanitation status (CLTSH) are inadequate for long-term change, then many health gains will be lost. Thus far, publications on the sustainability of sanitation improvement achieved through CLTSH have only been published for follow-up periods of up to one year. This study allows for the examination of the state of sanitation in communities up to 5 years after the initial CLTSH intervention occurred.

CRS has been working in Ethiopia for over 60 years, and they have well-established ties with community partners and local governments in Ethiopia [8]. The trust and partnerships that CRS has built allows them to make recommendations for change in the communities where they work. Before CRS continues to fund CLTSH interventions in Ethiopia, they want to know whether their previously-funded projects have long-term sustainability, and what factors are related to the success or failure of a CLTSH site. This information is important for advocacy efforts aimed at providing supplemental interventions if and where they are needed in order to meet sanitation goals.

By examining where, and by whom open defecation is occurring, NGOs and the Ethiopian government can strengthen their approach to improved sanitation for the people of Ethiopia, to the ultimate end of reducing the morbidity and mortality of diseases associated with poor sanitation.

Chapter 2: Literature Review

In 2010, the United Nations declared water and sanitation a human right [20]. Specifically, the UN "Recognizes the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights;" [20]. This declaration is an important step in ensuring that everyone, everywhere has access to clean water. However, this human right has not been fully realized, due to social, geopolitical, and physical difficulties. In an addition to drought, political unrest, and population pressure, a major threat to clean water for all people is contamination with human waste from inadequate sanitation. In line with many other organizations working in WASH, UNICEF defines their work in sanitation as

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"For sanitation, UNICEF works to ensure access and use of basic toilets and ways to separate human waste from contact with people. One important area of work for sanitation is to end the practice of "open defecation," and facilitate community-led initiatives to build, maintain and use basic toilets."[21]

With billions of individuals affected by WASH related illnesses, including 480,000 children dying of diarrheal illnesses annually [22], 1.3 million individuals blinded by trachoma [23], and the increasing pressure on WASH systems to address these illnesses for an expected 9.8 billion people on earth by 2050 [24], the need to address sanitation everywhere is increasingly urgent. Sanitation has gained increasing amounts of attention in the international community by governments, non-governmental organizations (NGOs), and private citizens.

Below, the research, policies, and other literature relevant to the objectives of this project and Ethiopia's current efforts to improve sanitation are discussed.

Sanitation Globally

State of Sanitation

High-tech toilets that can talk, warm the seat, function as a bidet, and automatically flush are not a sci-fi invention, but a current reality for many in the world. Talking toilets paints the image of a technologically advanced society that makes dealing with human waste as comfortable and hygienic as possible. However, the general lack of access to basic sanitation for 2.3 billion people worldwide serves as an egregious example of inequality in global health and development[1].

Sanitation can be measured via two main indicators: 1) access to sanitation – and in that access we can describe levels of sanitation services – and 2) the use or non-use of sanitation facilities when available. This distinction is important because having "access" to a latrine does not ensure "use" of that latrine. While having no access to a latrine is highly associated with open defecation behavior, the converse situation is often not true – open defecation is not always associated with not having access to sanitation services.

Most global reports and measures of sanitation will cover only the level of sanitation available in a region or country. The JMP has aligned sanitation indicators with the UN's Development Goals, so that the definition of those indicators reported by the JMP change every 15 years. Currently the JMP reports the level of sanitation services available at a given country level, as well as in urban vs rural areas. Over 20% of the world's population is still reported as having no access to sanitation services of any type. However, obtaining global estimates on the

"use" of sanitation services when available are not possible since that information is not collected in a systematic way in every nation.

Sanitation Goals Past and Present

As stated previously, the JMP aligns their reporting, measures, and targets with the Sustainable Development Goals (SDGs). Prior to 2015, the JMP reported on Millennium Development Goals (MDGs) that were in effect from 2000 to 2015 [1, 2, 25-27]. There were eight MDGs, ranging from eradicating extreme poverty to promoting gender equality.

The MDG related to WASH was MDG #7 "Ensure Environmental Sustainability", particularly 7.C "Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation" [27]. While not all global regions were able to achieve this goal (such as Eastern Africa), the world did achieve parts of Goal 7 – specifically the safe water goal[28]. Overall in 2015, "2.3 billion people still lacked even a basic sanitation service… and 892 million people worldwide still practised open defecation".[1] Yet, despite not meeting the sanitation portion of this goal, there was a 8% drop in OD behavior between 2000 and 2015 globally (From 20% to 12%) [1, 2].

The reduction in OD behavior, however, was not uniform. There remain large disparities in regions. As of 2015, the least developed countries, as well as the landlocked developing countries (of which Ethiopia is both), OD behavior is still estimated at 20% overall, and 27% rurally [1, 2]. [1]. The issues of unequal gains are in part addressed in the SDGs that went into effect after the MDGs were completed.

The 17 SDGs went into effect after the MDGs in 2015, and will end in 2030. The SDG related to water is SDG #6 – "Ensure availability and sustainable management of water and

sanitation for all", and more particularly Goal 6.2 "by 2030, achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations." [25, 26]. While many nations are particularly concerned about the infectious diseases transmitted through a lack of clean water and sanitation, the UN points to "food insecurity, livelihood choices and educational opportunities for poor families across the world." [25] as being heavily impacted by lack of access to clean water and sanitation.

Levels of Sanitation –MDGs and SDGs

During the MDG era, there were four levels of sanitation measured globally (see Figure 1): 1) open defecation (no sanitation services), 2) unimproved sanitation, 3) shared sanitation, and 4) improved sanitation. Improved sanitation "hygienically separates human waste from human contact" and are not shared between households [21]. Flush and pour/flush toilets constitute improved sanitation, as do pit latrines that have a cover over the drop hole and a slab that can be washed. Shared sanitation meets the criteria of improved sanitation, however the latrine is shared between two or more households. Unimproved sanitation includes hanging latrines, use of buckets, and pit latrines that do not safely separate the excreta from human contact.

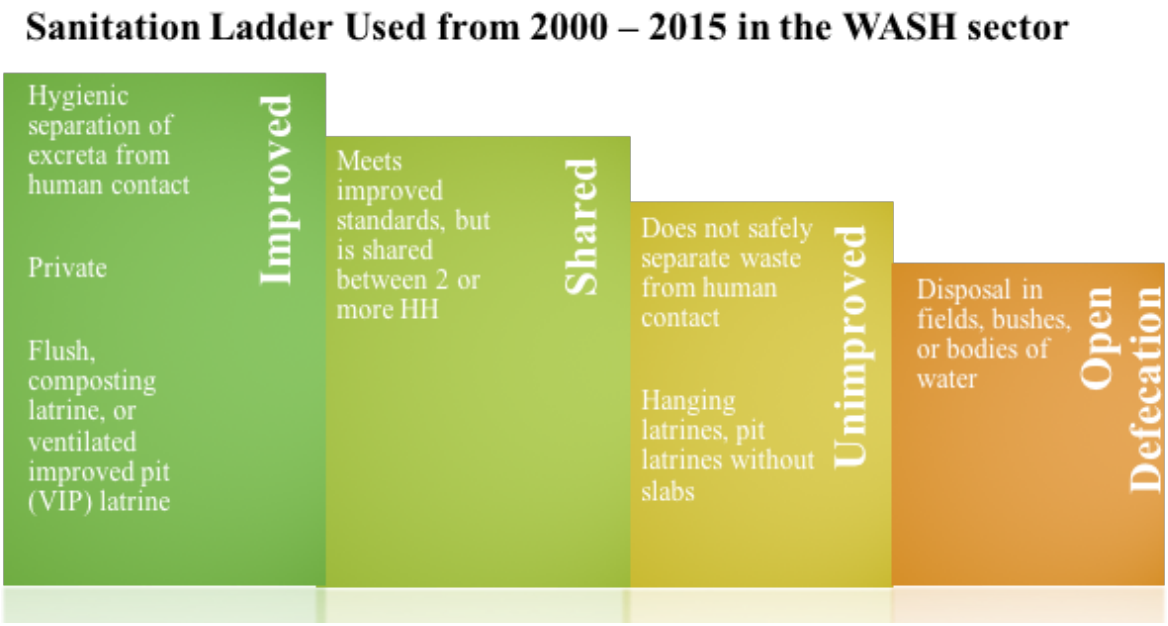

***Figure 1**: 2000 - 2015 Sanitation Ladder: This 'sanitation ladder' describes the 4 categories into which the Joint Monitoring Programme allocated households in their reports from 2000 – 2015. These categories were determined based on the Millennium Development Goals, and their definitions were adopted by other organizations in the WASH sector. Adapted from JMP[21]*

Recently, further differentiation in types of sanitation have been added to the distinction of unimproved and improved sanitation used during the MDG era (see Figure 1). The newest goals in WASH are for safely managed water and sanitation [1, 29] (see Figure 2). Safely managed sanitation constitutes improved sanitation, that is not shared, and the excreta is treated on or off-site. Off-site treatment includes traditional treatment methods such as wastewater treatment sites, while on-site treatment includes septic tanks and latrine pit treatment [1, 29]. While estimates of global access to improved sanitation are roughly 68% (for 2015), only a portion of that is considered safely managed [28].

Improved sanitation that is not treated is now considered basic sanitation. This divides data that was previously categorized as improved into two categories. Since data was not collected in this way prior to 2015, any progress made on safely-managed sanitation can only be reported from 2015 moving forward. Limited sanitation has the same definition as shared

sanitation prior to 2015, and unimproved sanitation and open defecation have remained the same in both name and definition.

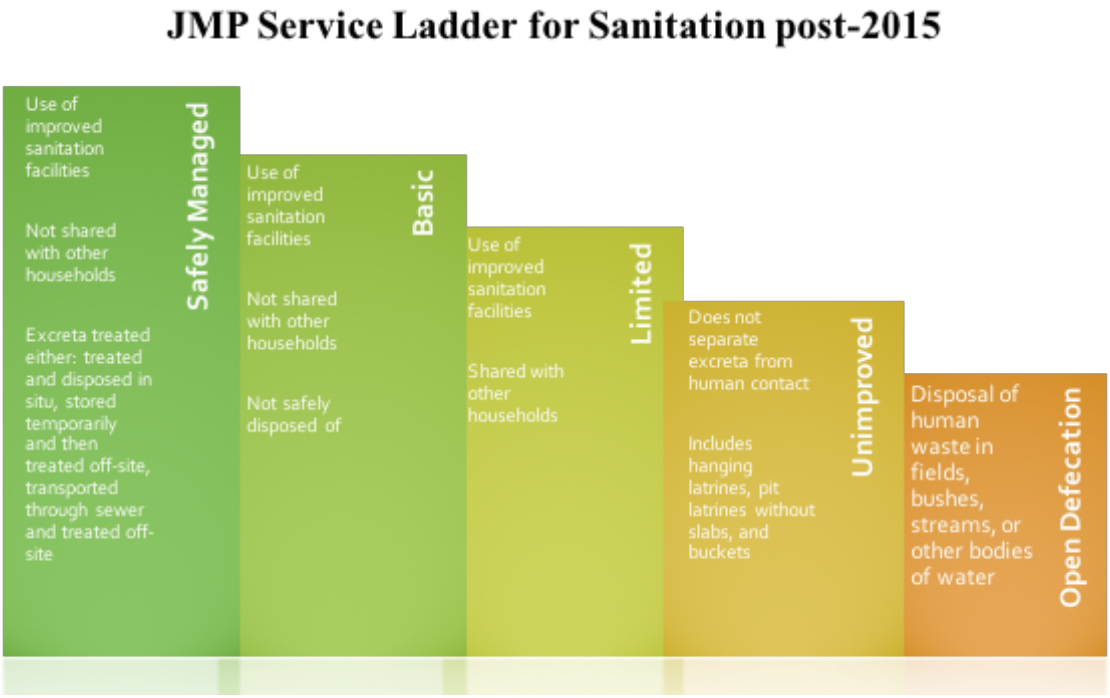

***Figure 2**: JMP Service Ladder for Sanitation [29]. This 'sanitation ladder' is an update to the MDG sanitation ladder (see Figure 1) for the new Sustainable Development Goal (SDG) era WASH goals. The previous category of "improved" has been subdivided, leading to five 'rungs' in the ladder, rather than the previous 4. Adapted from JMP[29]*

Open Defecation

As of 2017, 892 million people still practice open defecation [1]. Open defecation (OD) is defined by the JMP as "the practise of defecating in fields, forests, bushes, bodies of water or other open spaces." [2, 21].

Open defecation exposes communities to pathogens contained in human waste, particularly those in feces [30-34]. Feces contaminate surface water, wells, and irrigation lines, as well as food sources, leading to a variety of diseases [30, 34-38]. Additionally, lack of sanitation is

associated with other hygiene-related non-diarrheal illnesses such as schistosomiasis and trachoma [23, 39-47], the latter of which is a major cause of blindness in developing countries, particularly in the tropics [23, 31, 39-42, 48-50].

Open Defecation and Diseases

Most critically, OD contributes to the perpetuation of diarrheal illnesses that are passed by the fecal-oral route. Diarrheal diseases may lead to short-term, acute gastrointestinal illness, such as norovirus (a common "stomach bug"), or more severe illnesses such as cholera or helminth infections (e.g., hookworm) [30-32, 51, 52]. Diarrheal disease can also cause severe dehydration, which is particularly harmful to the elderly and children [7, 51-58]. In addition to the 11% of child deaths attributable to diarrhea [7], it has also been posited that diarrhea is associated with developmental delays, poor educational outcomes, stunting, and wasting [19, 51, 59-63]. As such, efforts have been made internationally to reduce the practice of OD by a variety of means, including the provision of latrines, educational campaigns, and various incentives and subsidies to individuals and communities [12, 18, 64-66].

In attempts to address the health risk posed by OD, many campaigns have focused on one obvious contributor to OD behavior – a lack of sanitation infrastructure. The assumption is that if there are no latrines, then communities must defecate in the open. However, more recently, it has been shown that reducing OD behavior is more complex and requires more than increased access to sanitation [67-69]. Much of this has been proven through the failures of sanitation programs that only provided latrines. Without addressing additional factors related to OD behavior, improving access to sanitation facilities is insufficient to provide an environment free of human excrement.

Open Defecation when latrines are present

Expected level of cleanliness, issues of safety, and cultural practices will vary from community to community regarding OD and the use of latrines. For example, latrines are often viewed as unhygienic by some communities due to offensive smell, flies, presence of other people's excrement, and fecal sludge that overflows in periods of heavy rains, [10, 18, 66-71]. In terms of safety, shared community latrines have been seen as unsafe for women and girls, as they are more vulnerable to rape and robbery while using these facilities [67, 72]. Latrines may also be far from someone's home (greater than 500m), making the latrine not only time consuming to reach, but also providing additional opportunities for women and girls to be attacked on their way to and from the latrine [72]. Lastly, the importance of habit and cultural practice cannot be understated in latrine use. Both men and women have reported that they view their time defecating in the open as a social time with family and neighbors or time to be in nature. There were also reasons why they chose to defecate away from their immediate household environment [11, 42, 67-69, 72, 73]. These factors make determining the reasons for OD in any particular community more complex. However, in order to provide adequate sanitation for all these issues must be addressed.

Past and Current Sanitation Interventions

Since the early 1900s, governments and companies with interest in having a healthy workforce have invested in sanitation and hygiene interventions to decrease the incidence of diseases such as cholera and hookworm [74]. Methods have included information campaigns, building sanitation infrastructure - from pit latrines to full sewer systems - and school-based interventions [75]. The different interventions can be discussed in terms of the funder or donor,

whether subsidies are used or discouraged, and on which part of sanitation the intervention focuses on.

Intervention	Subsidy		Point of Intervention			Typical Funding Streams		
Name	Yes	No	Infrastructure	Behavior	Other	Government	NGO	Private
CLTS[76, 77]		X		X		X	X	
Arborloo[70]	X		X				X	
Sanitation Marketing[5, 14]	X				X	X	X	X
SLTS[18]		X		X		X	X	
India's TSC[10]	X		X			X		
Sewerage installation[75]		X	X			X		
Ethiopia CLTSH[3]		X		X		X	X	

***Figure 3**: Comparisons of Sanitation Interventions. Interventions in sanitation differ in whether they provide subsidies directly to households (Subsidy Yes/No), whether they focus on sanitation infrastructure, sanitation use behavior, and sometimes other factors such as creating supply in the community (such as in sanitation marketing). Funding sources vary, and here, the typical funder is indicated, though this is not true of every instance of the intervention.*
SLTS – School-Led Total Sanitation
TSC – Total Sanitation Campaign

Community-Led Total Sanitation and Hygiene

Since the early 2000s, one of the common sanitation interventions aimed at behavior change in communities is Community-Led Total Sanitation (CLTS). Kamal Kar first used this approach in Bangladesh in the late 1990s and early 2000s, eventually writing the "CLTS Handbook" that has become the basis of CLTS-based programs internationally [76]. Kar has since advocated for the approach and published on ways in which CLTS can be modified. Some countries and programs have added hygiene components, such as hand-washing, to the base of CLTS, leading to the acronym CLTSH. Other programs that are essentially the same in methodology as CLTS, but implemented in more targeted locations, such as schools, have earned acronyms such as SLTS (School-Led Total Sanitation).

CLTSH is an approach that utilizes a 'triggering' phase to show community members the issues with open defecation, so that they will want to construct and utilize improved sanitation facilities [12]. This phase is dependent on community members having an emotional reaction to current sanitation practices and encouraging further community participation in the building and utilization of improved sanitation, typically pit-latrines [12]. From the CLTS Handbook [76]:

"Appraising and analysing their practices shocks, disgusts and shames people. This style is provocative and fun, and is hands-off in leaving decisions and action to the community."

The focus of this intervention is not on building sanitation facilities for communities, but rather, on "igniting a change in sanitation behaviour" [76], as highlighted in the above quote.

It is thought that the emotions of "shock" and "shame" will serve as strong motivators for community members to enact change on their own, particularly when triggered in group settings [65, 76-83]. The use of shame in theoretical literature lends more strength to the theory that it may work for sanitation, however, the use of shame in sanitation has not been validated through field studies as more effective than interventions not inducing shame [67, 71, 84-87].

An important tenet of CLTSH is that the approach does not use subsidies – in fact, it forbids the use of subsidies to the communities where this intervention is being implemented [3, 76, 78, 88].

The concept behind forbidding subsidies is that by placing the financial and work burden for the creation of sanitation infrastructure on the homeowners and communities, there will be more long-term buy-in to use and maintain sanitation gains [3, 65, 67, 71, 75, 76, 82, 84].

CLTSH Process

Pre-triggering – prior to beginning the CLTSH intervention, a community must be selected. There are favorable and non-favorable conditions for CLTSH, many of which have been laid out in the CLTS Handbook [76]. Factors such as distance from large towns and roads, homogeneity in the community, rate of diarrheal illness, and size of the community need to be considered. Smaller, more homogeneous, remote communities with high rates of diarrheal illness are laid out as being more favorable for CLTS interventions [76].

Figure 4: Favorability of conditions for the implementation of CLTS

Favorable	Less Favorable	Unfavorable
Small community/ "hamlet"	Large settlement/village	Large city
Far from main roads and cities	Closer to towns and/or main roads	
Homogeneous population with high cohesion	Socially or culturally diverse, or homogeneous with low social cohesion	Multi-ethnic diverse community
Wet/moist geography	Desert conditions	Dry, desert conditions
Visibly filthy conditions	Human waste not readily visible	
Unprotected vulnerable water supplies or polluted water supplies	Protected sources of water	
High rates of diarrhea	Low rates of mortality due to diarrhea	Low or no diarrhea
No program of subsidies	Previous program with subsidies	Current, ongoing sanitation program with subsidies
No current or previous sanitation interventions	Previous sanitation interventions	Current non-CLTS sanitation interventions

Active groups within the community	No active groups in the community	
Political leadership is supportive		Political leadership is in opposition to intervention
Lack of privacy for open defecation	Good coverage for open defecation	
Feces have little or no economic value		Feces have high economic value (such as fertilizer)
Soil is stable and easy to dig	Soil is unstable	Soil is difficult to dig or cannot be dug by hand to latrine depths
Restriction on women's movement to the point where they must defecate in buckets in house Strong tradition of joint action		Taboos deterring use of one latrine for all family members
Availability of affordable/free local supplies for superstructure		Supplies for building latrines are inaccessible or too expensive for community members
		Dense settlements with little land area to build latrines

Figure 4*: Favorable and non-favorable CLTS conditions as mentioned in guidelines for CLTS implementation. Many of these determinants are not defined by authors for favorable as opposed to unfavorable, such as the size 'small town' as opposed to a large settlement. Adapted from CLTS handbook and CLTS Follow-Up guide.*[76, 77]

While the CLTS handbook lays out in detail the pre-triggering phase, not all publications that examine this intervention includes details about pre-triggering or what factors were considered prior to the triggering process [3, 59, 80, 85, 86].

Triggering – "The basic assumption is that no human being can stay unmoved once they have learned that they are ingesting other people's shit." [76]. While this straightforward sentiment is integral to the theory behind CLTSH, putting it into practice is not straightforward. The involvement of multiple stakeholders including village men, women, and children is critical for success. Additionally, any important institutions in the community should be involved, such as schools, clinics, or religious organizations.

Triggering activities may change from one context to the next, yet at the core, they involve group (rather than individual) sessions discussing and physically demonstrating the sanitation issues in the community. Activities such as transect walks where community members systematically walk the village looking for feces, and mapping of the area and households based on their sanitation status are considered triggering activities [64, 71, 76, 78].

During triggering, potential solutions to the issues posed by open defecation are discussed by not the facilitators, but by the community members. During this stage, the facilitator is instructed to take a backseat to the community discussion, and let them sketch out their own plan. Questions can be answered, but there is strong advice such as "**DO NOT** prescribe models of latrines." [76]. The emphasis is on the community structuring solutions which are best for them, even if that is a simple, unimproved pit latrine.

Post-triggering – "Triggering without follow-up is bad practice and should be avoided…" [76]. Facilitators should follow-up as soon as is feasible, and provide encouragement to the community to act on the plans that were made during the triggering process. An example of a reason to return to the community within a week is to present the community with the results of a water contamination test.

Facilitators are not responsible to enact the plans the community made. They should be alert to dates, and provide reminders to the community about any target dates that they set. Additionally, facilitators should provide positive feedback when progress occurs, by being attuned to indicators of change. Conversely, negative indicators should also be monitored so that if doubts arise or progress slows or stops, the facilitator can step in.

During this follow-up period, natural leaders should be encouraged. Natural leaders are not necessarily formal, elected or religious leaders, but potentially other engaged members of the community such as well-respected women, enthusiastic children, etc. These leaders can play an important role in continuing momentum, as well as encouraging final pushes for success by getting the community to rally around those who are not able to build their own latrines either through financial or physical hardship.

The post-triggering phase is also when official verification of ODF status, as well as any accompanying celebrations should occur. While the handbook lays out some ideas for verification and certification roles, they also discuss the need to tailor the verification process to the local context and involve the local government in those processes [76]. Ethiopia is an example of a nation that has created these specific, localized, verification protocols [3].

Scaling up – Since Kamal Kar led trainings between 1999 and 2007 in specific locations, CLTS has extended to dozens of nations, and thousands of communities. There is a risk that as this intervention spreads, it can (and often has been), carried out poorly, too rapidly, or without consideration of the local context [10, 64, 89]. In order to combat these issues, several practices are discussed in CLTS manuals. There is a strong emphasis that all training in CLTSH is hands-on, involving the experience of those who have participated in triggering. The idea is that those who are being trained have a commitment to CLTSH. Finding community facilitators who are

enthusiastic, and are natural leaders is key for achieving success post-triggering. It is also recommended that facilitators start in areas that have been deemed "more favorable", and then spread to the "less favorable" areas, rather than vice versa.

When scaling-up CLTS, quality should be emphasized over quantity of trainings, facilitators, and triggered communities. Having a high-quality facilitator who speaks the local language may be difficult to find, but could be the difference between success and failure to end OD in a region. Issues of quality have been overlooked in the name of speed and cost in both Ethiopia, India, and Ghana CLTS interventions leading to short-term gains that were lost because the interventions emphasized number of triggered communities over quality triggering [10, 12, 67, 85, 86, 90].

A benefit of scaling up is the potential for competition between neighboring communities. Friendly competition and bragging rights are thought to serve as encouragement to communities to act on the plans they make, and to do so in a timely fashion. Anecdotal evidence has shown that this competition has served in some instances to expedite the building of latrines [18, 76, 78, 91-93].

A critical point made in scaling up is the focus on ensuring there is a supply of the physical materials necessary for communities to enact their plans. For example, supply of slabs to cover the opening of the pit, chutes, pans, or materials for the superstructure itself are things that can be bought in bulk to bring cost down for the whole community, or that can be manufactured by local entrepreneurs [70]. The potential for creating businesses is something that can be used to market CLTSH as having broader benefits to the community [76]. Indeed, Ethiopia is an example country where in order to scale CLTSH to a national level, they have published

accompanying guidelines on what they call "sanitation marketing" – small businesses where supplies for latrines such as cement slabs are produced for the local community [5, 14, 94].

Criticism of CLTSH

There are several general criticisms of CLTSH often mentioned in the introductions of journal articles. For example, CLTSH is not always appropriate under all circumstances, and that it was developed in Bangladesh, which has a different cultural context than many places it is utilized currently [19, 59, 85, 86]. Additionally, the latrines built through CLTSH tend to be unimproved according to the sanitation ladder, and they tend to remain at the unimproved level indefinitely [18, 59, 86, 89, 90]. More robust literature examining these criticisms, as well as ethical, cultural, technical, and financial criticisms is needed.

Dearth of Evidence on CLTSH

Most published articles report on studies that focus on the triggering phase of CLTSH, and the short period after triggering where communities are implementing their plans. Studies rarely discuss the details of the pre-triggering stage, and no studies could be found on pre-triggering alone [83]. Studies comparing CLTS to a non-CLTS based intervention could not be found, thus comparison of CLTS to other sanitation interventions occurs solely in systematic reviews [75].

In systematic reviews, the quality of the CLTS studies have been a concern. The reviews have reported poor study design, and a majority of the evidence coming from case studies, rather than randomized or controlled trials [83]. The original intervention, as used by Kamal Kar, was developed in Bangladesh and has spread internationally, however, the spread was not due to

scientific evidence, but rather due to anecdotal evidence [82-84, 92]. The issue of using an intervention that was developed in a different geography and culture without validation in each new locale has also been discussed in the literature [79].

Finally, the issue of anecdotal evidence related to CLTSH evaluation provides two starkly different views of the successes, failures, and problems with the intervention. NGOs and governments provide anecdotal evidence of rapid and large-scale change in latrine ownership in communities [1, 10, 12, 25, 28, 83, 95]. While other evidence shows a picture of coercive tactics, latrines being used for storage, latrines in complete disrepair, and communities highly preferring OD to latrine use, even when latrines are available [6, 11, 66, 88, 92].

Theoretical Concerns

No statement on the behavioral health theory behind CLTSH could be found in the literature, potentially because Kamal Kar, the founder of the term, did not base the intervention on theory. Further, other CLTS researchers have not retrospectively fit the intervention into a theory.

One author, Mary Galvin, turns to social psychology and behavior change theory to account for behavior change dynamics of CLTS. Galvin discusses two issues – contextual behavior and social behavior. Contextual behavior is where people exhibit behavior only in specific circumstances, such as using a latrine at home but defecating openly away from the home. Social behavior is behavior that is conditional on the behavior of others. In this case, if a portion of the community resumes open defecation, other members of the community will find OD more acceptable and also resume OD [88].

Galvin further criticizes the lack of emphasis on follow-up and funding for monitoring long-term sustainability, despite the discussion of follow-up in the initial handbook [76, 88]. She cites Sigler's study that found that among the organizations emphasizing follow-up, only one in ten (10%) was in fact following up." [84, 88].

Concern over the use of shame in the intervention has been discussed as problematic for theoretical and ethical reasons. Theoretically, there is little evidence for shame as an effective behavior change technique, as discussed in detail by Bateman et al. [96]. The authors found that the literature on shame used as support for the technique were predominately performed in Western societies, and conducted pre-1990, excluding nearly 30 years of developments in behavior-change and international development thinking [96].

Ethical Concerns

A 2011 Guardian article written by doctoral candidate conducting a case study of CLTS in India concluded "the ultimate success of the project in Karnataka was founded on community-led coercion – not a utopian democratic upsurge."[91] This striking conclusion came from her experience in a village that had improved their sanitation coverage from 20% to 100% in two years. Upon arriving at the site, the research team found intervention tactics that included the government cutting off access to electricity and water; the humiliation of children whose homes did not have latrines; and community members following one another all day to ensure that they did not defecate in public [91]. These types of incidents are difficult to find in academic literature, although articles concerned with the ethics and theory behind CLTS have found that communities use extreme tactics to force other residents to comply with building latrines and

implement harsh punishments if they are caught defecating in the open (including beatings) [79, 82, 88, 92].

The extreme examples of coercion experienced in these communities stem directly from methods promoted in official CLTS guidelines. The use of shock, disgust, and fear are encouraged, over education on microorganisms and a thorough understanding of environmental health. Triggering involves encouraging community members to hold one another accountable, and sometimes involves training schoolchildren to shame anyone they find defecating.

The ethical concerns of CLTS stretch beyond coercion by community members. The basis of using disgust and shame as motivators has been discussed as problematic for multiple reasons. Bartram et al. quote both the Hippocratic Oath and the International Declaration on Human Rights in stating that the individual human right to dignity cannot be deemed as lesser than the human right to sanitation [92]. They further remind the medical and public health community of the United Nations Siracusa Principles wherein rights can only be permissibly infringed upon in very limited circumstances of "pressing public or social need … [that] pursues a legitimate aim… [and] is proportionate to that aim" and these limitations must be nondiscriminatory and codified into law [92, 97]. The CLTS approach of encouraging shaming of community members and other dignity-denying measures should therefore should "be the subject of critical review and accountability" [92].

Regardless of the success or sustainability of the approach, the question of human rights and power in the community remains. As far as rights, Galvin argues the contrast between the right to sanitation (and corresponding health), and other human rights. Though the original intention of using shame, disgust, and community policing may not be to infringe on other

human rights, those implementing the intervention should be aware that abuses do occur in communities post CLTSH triggering [88].

One article critical of the approach extensively draws a tie through history from colonial medicine, through post World War II (WWII) era medicine, to current Water and Sanitation Programming (WSP) in Indonesia. This historical context sheds a light on the striking commonalities between CLTSH and previous race-based colonial era measures [79]. The authors discuss at length the historic Rockefeller Foundation work in hookworm control – a program that they had first deployed in the rural United States and then brought to Indonesia. The parallels that the authors draw between the Rockefeller programs include the presumption of illiteracy, the use of disgust, and the promotion of the lowest level sanitation as sufficient for rural populations. These commonalities paint the picture that little has changed in 100 years of sanitation other than the vocabulary used in these approaches. Even more poignant, the author's final conclusion is that "the Rockefeller programme demonstrated greater concern about the dignity of households, working with them one-on-one to ensure privacy and open discussion" [79, 98]. For the Rockefeller program (post WWII) to seem to show more concern for dignity than current approaches is an important point echoed across literature examining the ethics of WASH interventions.

Sanitation in Ethiopia

As of 1990, 0% of Ethiopia's rural population had access to improved sanitation, and roughly 20% of the population had access to improved sanitation in urban areas [2]. As over 90% of Ethiopia's population was rural in 1990, the total proportion of the population with access was 2.6% [2].

Since 1990, at least 250 papers have been published on sanitation in Ethiopia. Plan International, Catholic Relief Services, UNICEF, the Ethiopian government and many others all have had, or still have water, sanitation and hygiene programs in Ethiopia, and have published stakeholder reports on the state of WASH in Ethiopia [3, 5, 8, 14, 78, 99].

From these reports, it is shown that the government has made radical progress towards eliminating open defecation as a practice. In large cities, particularly the capital Addis Ababa, public toilets have been built to prevent people from defecating along roadsides. It is now estimated that in urban centers, 92% of the population has access to some level of sanitation facility [1]. These facilities are still often unimproved, leaving those who use them potentially exposed to dangerous waste.

Current Status of Sanitation in Ethiopia

While access to improved sanitation still is still vastly lacking , as of 2015, that 2.6% has risen to 28% of the population with access to improved sanitation [2]. Additionally, gains have been made in both rural and urban populations, so that access to improved sanitation is roughly equal in both those areas (both approximately 28%).

As of 2015, in rural areas, 67% of the population is now reported to have access to some type of sanitation facility [1]. There are challenges in getting accurate measurements in rural areas due to a number of nomadic populations that are not always counted in health and demographic surveys. As of the 2014 DHS, the practice of open-defecation in rural Ethiopia was estimated at 37% [6], while the JMP estimates 32% [1]. It is important to note that the impression of the state of sanitation depends on the measure being used [6]. There is a large difference in the proportion of the rural population practicing open defecation compared to those utilizing improved sanitation.

This points to the proportion of the population using unimproved sanitation facilities, as well as the fact that owning a latrine and the behavior of using that latrine are two different things.

Plan International reports after their 2012-2013 ODF study that 'slippage' (rate of reversion to OD) was dependent on the definition of slippage used [78]. They found between 13% and 90% slippage in Ethiopia, with the low end based only on the indicator of having a functioning latrine [78]. Their reports indicate that gains in sanitation can be lost, and Ethiopia should continue to assess even those areas which have improved their sanitation status.

UNICEF reports after a 2015-2016 national study a 32% rate of OD [81]. This survey found higher rates of OD, and lower rates of improved sanitation than the 2015 JMP report, or the 2016 DHS survey [1, 81]. They additionally found that "CLTSH is not always implemented as intended." And "The Post-ODF follow-up of the CLTSH approach is limited" due to lack of clear guidelines and monitoring [81].

While the progress in Ethiopia is promising, and the government's commitment to an ODF nation will aid the continued efforts, as of yet, neither the government nor major NGOs operating in the WASH sector have made commitments to safely managed sanitation. Clean, safely managed water will be more attainable for all Ethiopian citizens once urban sewage is treated before being released into major waterways, and once clear guidelines are in place to deal with filled rural latrines.

Ethiopia's CLTSH policy

In addition to their national water plan [5], Ethiopia has a nationally supported document outlining CLTSH procedures and protocols, including certification of ODF status at multiple levels [3]. As a motivator for communities, they have instituted a color-coded system, where the

color-level which a community has achieved for sanitation is displayed as a flag. The guidelines for these different color-levels are outlined below, as designated by the Federal Government.

Pre-certification (Yellow):

- "At least 50% of households have and use latrines that have been constructed and designed by the community." (50% HH latrine coverage).
- "The latrine drop-holes have a cover over them."
- "50% of more of institutions (schools, mosques, churches, etc.) have constructed latrines with separate rooms for males and females." (50% institutional latrine coverage)

Level 1 (Green):

- "100% of the latrines constructed by community are in use" (100% HH latrine coverage).
- "Latrine drop-hole has a cover"
- "100% of institutions have constructed a latrine with separate rooms for males and females" (100% institutional latrine coverage)
- "Latrines have been constructed for the use of travelers and in public gathering areas and are in use"

Level 2 (White):

- "100% of latrines are in use" (100% HH and institutional latrine coverage).
- "Handwashing facilities are on [sic] working order and have enough water and soap or soap substitute"
- "Household practices safe water handling"
- "Communal latrines with hand washing facility available for passengers on main routes and public gathering places"

- "Existing water source/s are well protected from potential contamination by livestock and others, with good drainage"

Regression (Red):

- "Open defecation in HHs, institutions"
- "Poor handwashing practices"
- "Poor HH water management/safe water chain"

Verification procedure

In order to verify that an area has reached one of the above levels of sanitation, an external verification team has to visit that area, make observations, and have discussions. The national government has recommended interviewing village heads, religious leaders, schools, health facilities, children under 18, adult women, and adult women and men together.

Due to the large number of villages, households and institutions within a village, and total administrative districts in the country, external verification uses a sampling procedure to conduct their observations. For example, the government recommendation is the random selection of 30% of villages within a kebele, followed by the random selection of 30% of households and institutions within those villages to perform verification observations and interviews. For woreda level verification, 30% of kebeles would be selected, followed by 30% of villages, and so on, using 30% all the way through the regional level (see Appendix C) [3].

Once an area has been verified, there should still be follow-up. As outlined above, there is the possibility for a community to backslide into poorer sanitation and hygiene practices, and the government has set aside the red flag as a visible signal that a community is not maintaining its ODF status.

Government levels of certification

The government has officially outlined procedures for the certification and celebration of attaining ODF status at different levels. Village, Kebele, woreda, zones, and regions can be officially certified, in that order. In order for a higher level to become certified, 100% of lower levels in that administrative zone must have already been certified. Celebrations are encouraged as a way of recognizing the work of communities and partner institutions [3].

The government strongly discourages the recognition of individuals, as ODF status cannot be achieved by an individual alone.

Ethiopia's NGO sector

In 2009, the Federal Democratic Republic of Ethiopia (the Ethiopian national government) passed Proclamation No. 621 (The Proclamation to Provide for the Registration and Regulation of Charities and Societies (CSP))[13]. This law stipulates a series of requirements for what CSPs, also known as non-governmental organizations (NGOs), must do in order to operate within Ethiopia. CSPs receive a grade in accordance with their provision of reports, budgets, and working in accordance to the many subsections of the proclamation [100]. CSPs with poor grades face revocation of their licensure. In addition to being required to register with the national government, the proclamation restricts the names of organizations, as well as the types of activities that CSPs may engage in [13, 101, 102]. It is this last restriction which will be inspected more deeply here. In a country where CSPs were providing aid to millions of people in Ethiopia annually prior to 2009, restrictions on activities have the potential for wide-ranging effects, both

positive and negative. These potential effects have been looked at generally by international agencies such as Human Rights Watch, who have generally found the effects to be negative [15].

History of Proclamation No. 621

In the 1970s and 1980s, Ethiopia was under the control of the Derg dictatorship, who had ousted Emperor Haile Selassie to seize control. The Derg was replaced when the Ethiopian People's Revolutionary Democratic Front (EPRDF) captured major urban centers of Ethiopia in early 1991 [102]. Since that time, the EPRDF has been the major controlling party of Ethiopia [101]. With the closed-off Derg gone, and as the new government formed, international NGOs and local professional and civil society organizations grew in number and scope of work [102]. Prior to 2009, there was not a single agency or law governing the actions of CSPs. The Carnegie Endowment for International Peace notes that throughout the early 2000s "the civil society sector as a whole remained vulnerable to state control" [102]. After civil unrest following elections in 2005, the EPRDF sought to consolidate power and control CSPs that often advocated for the democratic process and human rights [15, 101]. In 2008, Proclamation 621 was first drafted. After a variety of changes to the proclamation, it was passed in February of 2009 [15]. Human Rights Watch summarized:

> "The law is ostensibly a tool for enhancing the transparency and accountability of civil society organizations. But in fact, its provisions would create a complex web of arbitrary restrictions on the work civil society groups can engage in, onerous bureaucratic hurdles, draconian criminal penalties, and intrusive powers of surveillance." [101]

While the law aimed to control civil and political dissent originating in CSPs, it reaches into all spheres of work led by CSPs, particularly those with international funding. Many of the

requirements of the law have effects beyond the intended control and oversight by the government, including into the health, hygiene, and sanitation sectors.

Under the current CSP structure within Ethiopia, certain practices are handed down from the national government to the WASH sector CSPs– including the requirement that CSPs wishing to work in sanitation must use the Community-Led Total Sanitation and Hygiene Approach (CLTSH) to achieve open-defecation free (ODF) status. Additionally, the national government set standardized definitions for different levels of ODF statuses and goals, as well as standard indicators for sanitation and hygiene within each level of governmental administration (from the smallest *kebele* level through the largest regional levels).

The requirement for the use of the CLTSH approach means that CSPs that do not comply are at risk of having their licenses revoked. While license revocations were limited to five cases of embezzlement and human trafficking from 2009 through early 2011 [16], by 2016, well over 100 CSPs had their licenses revoked in under one year for a variety of reasons [100], most of which cannot be easily found in English-language public documents. The rapid expansion of the relatively prosperous capital Addis Ababa, where most government officials live, was partly responsible for rising tensions in the past five years [103]. The threat of losing land for urban expansion sparked protests of the Oromo people [103]. 2016 was marked by these ethnic tensions and government response to protests that led to the deaths of over 600 people [104]. The correlation between increasing tension and increasing CSP shutdowns tends to suggest that as monitoring of CSPs increases, as well as with increasing political and civil tensions within the country, CSPs are under threat of increased scrutiny for activity "contrary to public order", such as supporting the right to land and clean water, and potential license revocation. In mid-2016 the federal

government had given only 191 CSPs a grade of "A" – compared to 1,327 with a grade of "C", putting them at risk of having their licenses revoked [100].

CSPs that wish to use methodology other than CLTSH, for practical or theoretical reasons, would not be in compliance with this proclamation. Losing their license would prevent a CSP from performing work in any sector. If for example, an organization provided subsidies to households for sanitation improvement, that CSP could lose their license and prevent them from providing nutrition, education, or agricultural assistance. This threat prevents innovation in the WASH field, and highlights the urgent need to determine in an evidence-based manner if, and in which ways, CLTSH is effective. Agencies may not be able to defy the government, but they can bring evidence and work with the government to change their humanitarian policies, which are currently built on the anecdotal evidence from Kamal Kar.

Summary of Current Literature

Safely-managed sanitation still remains out of reach for billions worldwide, with those in poor nations such as Ethiopia disproportionately lacking access to latrines and having to resort to OD and the associated consequences. Ethiopia has drastically improved rural sanitation since 1990 when 100% of the rural areas used OD as their method of sanitation. As of 2015, in rural areas OD was estimated at less than 40%. This improvement has been attributed to the government pushing CLTSH as their official sanitation plan. Their ability to enforce this intervention is strongly helped by their laws surrounding the registration and regulation of Charities and Societies (NGOs), which gives the federal government power over the ability of NGOs to work within Ethiopia.

Ethiopia's official policy on CLTSH lays out specific benchmarks for a community to be declared ODF, and prescribes four different levels for communities that have been triggered through CLTSH.

CLTSH is premised on invoking shame and disgust within the community that will spark community-led action for change. In addition to ethical issues around using the emotions of shame and disgust, CLTSH has been criticized for the lack of subsidies, which can keep latrines out of reach for the most disadvantaged. For governments like Ethiopia to attain their goals, evidence-based, quality interventions are needed. With little peer-reviewed evidence about the long-term sustainability of CLTSH, the future of sanitation in Ethiopia is unknown, including the future of the gains made in the past two decades.

Chapter 3: Methodology

Introduction

Methods used in this follow-up for the previous CRS intervention are aligned with standard qualitative, survey, and spatial methodology. Standard software including Excel, Statistical Analysis Software (SAS), and ArcGIS were utilized for data cleaning and analysis, and the versions used are cited throughout the methods section. Unless otherwise specified, definitions used were aligned with those set forth by the Ethiopian government.

Study Setting

Catholic Relief Services (CRS) is a multi-national, religious charitable organization founded in 1943 and primarily funded through the United States Conference of Catholic Bishops. CRS has worked in Ethiopia since the 1950s, in the areas of agriculture, finance, health, water and sanitation, nutrition, and emergency response [8].

CRS has WASH interventions throughout Ethiopia aligned with the Federal Government's CLTSH guidelines and Rural Water Supply Universal Access Plan (UAP) [3, 5]. The original CLTSH intervention included providing funding and technical assistance to MCS for HEW training in CLTSH aligned with the Ethiopian methodology and targets [3, 5, 14, 94]. The initial intervention included a health and nutrition component in all geographic areas, with some areas receiving integrated WASH with the nutrition component. The integrated WASH component had training on handwashing, clean water storage training, and CLTSH triggering. Previous follow-up studies have focused on areas that received WASH and nutrition interventions together. In Arsi Zone, they had several partner implementing organizations, including MCS, who continues follow-up studies.

Previous Intervention Follow-Up

The most recent follow-up in these areas was during the summer of 2015. The assessment looked at stunting of children, and calculated odds ratios for the stunting of children by their sanitation status (OD compared to latrine using; study results unavailable). The type of latrine (open defecation, pit latrine, or pit latrine with slab) was also assessed during the 2015 follow-up. However, markers of sustainability, or explanation for the different sanitation statuses in these areas were not evaluated at the time.

The particular period of intervention for this round of CLTSH was 2012-2015, soon after the introduction of the governmental CLTSH guidelines. For this follow-up, the study area of interest was the two woredas overseen by Meki Catholic Secretariat: Dodota and Sire. The two woredas being investigated here, Dodota and Sire, received the integrated WASH and nutrition intervention. The intervention led by CRS and MCS focused on rural areas, leading to the exclusion of kebeles within the two woredas that have been designated as urban by the Ethiopian census [4]. As such, this follow-up excluded the urban-designated kebeles since they have received WASH programming through a different model of CLTSH than was used by MCS and CRS in their intervention.

2015 Follow-up Variables

The 2015 follow-up study included assessment of child height, weight, and age for calculation of stunting and wasting. It also included measurement of sanitation on the JMP sanitation ladder from the MDG era (see Figure 1), and handwashing behavior of the head of household as a measure of hygiene.

The most recent data on the sanitation status of these areas comes from the HEWs themselves, who report the number of homes in their catchment area, along with the number of homes with latrines, to the health centers, which are then reported upwards through the health system (see Appendix C). As of the beginning of the study in June 2017, woreda level records showed that all kebeles were at 100% latrine coverage – the monitoring indicator for ODF status.

Population and Sample

Population Estimates

Using data from the 2007 Ethiopian Census, the combined population size of Dodota and Sire was 138,280 [4]. The census reports total population, as well as the population breakdown between urban and rural areas in each region. In 2007, the rural population of Dodota is 45,180 and Sire is 65,594 [4]. Between 2007 and 2017 Ethiopia has experienced population growth of 2.50% or greater per year, and an increasing proportion of the national population is urban [11, 102, 105].

The changing proportions of urban and rural populations, as well as census data that is 10 years old, made estimating the population to calculate sample size difficult, and other sources of population data were sought out directly from woreda level government entities. CRS was able to obtain population data at the household level from health centers. Documents provided by the health extension centers gave more updated estimates of the population at the kebele level. The population estimates of the kebeles are listed below, by number of households, the smallest unit of measure available.

As the survey was conducted at the household level, the research team decided to use these household numbers for the calculation of population size and sampling. Those kebeles which were selected for the survey are highlighted in green.

Kebele	*Woreda*	Population (# HH)
Amude	Dodota	598
Tero	Dodota	199
Balale	Dodota	242
Badosa Batela	Dodota	407
Dodota Alem	Dodota	714
Tedecha Guracha	Dodota	689
Amenga Debaso	Dodota	266
Lode Sharbe	Dodota	172
Dire Kiltu	Dodota	696
Koro Degega	Dodota	233
Dilfeker	Dodota	375
Awash Bishola	Dodota	337
Ibsata Uduga	Sire	1139
Koloba Bale	Sire	590
Koloba Bika	Sire	740
Koloba Hawas	Sire	437
Ufura Agemsa	Sire	914
Amola Chencho	Sire	914
Gesela Amuta	Sire	1579
Dhankica Gefersa	Sire	1134
Hogiso Borano	Sire	1539
Benben	Sire	1709
Lode Lemefo	Sire	1033
Alelu Gesela	Sire	582
Amola Tebo	Sire	608
Borera Chirao	Sire	1783
Gesela Chancha	Sire	1244
Gesela Shashe	Sire	843
Koloba Shameda	Sire	1416

***Figure 5**: Rural kebele size and associated woredas. The number of households (HH) in each kebele, as reported by the health centers (HC) in Dodota and Sire. The highlighted kebeles were selected to be surveyed. Urban kebeles are not reported here.*

The number of households in each kebele were used to weight the kebeles for selection proportional to population size.

Sample Size Calculations

Sample sizes in terms of households were calculated presuming a large population size (greater than 25,000) and a prevalence of open defecation at 50%. The estimates of open-defecation behavior ranged from 30-80% in different districts of Ethiopia [6, 18, 60, 86, 90], and a prevalence of 50% was chosen in line with standard sampling guidelines for situations when an exact prevalence is not available [106]. A design effect (DEFF) of 3.0 was used to account for the cluster design of the survey, based on previous studies. The calculated sample size was also increased by 10% to account for households that may choose to not participate. The final sample of homes to contact was determined to be 1300. OpenEpi English language version 3.01 was used to perform the sample size calculations.

Sampling Process

Based on feasibility of visiting geographically disbursed areas, 12 secondary clusters were chosen (12 kebeles). The kebeles were divided into three primary clusters - Sire Highlands, Sire Lowlands, and Dodota. Within each of these larger clusters, individual kebeles were selected utilizing a random digit assignment in Excel. Twelve kebeles were chosen in total, four from Dodota, and eight from Sire (due to Sire's larger population size). From each of these kebeles, village names were placed in a bucket on data collection day, and an enumerator would pull out three random villages to sample. Within each village visited, every inhabited household was surveyed.

Instrument Design

Survey Design

Survey questions were based on other standard WASH surveys in use in international settings such as the Joint Monitoring Programme (JMP) [21], UNICEF [99], and World Health Organization [2]. Demographic questions were based on the Ethiopian census demographic questions [4]. Questions more specifically related to the CRS led intervention were based on past CRS household surveys. The full paper-based version of the survey instrument is available in Appendix A. Previous measures from HEWs were based on the definition of latrine coverage as an affirmative answer to the question 'do you have a latrine?' when speaking with homeowners. This measure was included in this study for comparison to past HEW reports, in addition to the measures as defined by the JMP.

Standard WASH surveys elicit responses about latrines in more detail, including specific type – such as flush, pour-flush, pit, hanging, or ventilated improved pit (VIP), and where the waste goes once it is in the latrine (whether composted, to a sewer system, or emptying into a body of water).

Demographic questions included number of children, language spoken, educational attainment, and number of household members. Household was defined as "persons who sleep here at night and eat out of the same cooking pot" for the purposes of this survey. Questions regarding economic well-being included roof material (thatch, corrugated metal, etc.), and ownership of phones, radios, and televisions.

The questions were reviewed and revised by CRS WASH staff, as well as an Emory professor working in the WASH sector. The questions were pre-tested in the office with the

WASH team in paper form prior to being coded into the electronic platform to ensure that skip patterns and question order was agreed upon by all.

Survey Informatics

The CRS ICT4D team used iForm builder to build the pre-written [99] survey questions into an electronic format compatible with tablets. The surveys were downloaded onto 12 Samsung A6 tablets to be used in the field. The tablets were synced with the iForm system after each data collection day to upload the data to the iForm cloud. Data is protected through a password-protected portal in order to assure the confidentiality of the data.

Samsung A6 tablets were kept in airplane mode (calling and data abilities turned off) during data collection to conserve battery. This necessitated mass data upload at the end of each data collection day, rather than uploading each survey immediately after collection.

Key Informant Interview Design

The key informants for this project included the WASH coordinator for the woreda health centers, and health extension workers (HEWs), some of whom have participated in CLTSH triggering, and some who began working post-triggering. The interview guide for the Key Informant Interviews (KII) was initially developed to answer the primary research question of which factors are associated with sustainability of ODF status in communities triggered through CLTSH. The initial KII guide was pre-tested with CRS staff not working on this project from Oromia in the CRS office, to improve wording of the questions and consent statement. After pre-testing the guide was modified, with additional questions and probes added to address health worker perspectives on the CLTSH program and open-defecation practice in the communities of

interest. The initial KII guide used during interviews is available in Appendix B. The research team discussed ways in which the interviewers having a background and focus in WASH would affect perceptions of the HEW answers during interviews, as well as how to address this bias during interviews.

Enumerator Training and Piloting

CRS and MCS selected 12 male survey enumerators who worked either as school teachers or government personnel in Dera town (Dodota woreda). All 12 enumerators had past experience performing door-to-door household surveys in the communities of interest and spoke English, Amharic, and Oromo fluently. One enumerator left the project between training and data collection. Ten of the enumerators lived in Dodota, and one lived in Adama (neither in Dodota or Sire). Classroom enumerator training involved providing background information on the project, explaining household selection procedure, and reviewing each survey item and possible responses. Based on enumerator feedback, the survey questions were updated prior to piloting.

Survey enumerators practiced using the survey instrument on paper, then practiced on the electronic devices to familiarize themselves with both the survey instrument and devices. The 11 trained survey enumerators were given two days of in-field piloting in a kebele adjacent to Dera town, that had not been selected as a kebele for the full survey. After the pilot day, feedback from the survey enumerators was incorporated into the final survey instrument and the devices were updated with the new instrument prior to starting in-field data collection.

Data Collection

Qualitative Data Collection – Subject Recruitment

Purposive sampling was used to identify interviewees. The Health Center (HC) in each woreda was visited to gain initial permission from the HC to interview HEW. Contact information for HEW was obtained at these HC visits. In order to gain a broad qualitative perspective of the CLTSH program in each woreda, one WASH official at the HC level in each woreda was interviewed.

In addition to the two HC official KII, three KII were performed at different Health Extension offices with HEWs in each woreda, for a total of 6 HEWs. There were a total of eight KII across the two woredas. In Sire, HEW from both lowland and highland areas were interviewed, as the challenges faced in the two areas differ due to geography and accessibility.

Qualitative Data Collection – Tool Design

A standard guide of 10 questions, each with pre-written probes was used to begin and guide each interview (see Appendix B). As interviews progressed, the researcher probed on any points of interest that arose. Not every question was asked of every individual interviewed.

Saturation was reached on some topics before all eight interviews were completed. Less time was spent in subsequent interviews on topics that had reached saturation. However, not all topics mentioned in interviews that were of interest to the research question reached saturation.

Qualitative Data Collection – Interview Process and Language

One interview in Sire was held in English, directly between the researcher and the interviewee. All other interviews were translated by a CRS staff member from English to either Amharic or Oromiffa, whichever language the interviewee was more comfortable using.

Prior to beginning any Key Informant Interview, verbal consent was obtained from interviewees. If HEW did not provide verbal consent, the interview was halted. The consent statement was as follows:

"Hello, my name is _____, and this is _____ , who will be taking notes for us today. We are working with Catholic Relief Services and are looking into program sustainability for Community-Led Total Sanitation. We are interested in the perspectives of community leaders who carried out the program. We will take notes for use program improvement only, and none of your identifying information will be accessible to anyone outside of the Catholic Relief Services research team. The interview will last about an hour, do you wish to continue?"

Quantitative Data Collection

CRS provided two Toyota 4-wheel drive Land Cruisers to reach sites. The two teams alternated who would go to the further villages in the kebeles for data collection. Due to rainy season road conditions and extended travel times, in order to contact every household some villages had to be visited on two separate days rather than one visit.

Prior to beginning each survey, enumerators approached the household, asked to speak with an adult (someone age 15 or over), and explained who they were. They then asked for

verbal consent to ask and record the answers to the survey questions. The consent statement was as follows:

"Hello, my name is _____ and I am working with Catholic Relief Services on a program regarding sanitation and latrines in communities around Oromia. Your household has been randomly chosen to participate. It should take about 45 minutes to complete the entire survey, which will also include a visual inspection of sanitation facilities if you agree to it.

All information gathered will be kept anonymous – we will not be collecting your name or other identifying information. Your individual responses will only be accessed by research team members. You may stop the interview at any time, and you may also skip any questions which you are uncomfortable with. Do you agree to participating in this survey?"

After finishing the question portion, they then asked for consent to observe the latrine and water storage facilities before beginning the observational portion of the survey.

"Now I would like to see your latrine if you agree to it. May I see your latrine?"

All households in a village were surveyed. Enumerators were dropped by drivers at different start points and went to each household until they reached a house already interviewed by another enumerator. Village residents were consulted to ensure that households hidden from view by stands of trees or a rise in the hills were also surveyed. CRS staff chose enumerators at

random to observe each day to ensure that they were not passing households or skipping survey sections.

After receiving consent, survey enumerators would sit or stand outside the house, (following whichever position the respondent took), and ask the questions in whichever language the respondent was most comfortable with. They would enter respondent answers on the Samsung A6 tablets, which automatically performed skip pattern functions for the enumerators. Enumerators thanked respondents when they had completed the questions and observations, saved the responses, and opened a new survey file before arriving at the next household.

Enumerators collected between nine and 12 surveys per day, depending on how close households were in the villages, and the road conditions. Thick mud, particularly in the Highlands led to more travel time and fewer surveys collected per enumerator per day.

For the direct observation portion of the survey, enumerators entered the answers to a series of yes/no (present/absent) questions on the Samsung A6 devices, took a photo of the latrine showing the superstructure of the latrine if one was present, and then entered the household to answer the yes/no questions on water storage facilities.

Planned Analysis Methods

Survey data was cleaned manually in Excel version 15.25.1 for Mac. Cleaning included removing duplicate records, records from training days, and records where the household did not consent to a member giving the interview.

Frequency and correlations of attributes of interest were calculated in Statistical Analysis Software (SAS 9.5).

Basic proportions and frequencies were calculated in SAS. Statistical significance, 95% confidence intervals, and p-values were not calculated, as practical significance is of more interest in this program than statistical significance, and many variables could be found to be statistically significant due to the large sample size.

Proportions were used for analyses of bivariate and other categorical variables. Most variables were collected as categorical (age, etc.), to prevent bias during analysis by separating the continuous variables at a point which may show significance. Continuous variables were rarely collected, as no analyses were planned using the variables as continuous, other than calculating average household size.

Map Building and Spatial Analysis

Point and kernel density maps, maps of the proportion of clusters with various attributes, and those showing the study area were created in ESRI ArcGIS version 10.5.

Cleaned data, with the identifying information removed, was uploaded to ArcGIS, and the coordinates were plotted. Rather than manually plotting points, this information was plotted using the table join procedure within ArcGIS to maps of the national, regional, and *woreda* level boundaries provided by ESRI. Basemaps from satellite imagery or Open Street Maps are attributed on the individual maps themselves. As a quality control, any records that showed the survey had been completed outside the study area (in the urban meeting point for survey enumerators), were excluded, as it means the survey had not been completed at a household, but rather an enumerator had filled in a survey alone, potentially to meet the number of targeted surveys for the day more quickly.

Important features, such as the rough boundaries of the *kebeles*, and the two main roadways were digitized by hand using geographic features on the satellite basemap for reference.

To determine the proportions of each *kebele* for various traits, including evidence of open defecation, having a latrine, experiencing difficulties, etc., yes/no answers were recorded as 1/0 values for 23 survey questions. Values were then calculated directly in ArcGIS for the *kebele* average for each of those columns as a decimal value between 0 and 1. These values were then mapped as multiplied by 100 to show the percentage value for each *kebele* for the attribute in question.

Point and kernel density maps exclude zero values to account for the non-continuous nature of the areas which were surveyed. Equidistant cutoff values were used for these maps, with the lowest non-zero value as the start for the lightest colored values, and the highest value as the end point for the darkest color in each map.

Ethical Considerations

Emory University IRB approval was waived for this survey as it was a project evaluation based and not research based. From CRS "CRS does not typically seek IRB approval for this type of social research, and we do not anticipate seeking it for this project". KII were kept to under an hour since we were not compensating those who were interviewed, and it would have been unethical to take more of their time when they could be working in the community. Consent was still sought from respondents out of respect for their time, and to stay aligned with methods used in other studies in the same geographic area.

An additional consideration was asking potentially awkward questions surrounding

several topics – including personal bathroom habits, religion, and socioeconomic class. In order to maintain the IRB exemption, several adjustments were made to the first version of the survey. Religion was excluded from the survey, socioeconomic class was evaluated by proxy indicators used by the federal government [4] (see Appendix A). Personal bathroom habits, including defecation, were asked about more generally, as well as asking about other household members, and wording was agreed upon by the enumerators from the region for appropriateness.

Chapter 4: Results

Introduction

The results of the qualitative, quantitative, and spatial portions of this project are presented below. The qualitative data was used to design the survey component of the study, and is briefly discussed. After, the quantitative and spatial data is examined at the descriptive level, with emphasis on the data related to different definitions and indicators for the state of sanitation: latrine coverage, latrine use, and open defecation behavior. Subsequently, factors proposed to be related to latrine use, latrine coverage, and open defecation are examined. Spatial analyses include kernel density of health extension worker visits compared to evidence of open defecation, and kebele-level reports of households experiencing problems with their latrines.

Use of Qualitative Data

Key Informant Interviews (KII) informed the design of the survey. No in-depth thematic analysis was completed for the interview data. However, the following concepts from the interviews were included in the design of the survey: Homeowners' struggle with building and maintaining latrines, schoolchildren being exposed to sanitation interventions at school, HEW were not consistently received well in villages when promoting sanitation, and HEW having a large number of health programs they must promote to each household. Section C of the survey was added to assess these factors that were raised in the KII (Appendix A).

Population Characteristics

Table 1 (Figure 6) describes the demographic and population characteristics of the survey respondents. The population characteristics presented were selected because they are factors that

have been previously hypothesized to be important to the uptake of latrine usage behavior, or are included in the national census [4-6, 14, 18, 19, 57, 60, 68, 86, 90].

Table 1: Demographics	**Overall**	**Dodota**	**Sire**
Number of Clusters (n)	12	4	8
Total Population (n)	6213	1653	4560
Total Surveys/HH (n)	1332	332	1000
Survey Respondents			
% Female HHH	65.4%	64.1%	65.8%
% Male HHH	18.3%	23.9%	16.5%
*% Female non-HHH**	16.3%	12.1%	17.7%
Avg. HH size (n)	5.53	5.12	5.66
Household Language (n)			
Amharic	119	2	117
Oromiffa	1212	329	883
Other	1	1	0
% HH observed w/ a latrine	94.8%	92.7%	95.5%
% HH with a child attending school	73.6%	67.7%	75.5%
% HH with a CU5	24.4%	18.1%	26.5%
% Own a TV*	1.2%	0%	1.6%
% Own a radio*	44.6%	38.4%	46.7%
% Own a telephone+***	69.0%	66.8%	69.7%

Figure 6*: Population characteristics of surveyed households.*

* Female non-HHH is a woman over age 15 who lives in the household but is not the matriarch. Male non-HHH response was 0% in all kebeles, and therefore not reported in the table.
**these measures are included in the Ethiopian census as one proxy measure of economic class.
+ Telephone is any member of the household with either a landline or cellular telephone.
HH – Household
HHH – Head of Household
CU5 – Children under Five

Spatial Components of Latrine Coverage and Open Defecation

Latrine Coverage by Cluster

According to official reports from the Ethiopian government, all kebeles surveyed had achieved ODF status. In order to maintain this status by government definition, 100% of HH would need to have a latrine on the day the households were observed. In this study, kebeles were analyzed for the proportion of homes that were observed by the enumerators to have a latrine (regardless of reported latrine usage by household members). The map below demonstrates the study area and latrine observations (Figure 7).

Kebeles with the lowest observed rates of latrine ownership (less than 93%) are mapped in red – one kebeles each in Dodota and Sire. Kebeles with 93.1 - 96% latrine ownership are shown in orange, accounting for three kebeles in Sire. In yellow, are kebeles with 96.1-98% latrine ownership, accounting for two Dodota kebeles. In green, are kebeles closest to the government target of 100% latrine ownership at 98.1% or greater for latrine ownership.

Overall, Dodota (region in pale yellow) has fewer kebeles surveyed due to smaller rural population size and shows a general trend of having medium to high latrine ownership as shown by 3 of 4 kebeles exhibiting over 96.1% latrine ownership. Sire (region in pale green) has kebeles across the full spectrum of latrine ownership (from low to high), possessing both the kebeles with the lowest (91% in Hogiso Boreno) and highest (99.2% in Dhenkicha Gefersa Chancho) rate of latrine ownership.

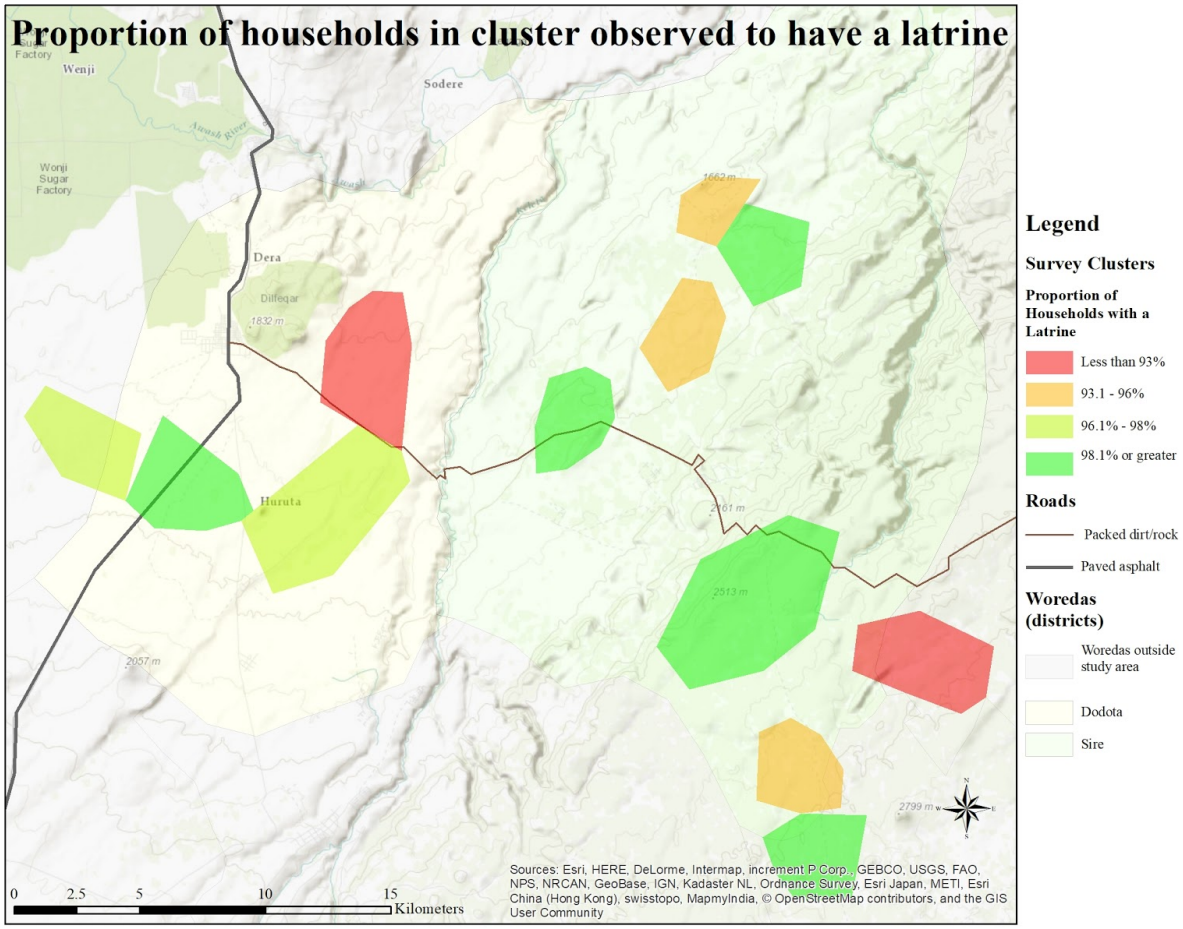

***Figure 7**: Proportion of Households with latrines. This measure is from visual inspection by survey enumerators who verified the presence of any type of latrine in the household compound.*

Observed Evidence of Open Defecation by Cluster

In addition to observing the presence or absence of household latrines, the enumerators were trained to look for evidence of open defecation around the household and the compound. Evidence includes visible piles of human feces; used diapers, cloths, or bags used for child defecation left in the open uncleaned; or witnessing anyone, adult or child, defecating somewhere other than a latrine. Figure 8 is a spatial map that shows the kebeles color-coded by the proportion of households which were found to have evidence of open defecation around the household compound. The four kebeles with the highest rates of open defecation were the four

kebeles located in Dodota woreda; having over 17% of households displaying evidence of open defecation. The highest rate of visible evidence of open defecation was Badosa Batala kebele in Dodota, with 31% of households having evidence of open defecation. Recall, all four kebeles in Dodota had latrine ownership of at least 94% and Badosa Batala had latrine ownership of over 96%. No kebele in Sire had more than 9.3% of households displaying evidence of open defecation.

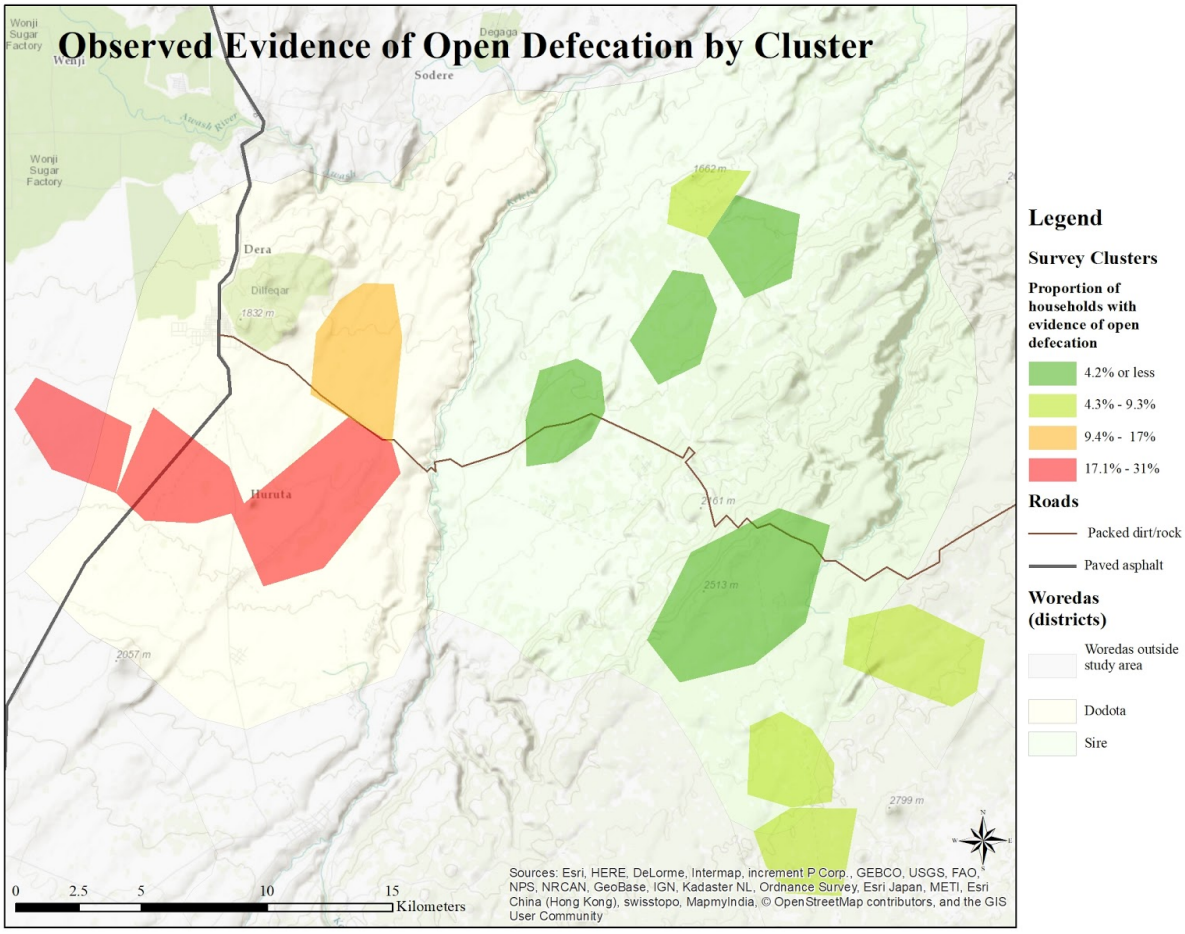

Figure 8: *Open Defecation at the kebele level for selected areas. This measure of open defecation was made through observation by survey enumerators at each household, regardless of the presence or absence of a latrine.*

Latrine Coverage and Open Defecation Behavior

During the in-person household survey, the interviewee was asked to respond yes or no to three questions that represent different definitions of latrine coverage:

- Do you have a latrine?
- Is this latrine shared with other households?
- Can anyone in the community use the latrine?

Below, in Figure 10, the responses to these questions are presented together to provide a comprehensive picture of latrine coverage in each region.

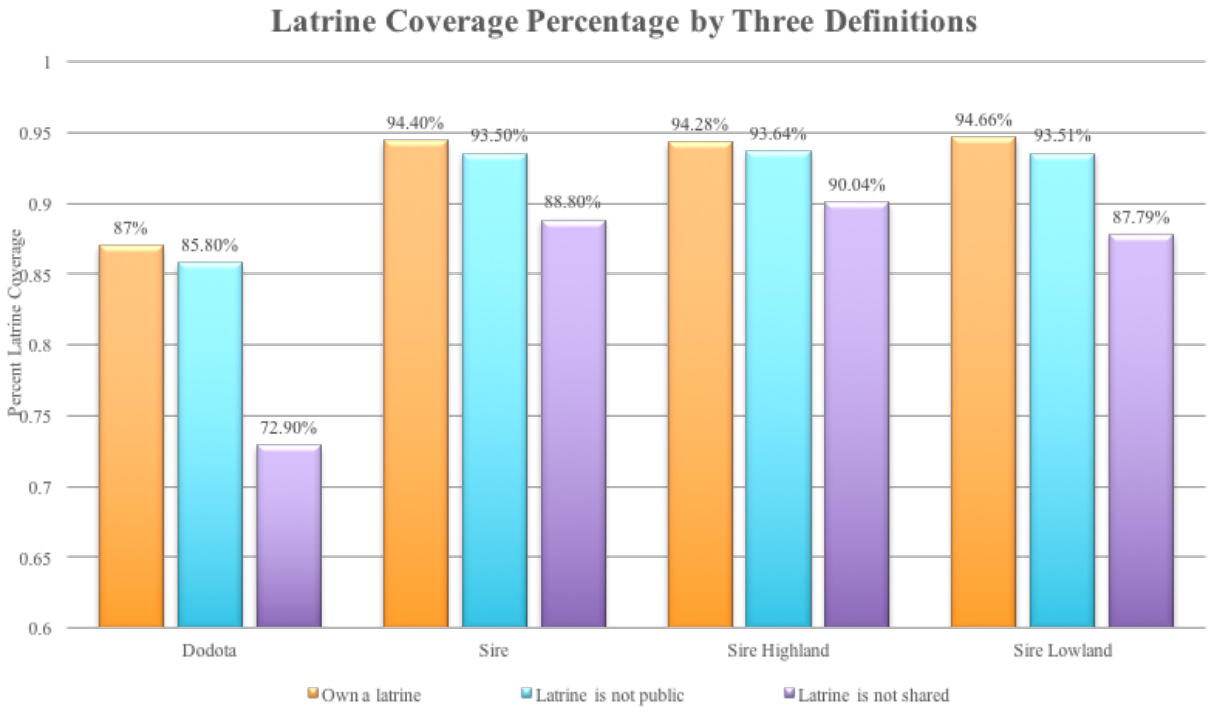

***Figure 9**: Latrine coverage by three different definitions*

The responses to the three sanitation definition questions were assessed as follows: responses that are categorized as “Own a latrine” (orange) had a respondent who answered “yes” to the question “Do you own a latrine?" From those who were categorized as owning a latrine, they were then asked if the latrine is shared with any other households. Those who answered “no” had

were counted in the data that is presented for “Latrine is not shared” (purple) and “Latrine is not public” (blue). For respondents who said “yes” to sharing with other households, they were then asked if the latrine was available for anyone in the community to use (public). Those who answered “no” to that question were also categorized as “Latrine is not public” (blue).

The results show that overall owning a latrine, public or private was reported for 87% of households in Dodota, and 94.4% of households in Sire. Having a latrine that is not shared is 72.9% in Dodota and 88.8% in Sire. Having a latrine that is private or shared, but not public is 85.8% in Dodota and 93.5% in Sire.

Self-Reported Open Defecation Status

Survey respondents were asked, "The last time a person from the household from [age group here] defecated, where did they go?”. The age groups were age 15 and older (adult), age 6-14 (child), and age 0-5 (child under 5yrs old or CU5). A follow-up question for children age 0-5, asked what was done with the feces for children too young to use a latrine. For all categories, if a latrine was used, or if child feces were disposed of safely (e.g., put in or rinsed into the latrine), the household member was categorized as not practicing open defecation at home. Otherwise, the behavior was categorized as open defecation.

The proportion of households NOT practicing open defecation was analyzed and reported by age group and woreda. Additionally, the percentage of households where no members reported open defecation is presented to the right of the dashed line (see Figure 10). For children aged 0-5, approximately 91% of households reported handling child feces safely (feces was put in or rinsed into a latrine), in all kebeles. Children aged 6-14 report no open defecation for 83 – 96% of the households. Adults (age 15 or older) reported not openly defecating in 88 to 98% of

households. Notably, however, household open defecation free percentages are lower than any one age group, due to the cumulative effect of excluding households from the ODF category. For an Entire Household (HH) to be considered ODF, all household members must have exclusively used a latrine at home within the past 24 hours. If one or more members, from any age group reported open defecation, that household was excluded from the "Entire HH" category for ODF status. So then households with ODF children may not have ODF adults and vice versa.

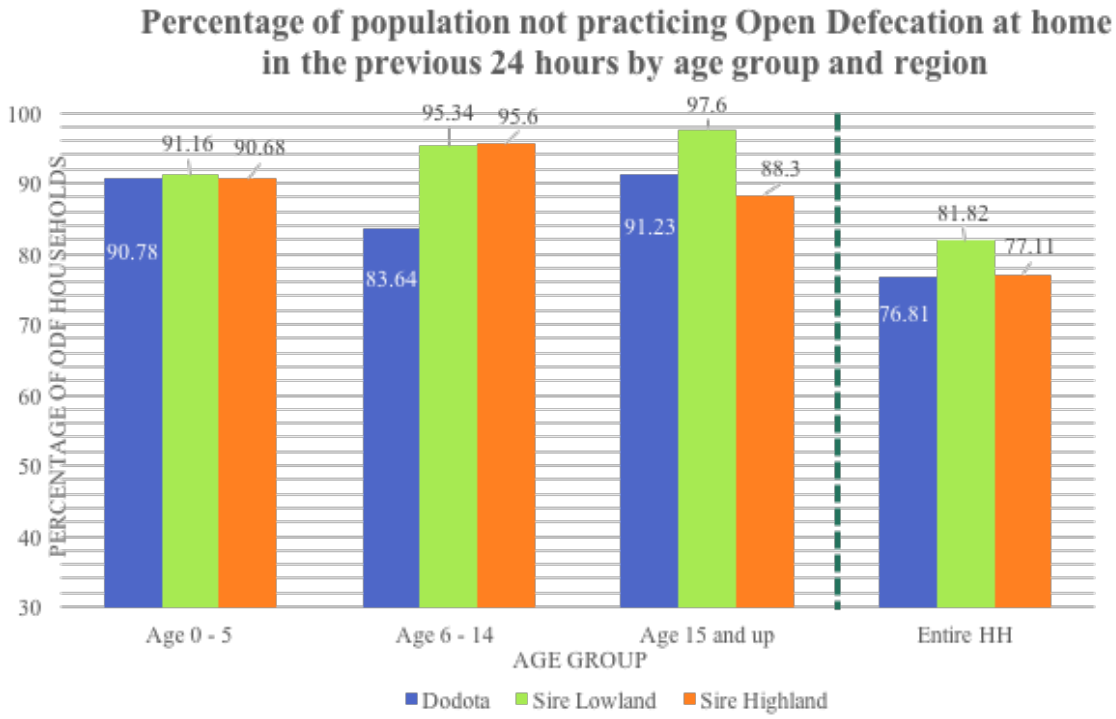

***Figure 10**: Latrine usage behavior by geographic area and age. For an Entire Household (HH) to be considered ODF, all household members must have exclusively used a latrine at home within the past 24 hours. If one or more members, from any age group reported open*

Open Defecation Status Self-Report vs. Observation

In order to find the most thorough indicator of true ODF status in the communities, three variables were measured. In Figure 11, the self-report of meeting the JMP definition of latrine

coverage is shown in blue, where coverage ranged from 72.9% to 90.1% of households (see also Figure 5). The self-report of all household members always utilizing a latrine for defecation, even when away from home, is shown as ODF self-report in teal, where coverage ranges from 57.4% to 68.6%. The third measure used is shown in red, where the self-reported ODF households are verified to be ODF through observational data from survey enumerators of whether or not there were human feces in the household environment. Dodota, and both Sire Highlands and Lowlands experience a drop in ODF status, with the proportion of ODF households ranging from 45.3 to 65.9% when the observations of survey enumerators were reported.

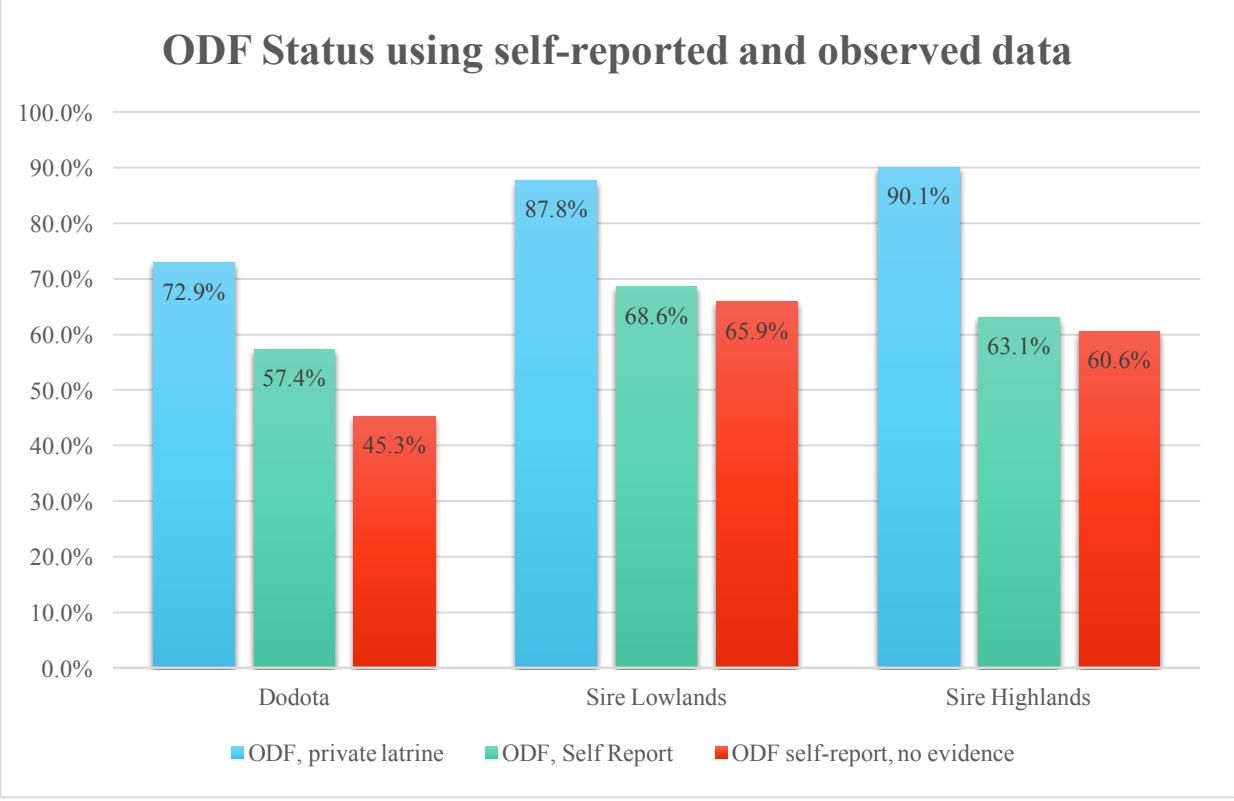

***Figure 11**: ODF Status by observed and self-report data*

Factors Related to Open Defecation Behavior

Types of Issues experienced by Latrine Owners

Homeowners were asked about the types of problems or issues they have experienced with their latrines. These issues included structural problems such as collapse of the superstructure (building) around the latrine, filling of the latrine pit, collapse of the latrine pit (common in soft soils), and the superstructure being too small (or too short or narrow). Other issues concerned use of the latrine, such as the smell, the presence of flies, or concerns about the latrine being unsafe for girls or children.

When households reported experiencing any issues, 90% reported two or more issues. The most commonly reported issues were found to be the collapse of the superstructure, the collapse of the pit itself, filling due to use, and the feeling the latrine was not safe for girls (see Figure 15). Sire residents, both in the Highlands and Lowlands, had more issues with their latrines than those in Dodota. Two issues that were infrequently reported across all kebeles were problems with the smell or flies in the latrines. No households reported not being able to plant trees on old latrine pits, or filling of the pit from rainwater/groundwater.

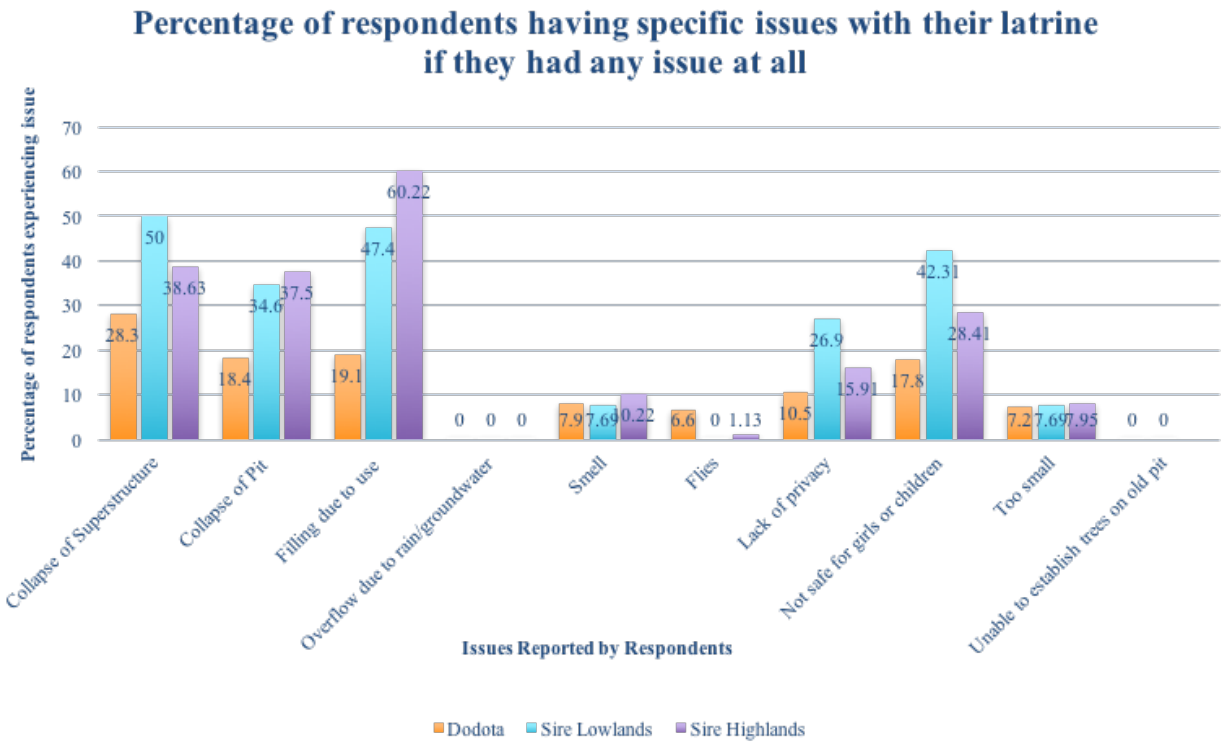

***Figure 12**: Type of issues households experience with latrines*

Time since last HEW follow-up

HEW reported visiting each household once per month. To verify this, during the survey, respondents were asked how long it had been since their last visit from a HEW. Only 60% of households reported having ever had a visit by an HEW, and 25% of households reported having had an HEW visit within the past month, and 35% having had a visit longer than one month ago (Figure 16). The breakdown of HEW visits differs between Dodota, Sire, and within the *kebeles*. Nearly all households that reported any visits from HEW in Dodota had a visit more than four weeks previous to being surveyed. Households that received visits in Sire, both Highlands and Lowlands account for the majority of responses under four weeks.

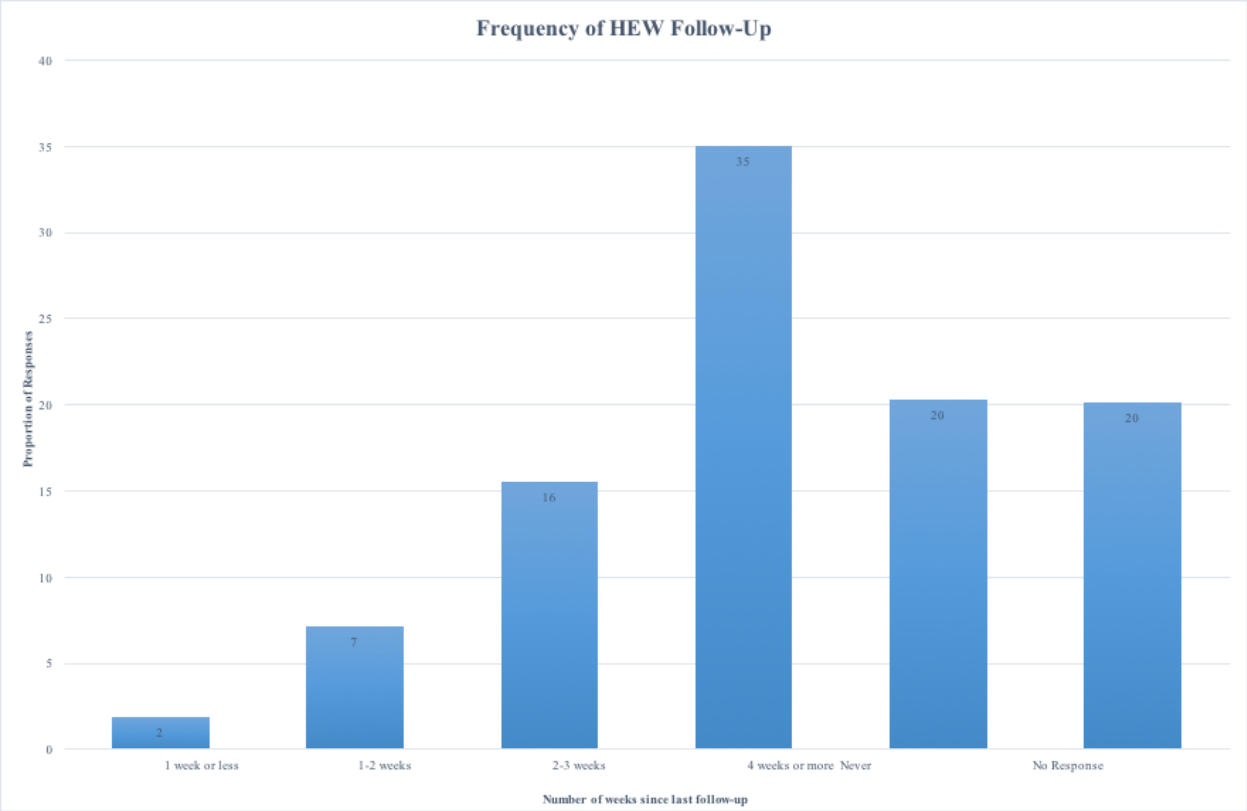

***Figure 13**: Time since last HEW follow-up*

Household Factors and Open Defecation Free Status

Of the factors hypothesized to be related to latrine usage, several binary factors from the surveys have been analyzed (as shown in Figure 17), and graphed below. Less than 45% of homes that did not have a slab were entirely ODF, and over 90% of HH with slabs are ODF. Respondents who reported thinking it is shameful to openly defecate (strongly agree or agree) to the question "Do you strongly agree, agree, neither disagree or agree, disagree, or strongly disagree that it is shameful to defecate in the open?" live in ODF households 90% of the time. Respondents who responded neither agree nor disagree, disagree, or strongly disagree to the same question lived in ODF households 65.8% of the time.

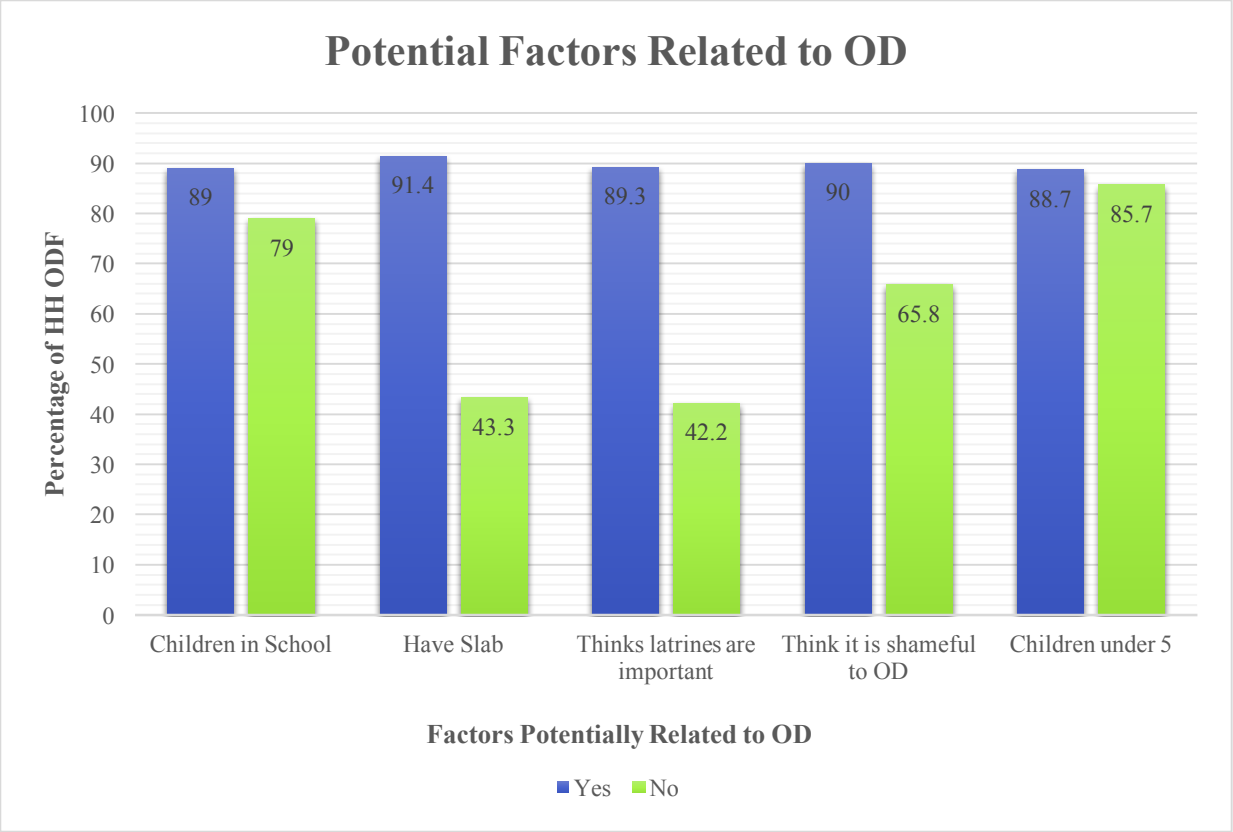

***Figure 14**: Factors potentially related to Open Defecation Behavior*

Spatial Characteristics of Factors Related to Open Defecation

Health Extension Worker Household Visits

The maps below show the surveyed kebeles outlined in colors based on the proportion of households with visible evidence of open defecation (first shown in Figure 8). Deep green outlined kebeles have the least evidence of open defecation, and red outlined kebeles have the most evidence of open defecation (up to 31% of households). To evaluate the spatial pattern of HEW visits, the density of households was plotted using kernel density. The first map shows the kernel density of households reporting that they had ever had a home visit from a health extension worker. The second map shows the kernel density of homes reporting having never had a visit from a health extension worker.

As the density of households (overall) is the same in the two maps, if health extension worker visits are evenly distributed, the two maps should show the same kernel density pattern. The highest densities (darkest colors) of homes reporting HEW visits are in Sire, specifically in Borara Chirao, Ufura Agemsa, and Dhenkicha Gefersa Chancho kebeles. These kebeles have 1%, < 1%, and 8% open defecation respectively. The highest densities of homes reporting never having had an HEW visit are split between Dodota and Sire. Boraro Chirao kebele, with its large number of homes, shows more density than smaller kebeles of homes reporting no visits. There is a swath of density through Dodota (Figure 13), which does not match the pattern appearing on the map of homes reporting having had an HEW visit (Figure 12). The highest density of homes reporting having no visits is aligned on top of Sharbe kebele in Dodota, which has 24% OD.

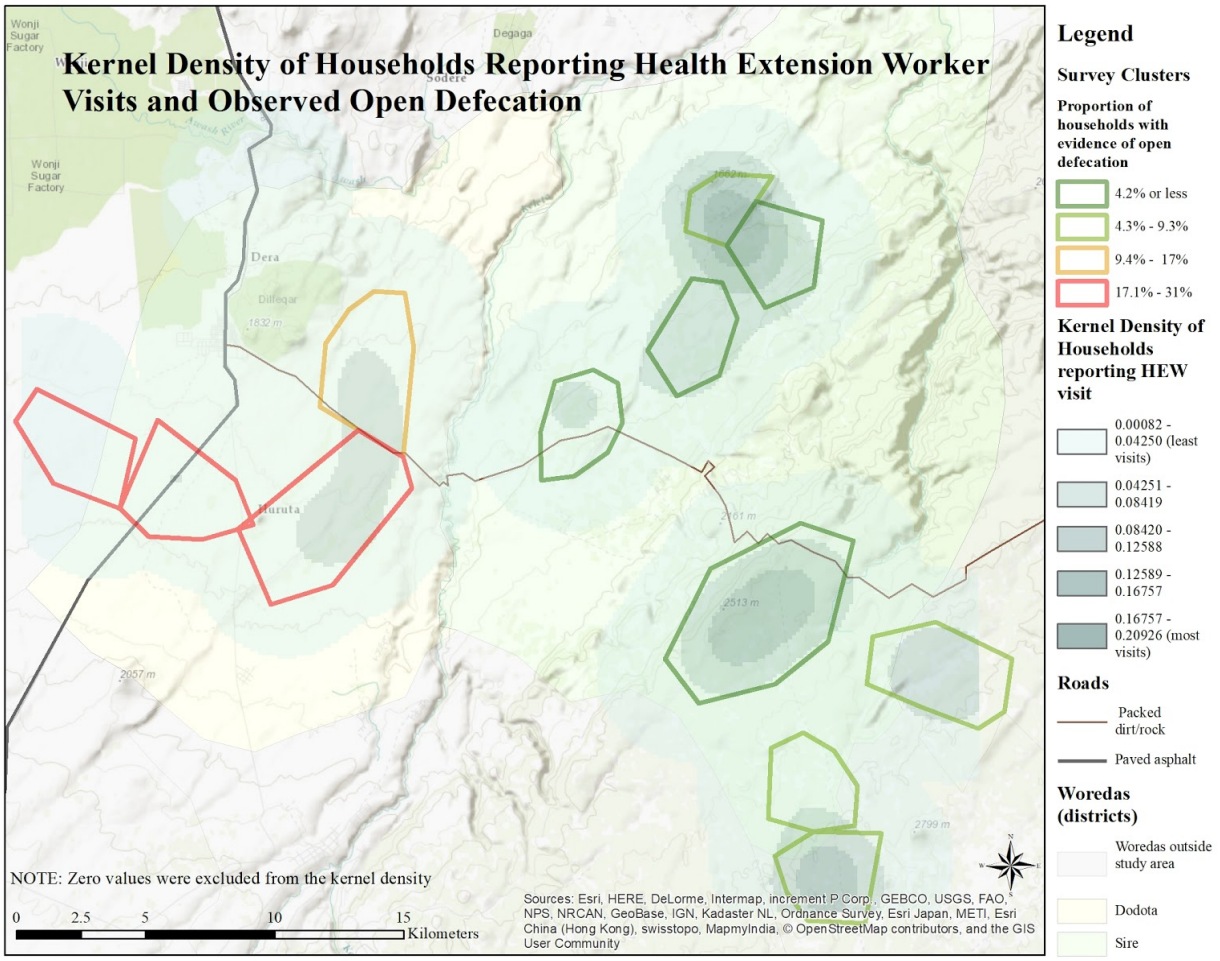

***Figure 15**: Kernel Density of Households having had HEW Visit*

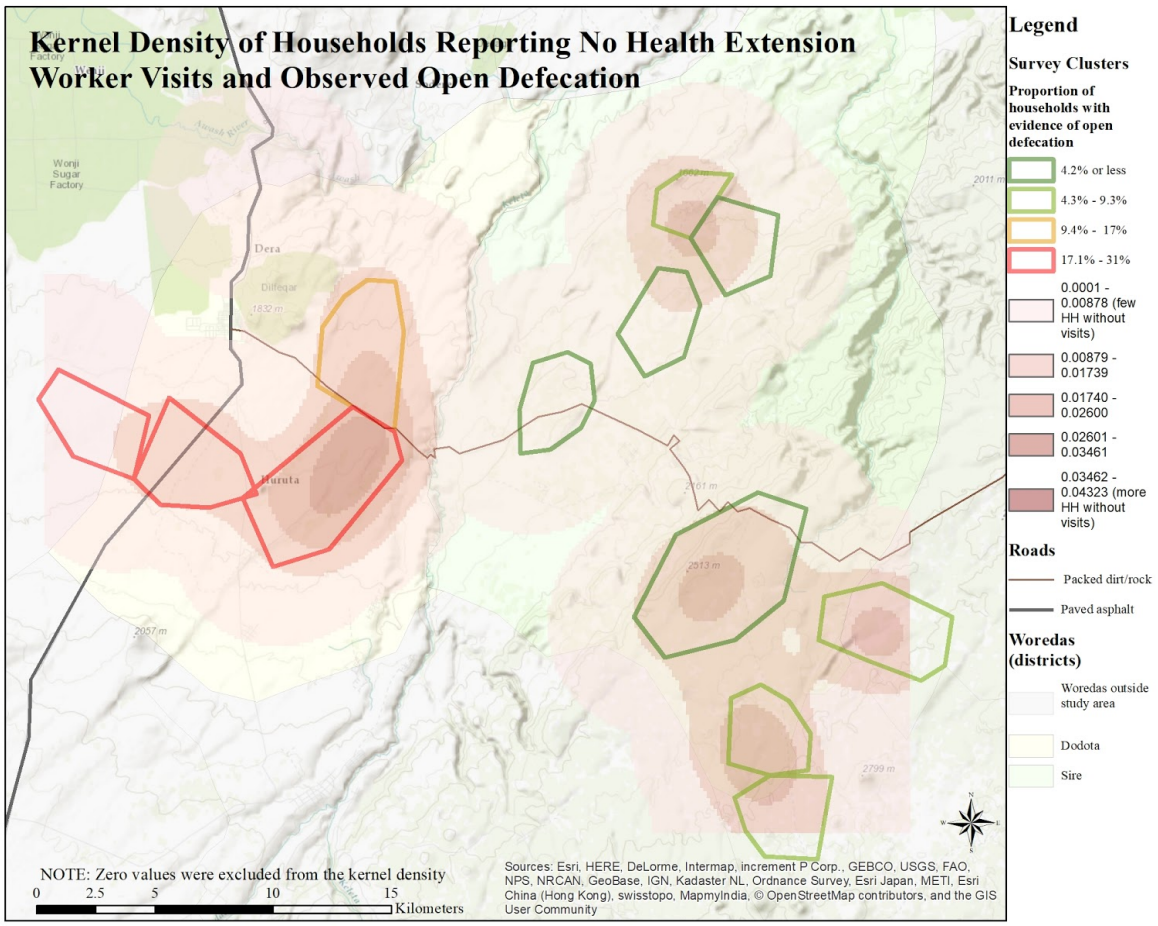

***Figure 16**: Kernel Density of Households never having had an HEW visit*

Physical Difficulties with Latrine Structures

In the survey, the respondents were asked “have you had any difficulties with your latrine?” Those who replied affirmatively were then asked to report what types of difficulties they had experienced, and could choose one or more response from a set list of potential difficulties. Rates of affirmative response to “have you had any difficulties with your latrine?” were low, between 0 and 50% in each kebele, and 23% of households overall. To examine the potential geographic pattern of difficulties with latrines, spatial analysis was performed (see Figure 17).

To examine spatial patterns of latrine difficulties, the proportion of latrine difficulties were mapped, with the proportion of difficulty as well as the observed proportion of open defecation overlaid on the kebeles. As seen in Figure 17, in Sharbe kebele in Dodota only 6% of households reported having ever had any type of difficulty with their latrines, while 24% of households had evidence of open defecation. This results shows that many households felt there were no issues (difficulties) with the latrine itself, including safety, smell, filling, etc., yet some or all household members do not use a latrine (practicing open defecation). Conversely, Alelu Gesela kebele shows a 4% rate of open defecation, with 27% of households reporting one or more difficulties with their latrines. No clear pattern was found between geography/elevation and proportion of homes experiencing latrine difficulties.

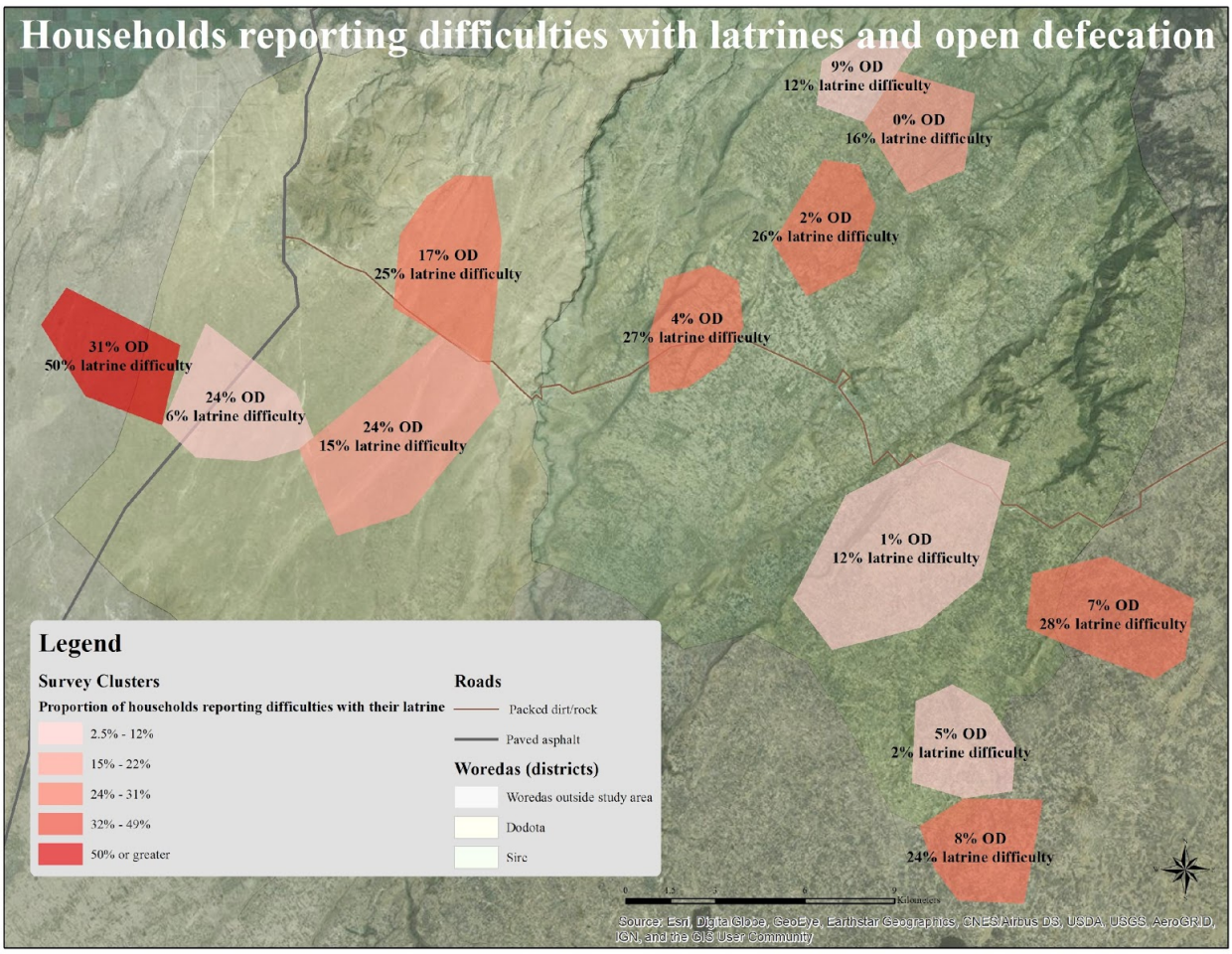

***Figure 17**: Proportion of households with open defecation overlaid on proportion of households with latrine difficulties*

Chapter 5: Discussion

Introduction

This paper has provided a brief glimpse into the sanitation status according to a variety of definitions from the Ethiopian government, Joint Monitoring Programme, and Sustainable Development Goals in two *woredas* – Dodota and Sire – in Arsi Zone, Ethiopia. In addition to gathering data on the differences between latrine coverage and open defecation behavior, various factors potentially related to these two important measures were examined.

In this study, there were a variety of indicators used to measure the state of sanitation in in Dodota and Sire: 1) the observation of evidence of open defecation, 2) self-reported defecation behavior of one household member, 3) self-reported behavior of the household as a whole, 4) self-report of having a latrine, 5) self-report of having a private non-shared latrine, and 6) the observation of a latrine. Depending on which indicator was analyzed, the ODF status of the communities changed. For example, results from self-report of household members' defecation habits and enumerator verification that there were no feces around the household, ODF status falls between 45 and 65%. Using the measure of having all family members using a latrine when defecating at home, less than 60% of households are ODF. t Lastly, according to the self-report of "having a latrine", 92% of households in Dodota and Sire are meeting the sanitation goal of being open defecation free.

Follow-up of HEW, types of difficulties experienced with latrines, and household demographic factors were also examined in relationship to ODF status. Spatial analysis was used to examine the density of HEW follow-up geographically and relationship to the prevalence of open defecation. The results presented should be considered as guidelines for future studies, and

areas to consider for future interventions. Results are further discussed here in the light of what is practically significant for field work, as well as results from similar studies.

Results in Context

Overall Findings

The rates of latrine coverage, evidence of open defecation, and reports of open defecation behavior in the study area were not aligned with governmental reports of full ODF status in the area [6, 18, 54, 107]. Considering other recent studies in Ethiopia on latrine coverage and open defecation, the rates found in this study are in line with other rural populations [11, 86, 108]. The findings that Dodota and Sire have spatially similar latrine coverage, but spatially different open defecation patterns indicates that latrine coverage is not equivalent to open defecation behavior. This aligns with previous findings from India, Kenya, Ghana, and Amhara Region of Ethiopia [10, 12, 40, 59, 66, 93, 109]. Additionally, the kernel density indicates HEW follow-up at households is different across *woreda* lines. Adherence to the intervention during implementation is critical to the long-term success of many WASH programs. These differences between the two *woredas* indicate possible poor adherence to some components of the intervention by the implementers in Dodota. This is not surprising, as multiple other reports have noted poor adherence to implementation guidelines when the intervention is scaled-up [18, 84, 86, 88, 90].

Superstructure / Structural results

The finding that many of the latrines examined did not have slabs, doors, roofs, or provide adequate privacy to the user is not surprising in light of the frequent criticism that CLTSH leads to the building and use of only unimproved sanitation facilities [12, 86, 88]. However,

the findings that the majority of issues reported by households were either related to, or could be prevented by an adequate superstructure, have not been previously examined in literature. Previous studies have reported people having issues with non-structural components of the latrines such as flies, smell, safety, cleanliness or social perceptions [34, 50, 69, 86, 87, 90]. As some of these other studies were completed in different geographic and cultural regions, it is possible that the issues experienced by the communities in this follow-up were not experienced elsewhere. A lack of studies examining the dimensions of the superstructure prevents a conclusive statement on this point.

No residents reported overflow due to rain and groundwater, which may be due to a misunderstanding about the difference between filling due to rain and filling due to use. Another issue reported that should be considered in light of lower rates of children aged 6-14 reporting latrine use, particularly in Dodota, is respondents reporting that they felt that latrines were unsafe for children or girls. Safety has been discussed in qualitative studies of sanitation, particularly for women and girls who feel that they may be targeted while going to or from the latrine [65, 69, 75, 83, 87, 88].

Factors associated with open defecation

One proposed theory on why people who own a latrine may not use a latrine is that there is some type of problem with the latrine itself. If so, it would be fair to expect that A) there would be equivalent or a greater number of households reporting difficulties in households practicing open defecation and B) kebeles experiencing more difficulties with their latrines would demonstrate higher proportions of evidence of open defecation (as observed by study enumerators). These expected patterns were not found in this study.

Examining the map of households with latrines next to the map of observed open defecation (Figures 3 & 4), it becomes evident that there is not a clearly visible correlation between latrine ownership proportions and open defecation behavior proportions. It is possible that a pattern could be elucidated through more complex statistical methods, however, this is not practical for NGOs working in these areas. Furthermore, it highlights that utilizing latrine ownership is not a sufficient indicator for open defecation free communities. Part of the status of OD may potentially be explained by difficulties that homeowners have faced with latrines. The large number of households either reporting OD behavior, or having evidence of OD around the household, who did not report any difficulties at all with their latrines points to the existence of a myriad of other factors explaining the behavior.

However, the latrine issues faced by some households should not be ignored if by solving these issues more members of the community will be inclined to use a latrine consistently. For example, the largest issue in Dodota was reported to be the collapse of the superstructure (28.3% of those experiencing issues reported collapse). If superstructure collapse was addressed, then 24 households reporting this as a reason for abandoning the latrine *may* have continued usage, representing 7% of households in Dodota.

Regarding the bivariate analysis of demographic determinants of open defecation, the factors were chosen based on previous reports of factors associate with OD behavior [12, 53, 56, 57, 67, 110]. Having children in school was considered a determinant for open defecation behavior as there were additional WASH interventions occurring in regional schools, including "hygiene clubs". Having a slab for the latrine was examined because having a slab indicates that additional investment was put into the physical structure of the slab. This investment could be viewed as an indicator of the homeowners' personal value around the latrine. This is confirmed by the similar

pattern between the proportion of HH that are ODF that have a slab and those who self-reported they think latrines are important. Homes without a slab were entirely ODF 43.3% of the time, and those who reported that they did not feel latrines were important were ODF 42.2% of the time. In contrast, homes with slabs were 91.4% ODF, and those feeling latrines were important were 89.3% ODF (Figure 17). These two indicators show the largest difference among the potential factors related to OD behaviors (Figure 17).

Woreda-Level Differences

The map of open defecation behavior shows a sharp divide geographically between open defecation behavior in Dodota and Sire, despite similar socioeconomic and physical geographic factors in Dodota and the lowlands of Sire. In lowland Sire, the highest rate of observed open defecation was 9%, which is different from the lowest rate in Dodota of 17%. Only five kilometers separates a kebele in Dodota with 17% open defecation from one with 4% open defecation in Sire. The most obvious potential difference between these two kebeles is the governance of their primary health systems. Another consideration for these results is that the study enumerators did not observe fields, stream beds, or fields where animals are let to graze for signs of human defecation. The map demonstrates the observation of human feces in the immediate household environment only.

Finally, the kernel density maps, taken together, suggest that HEW visits are not distributed evenly throughout the regions. Kebeles in Dodota, even large kebeles, are not receiving HEW home visits, despite reports from HEW that they visit all households on a monthly basis. Areas of dense HEW visits have lower rates of open defecation evidence, while areas of low HEW visitation had higher rates of open defecation evidence. Use of HEW follow-

up as an indicator of sanitation coverage is difficult due to the reports that HEW are overtaxed and underpaid for the amount of work they perform for the community. Analyses to determine if they are visiting all of their assigned households could have implications for their employment and livelihood [19, 86, 93, 111-113].

Limitations and delimitations

Poor qualitative data collection: Due to time restraints, training in qualitative interviewing techniques for the CRS staff member performing the translations did not occur. Additionally, the choice was made to use the same translator throughout the interviews, despite multiple languages being used. While using the same translator was convenient, it created opportunity for translation errors for the Amharic language interviews, as both Amharic and English were secondary languages for the translator. Also, the methodology in the qualitative portion of this study was not ideal, as factors that would be interesting to be probe were likely missed during the translation. These constraints led to the use of the qualitative information for survey instrument design, but not a full thematic analysis. Future studies should consider providing in-depth qualitative interview training for staff in order to avoid errors of translation during the interview, as well as discussion about how to probe on particular word choices in local languages.

Religion as a confounder: While this study did not collect data on religion, previous studies have evaluated the importance of religion as a correlate in latrine adoption and usage [34]. No significant association was found in these prior studies, and given the ethical concerns surrounding collecting data on religion, the question was removed from the survey. As research into potential relationships between religious affiliation and sanitation status is ongoing, it is

possible that the omission of collecting data on religion reduced the strength of current and future analyses utilizing these data.

Length of survey: The survey demographic and sanitation questions as well as a large number of water and hygiene components (see Appendix A). The survey was therefore lengthy, and created opportunity for both the enumerators and respondents to be less attentive as they attempted to complete the survey. Further, potential errors in data entry and rushing to the end of surveys could lead to poor data quality. There was no documentation or analysis of responses from surveys that may have been poorly conducted.

Lack of official kebele maps: In the spatial analysis phase, official maps of the kebele boundaries could not be found. This lack of information required this author to use estimations of regional boundaries, and thus, non-contiguous shapes / boundaries, affecting which types of spatial analysis could be used.

Inconsistent census data: The most recent official census data is 10 years out-of-date and recent data from local (woreda) sources do not align with the past census data regarding the percentage of the population in urban vs. rural areas. Additionally, the last census reports the number of people, while woreda level data is reported as number of households. This led to estimations of the number of people and the number of households in different regions. These estimations could have created inaccuracies in sample size calculations. These possible inaccuracies were addressed by using the 50% level for the estimate of OD prevalence to get the largest possible sample size. Whether or not the sample size was sufficient to detect statistical significance is unknown. For this reason, this paper considers *practical* differences that can be easily interpreted from the data; and the type of results that can be acted on in future iterations and interventions for sanitation.

Population movements: There is no guarantee that the individuals currently living in the study area were living in the area at the point of triggering in the intervention. Political unrest, drought, environmental change, and search for better economic opportunity leads to migration within Ethiopia [4, 6, 14, 15, 17, 100, 101, 107, 114, 115]. This study did not investigate how long a household (or member) had lived in the area. Additionally, movement of those who received the intervention but are no longer in the area was not measured.

Recall Bias: Surveys with self-report from respondents are prone to recall bias, as well as reporting bias [85, 106, 116, 117]. To account for recall bias in this survey, respondents were asked to report about behaviors within the past 24 hours. However, this leads to a limitation in capturing the behaviors of respondents and their household members over longer periods of time, including the difference between market (or travel) days and days spent at home. All findings from self-report about open defecation should be considered with recall and response bias in mind, since it is a sensitive topic.

Chapter 6: Areas of Further Study / Recommendations

For Funders and Implementers

Implementing organizations and funders can benefit from critical review of successes and failures of CLTSH as a means of improving sanitation. Specific recommendations are made below for organizations looking to implement, improve, or augment CLTSH

Implementation evaluation: Due to the clear disparity in open defecation behavior between the two *woredas*, one likely explanation is lack of adherence to the protocols for CLTSH set out by the Ethiopian government. Though evaluation of past interventions is not financially prudent, future CLTSH interventions in Ethiopia should have a built-in monitoring and evaluation of the implementation of the intervention – both evaluation of the triggering phase, and evaluation of the follow-up phase. Without these evaluations, it is difficult to know if program failures are due to the intervention itself, or due to incomplete and/or poor quality implementation of CLTSH.

HEW follow-up: As found by previous NGO studies, follow-up is often lacking in CLTSH interventions. While the HEW program theoretically involves monthly household visits by the HEW for a variety of health interventions, including the seven WASH interventions, this study found that many households had no recollection of having been visited by an HEW ever, let alone in the past month. It is recommended that HEW are given more leeway to report their true ability to follow-up with households, and expand the number, role, and support of Health Development Army (HAD) workers and HEWs in order to ensure that each household does, in fact, get WASH follow-up. Additional studies should be performed to see what the barriers are to HEW performing follow-ups, as well as to determine the way in which follow-up may function as a mediator to the success or failure of CLTSH to result in long-term sustainability of latrine usage.

Push for improved sanitation over unimproved: The continued usage of CLTSH in Ethiopia may lead to decreases in open defecation, but as it stands, it will not lead to safely managed sanitation. Significant additions to the current national WASH protocols and plans in Ethiopia should be made to ensure that communities will move up the sanitation ladder. The latrines inspected during the enumerator observations rarely qualified as improved sanitation, and thus left homeowners and users of the latrine at risk of coming in contact with fecal waste. By encouraging the use of slabs, drop-hole covers, and washable materials in the construction of latrines, better health outcomes would be possible.

Better superstructures: The surprising finding of this study was that the majority of issues homeowners faced with their latrines were not related to smell, flies, or cleanliness – but rather issues related to the superstructures. This finding points to possible interventions that can address these issues. For example, the rapid filling of the latrines in highland areas can be partially addressed by encouraging water-tight roofing materials to decrease the amount of rainwater entering the latrine.

For Governments and Policy Makers

When reporting to government ministries, provide updates on success/failure of CLTSH and the need for supplemental interventions. NGOs, particularly large NGOs with an established presence such as CRS, should use their visibility to make suggestions to the ministry of health and the ministry of water and energy. Presentations should include what CLTSH has achieved and information about current failures.. Additionally, NGOs should recommend specific supplemental interventions to improve outcomes. It is clear that CLTSH alone will not achieve the goals of the Ethiopian government.

Change in reporting and verification procedures: The affirmative response to the question "Do you have a latrine?" is insufficient to gather accurate information about the state of sanitation in remote areas. Asking households to report on the defecation behaviors of multiple household members provides a more detailed picture of who is and is not using latrines in areas where latrines are present. Asking about each individual household member may be too time-consuming for HEW to complete each month, however, this indicator could be used as part of the verification process for community ODF status as laid out by the federal government.

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Appendices

Appendix A Survey Instrument

CATHOLIC RELIEF SERVICES, WASH BRANCH, ETHIOPIA

CLTSH-ODF Follow-up Instrument: Oromo Region 2017 – 2018

Interviewer Name: _____

Interviewer #: _ _ _ _

Woreda: SIRE / DODOTA (*MARK ONE*)

Kebele: _____

Village: _____

Date of Survey (*DD/MM/YYYY*): _ _ / _ _ / _ _ _ _

Language Survey given in: _____

Time of survey start: _ _ : _ _

INSTRUCTIONS TO THE SURVEYOR

Do not read aloud words in italics. Read all answer options unless otherwise directed. Carefully fill in each question. Remind the participant that they can skip any questions which they are uncomfortable with, and can continue the rest of the survey. Read the statement of consent (below), prior to continuing with the survey. Unless otherwise noted, read answer choices to multiple choice questions, but not yes/no questions. Note if a question needed clarification from the respondent.

→ *CONTINUE*

Statement of Consent: *Read the following aloud to the participant prior to beginning the survey. If they do not consent to participating in the survey, thank them for their time, and cease survey activity*

Hello, my name is _____ and I am working with Catholic Relief Services on a program regarding sanitation and latrines in communities around Oromia. Your household has been randomly chosen to participate. It should take about 45 minutes to complete the entire survey, which will also include a visual inspection of sanitation facilities if you agree to it. All information gathered will be kept anonymous – we will not be collecting your name or other identifying information. Your individual responses will only be accessed by research team members. You may stop the interview at any time, and you may also skip any questions which you are uncomfortable with. Do you agree to participating in this survey?

Indication of verbal affirmation: *Yes / No* (*IF **NO**, DO NOT PROCEED WITH SURVEY)*

YES → CONTINUE TO DEMOGRAPHICS PAGE

DEMOGRAPHICS PAGE

I. Gender of person interviewed SELECT 1

a. Mother / Female head of house
b. Female over 15 years
c. Male over 15 years

II. Roof Material SELECT 1

a. *Corrugated iron sheet*
b. *Concrete or cement*
c. *Thatch*
d. *Wood and mud*
e. *Bamboo or reed*
f. *Plastic / Shera*

g. *Asbestos*

I would like to begin with learning some basic information about you

1.1 What is the primary language spoken in the home? (SELECT 1)

a. Amharic
b. Oromofiia
c. Tigrinya
d. Guragiegna

1.2 Are you the head of household? (SELECT 1)

e. Yes → **GO TO 1.4**
f. No → **GO TO 1.3**

1.3. Educational status of the respondent

1 = No Education
2 = Can read or write (informal education only)
3 = Grade 1-4 (Primary School)
4 = Grade5-8 (Primary School)
5= High school and above

1.4 Educational status of the head of the HH

1 = No Education
2 = Can read or write (informal education only)
3 = Grade 1-4 (Primary School)
4 = Grade5-8 (Primary School)
5= High school and above

1.6 How many persons live in this household? (*Household is defined as* "persons who sleep here at night and eat out of the same cooking pot"*)*

g. _ _ _ persons (ENTER #)

1.7 How many children under 5 live in this household?

h. _ _ _ children (ENTER #)

1.8 Are there any children in the household who currently attend school? (*primary or secondary*) (SELECT 1)

1.7.1 Yes

1.7.2 No

1.10 Do you own a radio? (SELECT 1*)*

i. Yes

j. No

1.11 Do you own a television? (SELECT 1)

k. Yes

l. No

1.12 Do you own a phone? (*Either landline or mobile phone)* (SELECT 1)

m. Yes

n. No

→ **CONTINUE TO SECTION A**

SECTION A

Next are a series of questions relating to defecation and latrines

A1. What is the main source of drinking-water for member of your household?

a. Piped water into dwelling

b. Piped water to yard/plot

c. Public tap/standpipe

d. Tubewell/borehole

e. Protected dug well

f. Unprotected dug well

g. Protected spring

h. Unprotected spring

i. Rainwater collection
j. Bottled water
k. Cart with small tank/drum
l. Tanker-truck
m. Surface water (river, dam, lake, pond, stream, canal, irrigation channels)

A2. What is the main source of water used by your household for other purposes, such as cooking and hand washing?

a. Piped water into dwelling → **GO TO A5**
b. Piped water to yard/plot → **GO TO A5**
c. Public tap/standpipe
d. Tubewell/borehole
e. Protected dug well
f. Unprotected dug well
g. Protected spring
h. Unprotected spring
i. Rainwater collection
j. Bottled water
k. Cart with small tank/drum
l. Tanker-truck
m. Surface water (river, dam, lake, pond, stream, canal, irrigation channels)

A3. How long does it take to go there, get water, and come back?

a. _ _ _ minutes (enter #)

A4. Who usually goes to this source to fetch the water for your household? (*Probe if the person is under 15, what gender)* (SELECT ONE)

a. Adult woman
b. Adult man
c. Female child (under 15 years)
d. Male child (under 15 years)

A5. Do you treat your water in any way to make it safer to drink? (SELECT ONE)

a. Yes → **GO TO A6**
b. No → **GO TO A7**

A6. What do you usually do to the water to make it safer to drink? (SELECT ALL THAT APPLY)

a. Boil
b. Add bleach / chlorine
c. Strain it through a cloth
d. Use a water filter (ceramic, sand, composite, etc.)
e. Solar disinfection
f. Let it stand and settle
g. Nothing

A7. Where do you store your water for drinking?

a. Jerry can
b. Bucket with lid and tap
c. Bucket with large, removable lid (such that pitcher is dipped in for removal)
d. Plastic roto (up to 200 liters)
e. Barrel with lid
f. Barrel without lid
g. Brick/clay pot

A8. Where do you store your water for other uses?

a. Jerry can
b. Bucket with lid and tap
c. Bucket with large, removable lid (such that pitcher is dipped in for removal)
d. Plastic roto (up to 200 liters)
e. Barrel with lid
f. Barrel without lid
g. Brick/clay pot

A9. What kind of latrine facility do members of your household usually use? (SELECT 1)

a. Flush / pour flush → **Go to A10**
b. Ventilated improved pit latrine → **GO TO A11**
c. Pit latrine with slab → **GO TO A11**
d. Pit latrine without slab / open pit → **GO TO A11**
e. Composting toilet (including arborloo) → **Go to A11**

f. Bucket → **Go to A11**

g. Hanging toilet / hanging latrine → **Go to A11**

h. No facilities / bush, open field, ditch, etc (*open defecation)*→ **Go to A16**

A10. Where does it flush to? (SELECT 1*)*

a. Piped sewer system

b. Septic tank

c. Pit latrine

d. Elsewhere

e. Unknown / not sure

A11. Do you share this facility with other households? (SELECT 1*)*

a. Yes → **A12**

b. No → **A14**

A12. How many households share this latrine? _ _ _ *(*ENTER #*)*

A13. Can any member of the public use this latrine? *(*SELECT 1*)*

a. Yes

b. No

c. Don't know

A14. How long has this latrine been in use? *(*SELECT 1*)*

a. Less than 6 months

b. 6 months to 1 year

c. 1-2 years

d. More than 2 years

e. Don't know

A15. Is this latrine a replacement for an older latrine? *(*SELECT 1*)*

a. Yes

b. No

A16. The last time you defecated where did you go? (SELECT 1)

a. Household latrine

b. Public latrine

c. Field, bush, or behind tree, in the compound

d. Into drain, ditch, or stream

A17. The last time another adult (*person over age 15*) in the household defecated, where did they go? (SELECT 1)

a. Household latrine
b. Public latrine
c. Field, bush, or behind tree
d. Into drain, ditch, or stream

A18. The last time a child aged 6 to 14 defecated, where did they go? (SELECT 1)

a. Household latrine
b. Public latrine
c. Field, bush, or behind tree
d. Into drain, ditch, or stream

A19. Are there children, toddlers, or infants under 5 in the household? (SELECT 1*)*

a. Yes **Go to A20**
b. No **Go to A23**

A20. The last time the youngest child passed stools, where did they do so?

a. Child used toilet / latrine
b. Child used a diaper / cloth / plastic bag
c. Child went outside / on ground

A21. The last time the youngest child passed stools, what was done to dispose of the stools? (SELECT 1)

a. Child used toilet/latrine
b. Put/rinsed into toilet/latrine
c. Put/rinsed into drain or ditch
d. Thrown into garbage (solid waste)
e. Buried
f. Left in the open
g. Other
h. Don't know

A22. Have any children under 5 had diarrhea (more than 2 loose stools in 24 hours) in the past 2 weeks? (SELECT ONE)

a. Yes

b. No

A23. The last time you were away from the home where did you defecate (SELECT ONE*)*

a. A latrine
b. Along the road
c. In the field
d. In the river / creek / stream
e. Other _____

A24. Did you wash your hands yesterday? (SELECT ONE)

a. Yes
b. No

A25. What did you use to wash your hands yesterday?

a. Only water → **GO TO A27**
b. Water and soap / or ash → **GO TO A26**

A26. Can you bring me the soap or ash? (record how long it takes them to bring soap)

a. Less than 1 minute
b. 1-5 minutes
c. More than 5 minutes

A27. When during the day do you wash your hands? (SELECT ALL THAT APPLY)

a. Before preparing food
b. After using the latrine
c. Before eating
d. Before breastfeeding
e. After handling a child's feces
f. After handling animals

→ **CONTINUE TO SECTION B**

SECTION B

Now I would like to learn more about sanitation upkeep for this household

B1. Where do materials to build the superstructure (walls / roof) of the latrine in this household typically come from? *(*SELECT 1*)*

a. Local supplies that household may collect without any cost
b. Local supplies that are bought with money
c. Adjacent town
d. Most of the materials must be brought in from more than 30 kilometers
e. Don't know

B2. Where does the slab to build a latrine come from?

a. Local supplies that household may collect without any cost
b. Local supplies that are bought with money
c. Adjacent town
d. Most of the materials must be brought in from more than 30 kilometers
e. Don't know

B3. In general, do you feel that materials for the latrines are: (SELECT 1*)*

a. Expensive
b. Moderately priced
c. Affordable
d. Free

B4. In general, do you feel that the labor costs for the latrines are: (SELECT 1)

a. Expensive
b. Moderately priced
c. Affordable
d. Free (Build my household members)

B5. Would you ever build a new latrine? (SELECT 1)

a. Yes → **GO TO B5**
b. No → **GO TO B6**

B6. When would this household build a new latrine? (SELECT ALL THAT APPLY)

a. When resources become available *YES* / *NO*
b. When current latrine fills *YES* / *NO*
c. When current latrine breaks *YES* / *NO*
d. When a better design is introduced *YES* / *NO*

e. When it becomes easier to keep clean *YES / NO*

f. When the neighbors and other community members build new latrines *YES / NO*

g. When community leaders recommend a new latrine should be built *YES / NO*

B7. Have you had any difficulties with the latrine?(SELECT 1*)*

a. Yes → **GO TO B7**

b. No → **GO TO B11**

B8. Which of the following difficulties have you had with latrines? *READ ALOUD* (SELECT ALL THAT APPLY)

a. Collapse of superstructure

b. Collapse of the pit

c. Filling (due to use)

d. Overflow (due to rainy season, groundwater rising)

e. Smell

f. Flies

g. Lack of privacy

h. Not safe for girls or children (physical hazard)

i. Too small (low roof, narrow walls)

j. Unable to establish tree / plants on old pit

B9. Have repairs been made to the latrine with difficulties? (SELECT 1)

a. Yes

b. No

B10. Is the latrine that had difficulties still in use? (SELECT 1)

a. Yes → **GO TO B101**

b. No → **GO TO B10**

B11. Did you abandon the latrine because of the difficulties? (SELECT 1*)*

a. Yes

b. No

B12. Have you ever had a visit from a Health Extension Worker? *(*SELECT 1*)*

a. Yes

b. No → **Go TO SECTION C**

B13. When was the last time you had a visit from a Health Extension Worker?

a. 1 week or less
b. 1-2 weeks
c. _ _ _ weeks (ENTER #)

B14. What did the Health Extension Worker discuss the last time she visited concerning water, hygiene, and sanitation (DO NOT READ ALOUD)? (SELECT ALL THAT APPLY)

a. Sanitation, open defecation, latrines
b. Sanitation marketing – getting a pit slab, shower device, etc.
c. Hand washing
d. Personal hygiene, showering, washing clothing
e. Food sanitation, washing vegetables, storing food properly
f. Safe water storage
g. Water treatment, getting water from safe sources
h. Diseases related to sanitation, diarrhea, worms
i. Don't know / none of the above

B15. Did the Health Extension Worker discuss personal hygiene (*showering / washing clothing*) the last time she visited?

a. Yes
b. No
c. Don't know

→ CONTINUE TO SECTION C

SECTION C

Now I would like to know more about your thoughts regarding latrines and defecation

C1. How often do you see someone of any age defecating in the open? (SELECT 1)

a. Daily

b. 2-5 times per week
c. Once per week
d. Once every two weeks
e. Once a month
f. Never
g. I don't know

C2. Which of the following do you feel when you see someone defecate in the open? *Probe "anything else?" twice. Mark all answers that they mention. (*SELECT ALL THAT APPLY)

a. Disgust
b. Fear of disease
c. Shame
d. Anger
e. Sadness
f. No feelings

C3. Do you strongly agree, agree, disagree or strongly disagree or neither agree nor disagree with the statement "It is shameful to defecate in the open (not in a latrine)" (SELECT 1)

a. Strongly Disagree
b. Disagree
c. Neither disagree nor agree
d. Agree
e. Strongly Agree

C4. Do you strongly agree, agree, disagree or strongly disagree or neither agree nor disagree with the statement "I always prefer to use a latrine than defecate in the open" (SELECT 1)

a. Strongly Disagree
b. Disagree
c. Neither disagree nor agree
d. Agree
e. Strongly Agree

C5. Do you strongly agree, agree, disagree or strongly disagree or neither agree nor disagree with the statement "I would prefer to defecate in the open than use a latrine" (SELECT 1)

a. Strongly Disagree
b. Disagree
c. Neither disagree nor agree
d. Agree
e. Strongly Agree

C6. Which of the following things do you think of when you think about defecating in the open? *READ OPTIONS ALOUD* (SELECT ALL THAT APPLY)

a. Create bad smells
b. Prevent bad smells
c. Attract flies
d. Get rid of flies
e. Lack of privacy
f. Having privacy
g. Cleanliness
h. Dirtiness
i. Pride
j. Shame
k. Pressure from neighbors not to defecate in the open
l. Pressure from neighbors to defecate in the open
m. Embarrassment of being seen
n. Fertilizer for field
o. No cost
p. Cost is expensive

C7. Which of the following things do you think of when you think about latrine usage? *READ OPTIONS ALOUD* (SELECT ALL THAT APPLY)

a. Create bad smells
b. Prevent bad smells
c. Attract flies
d. Get rid of flies

e. Lack of privacy
f. Having privacy
g. Cleanliness
h. Dirtiness
i. Pride
j. Shame
k. Pressure from neighbors not to use a latrine
l. Pressure from neighbors to use a latrine
m. Embarrassment of being seen
n. Fertilizer for field or growing on pit
o. Cost is expensive
p. Cost is cheap
q. Needing to make repairs

C8. Do you know of anyone building latrines for those unable to do so because of disability or financial difficulty? *(*SELECT 1)

a. Yes
b. No

C9. Do you think having a latrine is important? (SELECT 1)

a. Yes → **GO TO C10**
b. No → **GO TO C11**

C10. Why do you think having a latrine is important? (SELECT ALL THAT APPLY)

a. Prevent disease
b. Keep feces away from food
c. Composted latrine contents can be used as fertilizer
d. The government wants us to have latrines
e. It is a point of pride in the community

C11. Do you remember any community discussions happening about open defecation and latrines? *(*SELECT 1*)*

a. Yes, **GO TO C12**
b. No **GO TO SECTION D**

C12. Did anyone in the household attend the discussion? *(*SELECT 1*)*

a. Yes, **GO TO C13**

b. No **GO TO SECTION D**

C13. How did you feel after the discussion? *(*SELECT ALL THAT APPLY*)*

a. Excited to change things

b. Shame

c. Disgust

d. Pride in the community for making changes

e. Nothing

f. Other _____

C14. *Written Notes on things respondent said during survey (Ex: type of tree planted on pit, what they remember about the triggering event, anything else importantetc.) (ONE-TWO SENTENCE RESPONSE SPACE)*

a. _____

b. _____

c. _____

Time of verbal survey end _ _ : _ _

SECTION D: VISUAL INSPECTION

Now I would like to see your latrine if you agree to it. May I see your latrine? Yes / No

If permission is given to see the latrine, please CONTINUE:

IF PERMISSION IS DENIED, END SURVEY HERE

D1.Is there evidence of open defecation around the household?

a. Yes

b. No

D2. Is there any type of latrine in the Household?

a. A. Yes → ***GO TO D3***

b. B. No → ***END SURVEY HERE***

D3. Is there a clear path from the household to the latrine? Clear means clear of rubbish, plants, etc. and looks as if it is regularly walked. SELECT 1

a. Yes

b. No

D4. How far is it from the household to the latrine?

a. Attached to the household

b. 1 – 2 meters

c. 3 – 5 meters

d. More than 5 meters

D5. Is there a handwashing station within ten paces of the latrine? A handwashing station is defined as a point that provides clean water which can be poured over the hands. SELECT 1

a. Yes → ***GO TO D6***

b. No → ***GO TO D8***

D6. Is there water available at the handwashing station? SELECT 1

a. Yes

b. No

D7. Is there soap or ash available at the handwashing station? SELECT 1

a. Yes

b. No

D8. Is there feces around the pit hole?

a. Yes

b. No

D9. How many flies are in the latrine? Count living flies that are on any surfaces or flying inside the latrine. SELECT 1

a. None

b. 1 - 10

c. *11 – 30*

d. *More than 30*

D10. *What material is the slab made from?*

a. *No slab*

b. *Cement*

c. *Stone*

d. *Plastic*

e. *Wood*

f. *Wood and mud*

D11. *Please check the boxes for anything that applies about the condition of the latrine (yes answer)*

a. *Are there feces on the floor of the latrine?*

b. *Is there soil, ash, or leaves available to cover feces after each use?*

c. *Are there things being stored in the latrine that are not related to latrine use?*

d. *Is the latrine at least 30 meters (approximately 40 paces) from a water source?*

D12. *The following questions are in relation to the latrine superstructure, please check the boxes for anything that applies (yes answer)*

a. *Does the latrine have a door?*

b. *Does the latrine have a lockable door?*

c. *Does the latrine have a walls that close around the entire latrine (no gaps other than door)?*

d. *Does the latrine have a roof?*

e. *Is there a slab that covers the entire pit?*

f. *Is there a lid to cover the slab opening?*

g. *If you push on the superstructure of the latrine, does it move?*

h. *Are there holes in the superstructure (walls or roof) that are from damage?*

i. *Is the roof securely attached to the walls? (would need tools to remove the roof)*

j. *Is the superstructure fully upright (not collapsed or leaning)?*

D13. *Please take a photo of the superstructure of the latrine*

D14. *Are there separate containers for drinking water and water for other uses?*

a. *Yes*

b. No

D15. Please check the boxes for anything that applies (yes answer) about water storage for DRINKING WATER (if separate containers) or GENERAL WATER STORAGE (if no separate containers)

a. Is there a lid on the container?

b. The opening of the container is wide enough to fit a hand inside?

c. It is possible to retrieve water from the container without coming in contact with the water?

d. Is there a faucet or spout on the container?

e. Is the opening of the container less than 20cm in diameter?

f. Do you see water treatment materials? (chemicals, filters, or cloth)

D16. Where is the jug used to retrieve drinking water stored?

a. On the floor

b. Inside the water storage container

c. On a shelf or hung from the wall

d. Do not see anything to retrieve drinking water

D17. Written Notes on latrine type and condition (Material type of superstructure, etc.) (1-2 SENTENCE RESPONSE SPACE)

a. _____

b. _____

Thank you for allowing us into your home and for participating in this survey today. This information will be used to improve programs in the future. Have a wonderful day.

Time of inspection end _ _ : _ _

Appendix B Key Informant Interview Guide

CATHOLIC RELIEF SERVICES WASH BRANCH ETHIOPIA

Key Informant Interview Plan, CLTS ODF 2017 – 2018

Research Questions being answered:

- **What is your key hygiene and sanitation approach to reach out the community?**
- Was the program/strategy delivered as intended?
- What was community involvement in the CLTS process like?

Target number of informants (saturation point – will be adjusted in the field):

- 8-10 health extension workers
- 5-6 kebele leaders
- Use purposive sampling – want health extension workers and kebele leaders from different kebeles (lowland/highland), representing different socioeconomic groups.
- Should take about 1 hour per interview

Notes for interviewer

The above questions are just guides for the sorts of things that may help answer the research questions of "Was the program delivered as intended?" and "What was community involvement in the CLTS process like?". If the informant says something interesting, feel free to ask them to tell you more about that topic.

Remember to probe further into topics that are related to the implementation of the program, thoughts of community members, and why the program did or did not work.

Try to stay as neutral as possible. As researchers we want to influence the informants as little as possible. Showing strong positive or negative emotion may lead to the informant saying what they believe the 'right answer' is, rather than their honest opinions.

Avoid questions that can be answered in one or two words. Things such as 'Have you…', 'How many…' and 'Did ____ occur?' can all be rephrased to encourage the informant to share their stories and opinions, which will tell the research team far more. For example 'Tell me about when you…', 'Describe the people who attended…' and 'What happened during…' will lead the informant to give a more thorough description.

Remember to debrief immediately afterwards so that the field notes are accurate as possible to what the informant stated.

Take note of any questions that were misunderstood by the informant, or topics / themes that came up repeatedly, and be sure to share that information with other interviewers so they may rephrase confusing questions, and probe about common topics.

Keeping the interview moving smoothly is important – if the informant begins to repeat things, move onto a new topic to save time.

Introductory Statement

Hello, my name is _____ , and this is _____ , who will be taking notes for us today. We are working with Catholic Relief Services and are looking into program sustainability for Community Led Total Sanitation. We are interested in the perspectives of community leaders who carried out the program. We will take notes for use program improvement only, and none of your identifying information will be accessible to anyone outside of the Catholic Relief Services research team. The interview will last about an hour, do you wish to continue?

To record as much information as possible we will be recording the interview, is that alright?

Semi-structured questions

1. Tell me about your work in _____ kebele *(Intro/Warmup question)*
    a. What do you do?

   b. How many kebele's do you work in?
   c. How long have you been a health worker / kebele leader?

2. What is your key hygiene and sanitation promotion approach/strategy to reach out the community?
   - CLTSH……..

3. What do you know about community led total sanitation?
   a. How do you feel about CLTS?
   b. What are the steps followed to implement the approach/strategy? CLTSH
   c. Who were key factors in the implementation process
   d. Who were the key actors in the process?
   e.

4. Describe your involvement in CLTS implementation
   a. Did you lead the implementation?
   b. Did you assist in implementation?
   c. What types of trainings did you attend?
   d. Tell me about sessions you led

5. Tell me more about the triggering event
   a. Where did it take place?

   b. How many people attended?
   c. What types of community members attended?
   d. Walk me through the steps of the event
   e. What were the reactions of the community to the triggering event?
   f. How do you feel it went?

6. What was in the action plan that the community developed?
   a. If they did not develop one, why do you think that is?
   b. Who all was involved in developing the action plan?

7. What has happened with the program since the implementation?
   a. How often are you able to revisit this program in this community?
   b. What sessions happened after triggering?
   c. Was the community declared ODF?
   d. What types of events happened when the community was certified ODF?

8. How did community members react to the work surrounding Community Led Total Sanitation?
    a. How did you handle their reactions?
    b. What was done to address issues they brought forward?

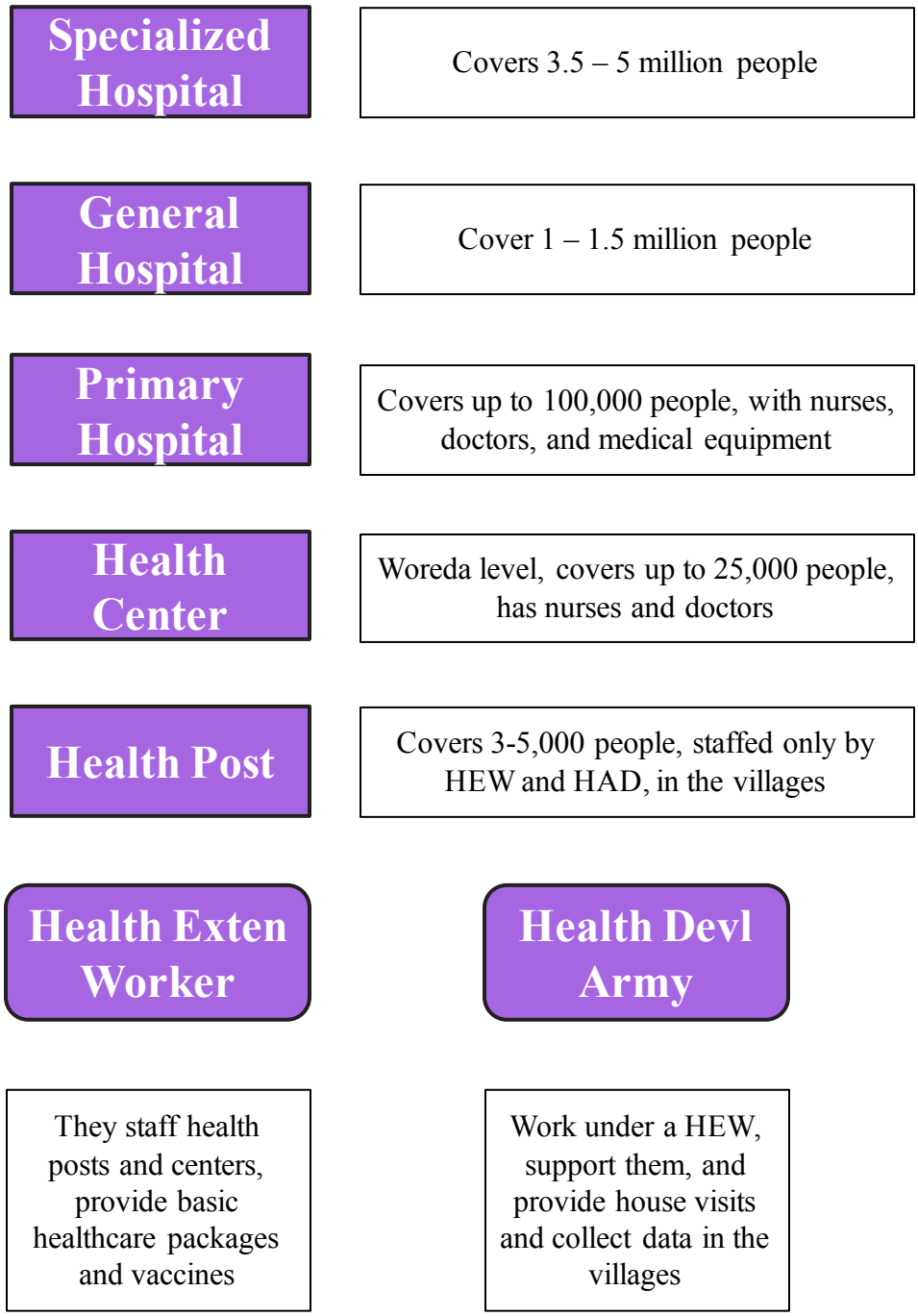
9. What types of latrines has the community built?
    a. What has happened with the filled pits?
    b. What issues have there been with these types of latrines?
    c. Do you think this status/ODF will sustain longer…..if not what are the reasons If yes Why???

10. How able are you to promote CLTSH?
    a. What is your work load like?
    b. What projects take priority?
    c. What type of assistance were you given when the additional CLTS work began?

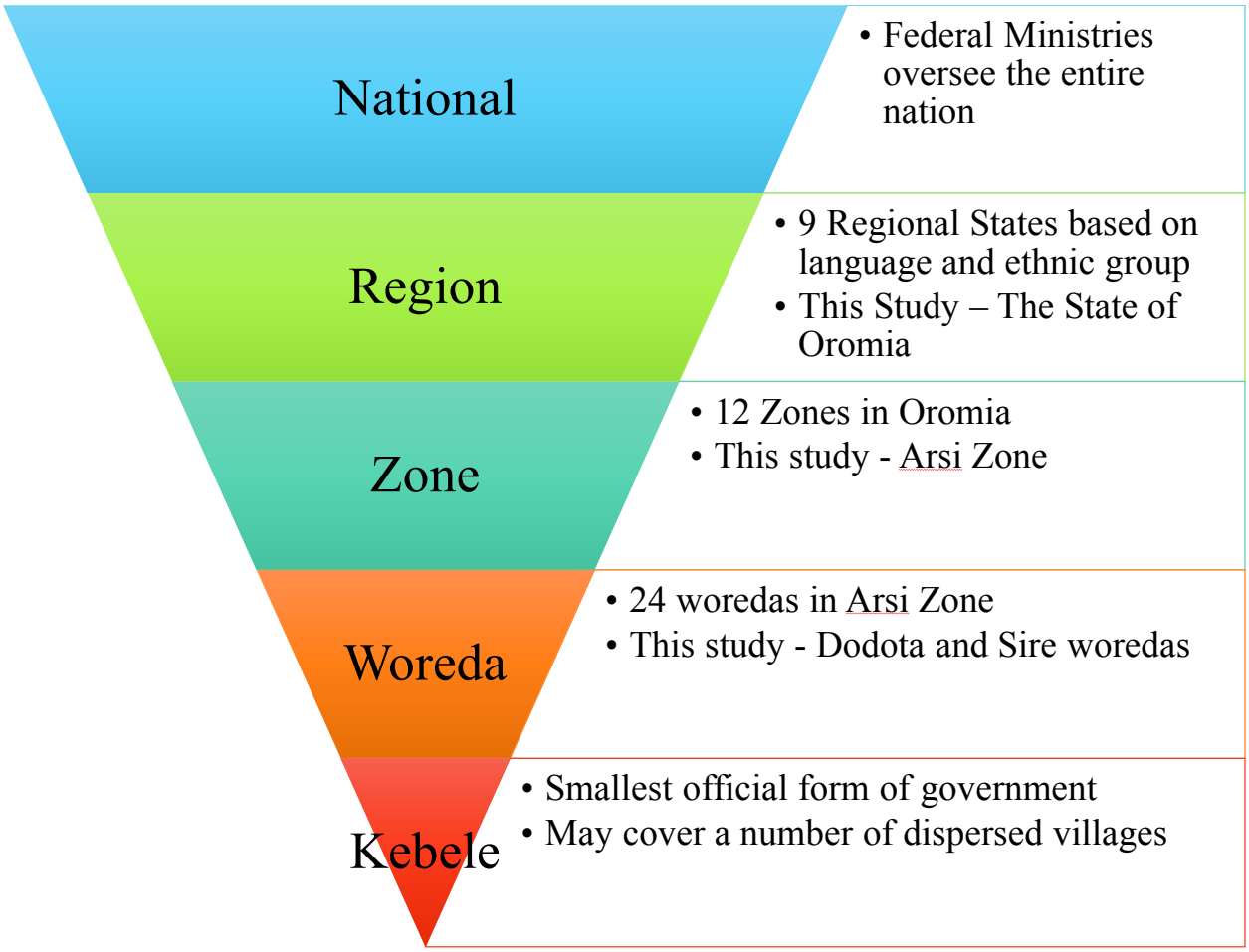
11. What do you think would decrease the practice of open defecation in this community? (*Wrap-up question*)

Thank you for participating today, and taking the time out of your full schedule to share your thoughts with us. Have a wonderful day.

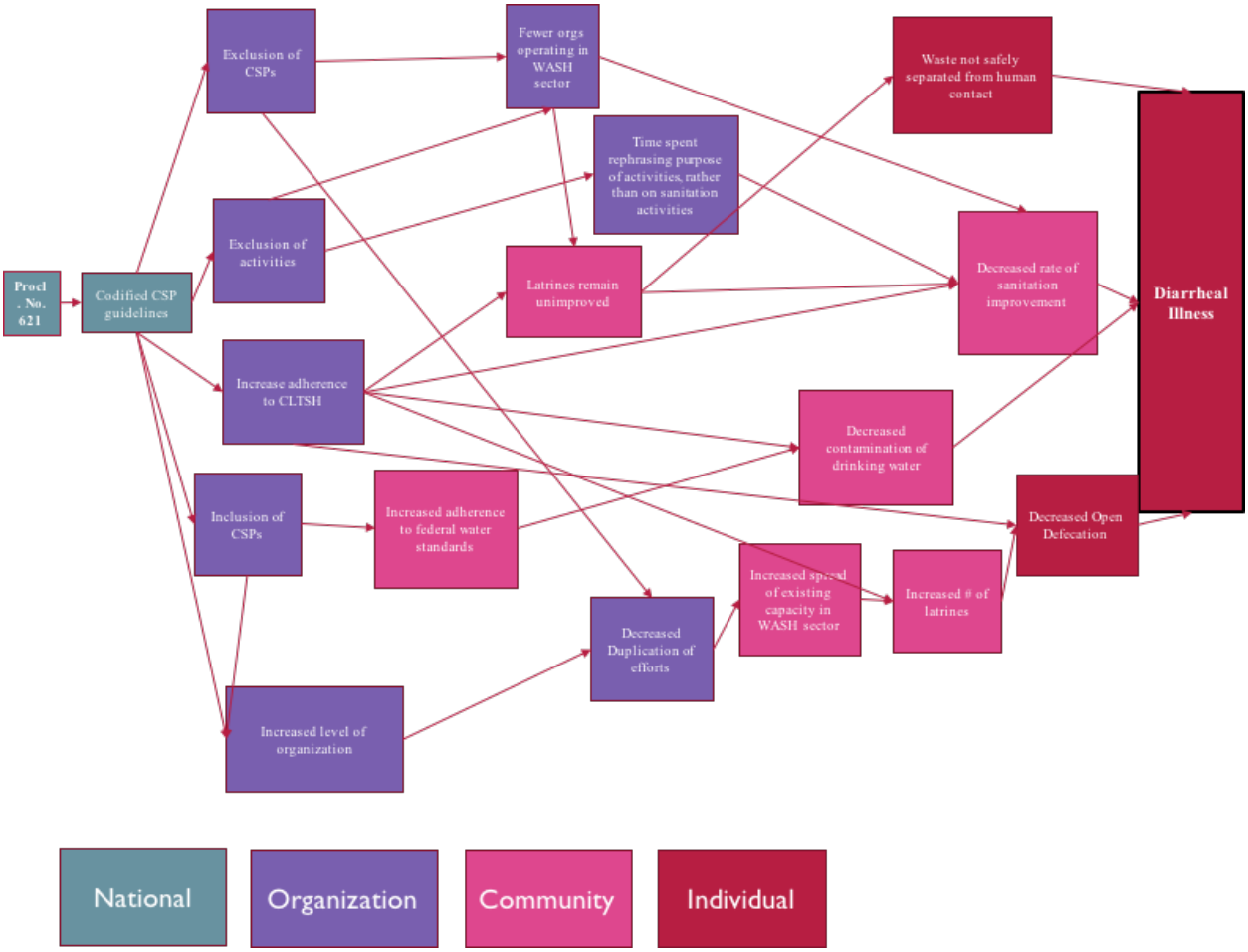
Appendix C Structure of Ethiopian National Health System [94]



Levels of the Ethiopian Federal Government



Appendix D Social Ecological Model Between Proclamation No. 621 and OD



Appendix E Post-Study Presentation to CRS Stakeholders

3/9/18

Sustainability of ODF status achieved using CLTSH approach

Samantha Lopez
August, 2017

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Overview

- Project Background and Research Questions
- Research Methods and Indicators
- Data Analysis thus far
- Key Points and Summary
- Future Data Analysis
- Questions

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Project Background

- **CLTSH National Standard**
  - Ethiopia's official national standard for reduction in Open Defecation (OD) is Community-Led Total Sanitation and Hygiene (CLTSH). These efforts are led largely by HEW and the HDA.
- **CRS's interventions**
  - Dodota – provided funding for CLTSH projects
  - Sire – provided funding for CLTSH projects along with additional interventions in the Lowlands
- **ODF Declaration**
  - To be declared Open Defecation Free (ODF) an area must have 100% latrine coverage, as well as public latrines for people passing through.
  - In Dodota and Sire, most kebeles were declared ODF in 2014 - 2015. Both woredas are entirely ODF certified at present.

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Research Questions and Objectives

- **Question A:** "What proportion of households in previously ODF certified communities are exclusively using latrines?"
- **Question B:** "What conditions cause people to abandon their latrine?"
- **Question C:** "What are the general attitudes towards defecating in the open?"
- **Additional sought for information:** Handwashing with soap, water source, and water storage, improved vs. unimproved latrines, HEW input on challenges of CLTSH.

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Research Methods

- **Survey**
  - The survey instrument included demographics, 3 sections of respondent self-report, and 1 segment of observation. The survey was designed utilizing both the Joint-Monitoring Programme (JMP) standard WASH questions, as well as previous CRS surveys.
  - Feedback was obtained on the instrument from the WASH team, Dr. Freeman at Emory, and the enumerators during training and piloting.
  - The survey was piloted in 24 households (HH) in a kebele not selected for the survey.
  - Surveys were conducted on Samsung A6 tablets.
  - Due to multi-stage clustering proportional to population size, the calculated sample size was 1,270. With 10% for non-response, the goal number of houses was 1,397. 1,332 were completed.
- **KII**
  - 8 Key Informant Interviews were conducted, with translation done by Lema to and from English.
  - 1 woreda level staff member, and 3 health extension workers (HEW) were interviewed each in Dodota and Sire.
- **Observations**
  - Enumerators were trained in key traits to look for in water storage and latrine structure and maintenance.
  - Additionally, enumerators took a photograph with the tablet of each latrine that was observed. Photos are used for cross-reference with marked observations

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Indicators

- **Demographic**
  - Presence of children attending school
  - Presence of children under 5
  - Economic: radio, tv, phone ownership, roof material
- **Head of HH education**
  - 5 levels from no education through higher education (high school level)
- **WASH**
  - Latrine type (improved or unimproved)
  - Diarrhea in CU5
- **Knowledge and Attitudes**
  - Memory of topics covered by HEW
- **Other**
  - Frequency of HEW visits
- **Latrine Specific (to determine improved status)**
  - Latrine type (pit, bucket, etc)
  - Slab: presence and material
  - Door: presence and lockable
  - Roof: presence and sturdiness
  - Walls: presence, sturdiness, privacy
  - Cleanliness: flies, feces on floor
  - Other: clearly used pathway

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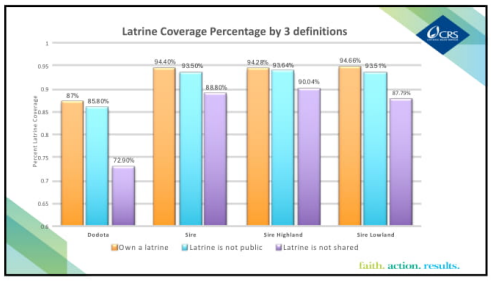

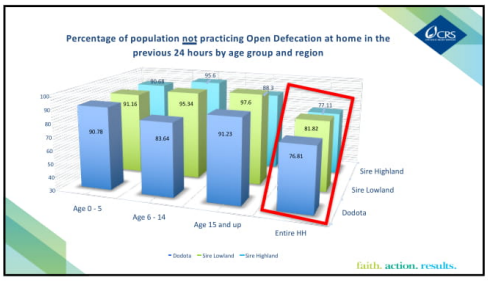

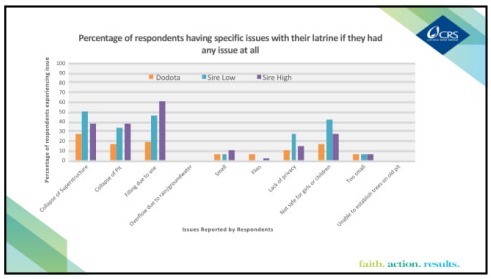

Notes from Enumerators – Latrine Negative

- **"They just build their home, and now it's planting season. They will build latrine later"**
- **"They started to dig latrine, but now they focus on farm"**
- **"Before we have a latrine – now it is damaged"**
- **"Currently household latrine was collapsed and they defecate away from the house under trees and so on."**

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Notes from Enumerators – Latrine positive

- **"Latrine is important for preventing different diseases"**
- **"He said that using latrine is our principle"**
- **"Since we started to use latrine our environment sanitation is highly improved"**
- **"Before we constructed toilets all people's used open defecation. At that time our area is not good, it have smell. Now our environment is cleared"**

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Key points

- **The quality of the latrine impacts latrine usage**
  - Poorly constructed latrines are utilized for shorter amounts of time, and when they collapse a household may revert to OD until a new latrine can be built, which may be months.
- **Issues depend on location**
  - Filling and collapse were issues everywhere, but the prevalence of each varied by geography.
- **Despite high latrine coverage, most latrines remain unimproved**
  - For a latrine to be improved it must: not be shared, and "hygienically separate human excreta from human contact" (JMP definition).
- **All age groups need to be targeted for ODF practices at all times**
  - The reason for OD in each age-group seemed to differ, which indicates a one-size fits all approach may not be the most effective

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3/9/18

Summary of Initial Findings and Recommendations

- **Despite the Woreda level reports that areas are ODF, dependent on the definition being used, there is up to 30% reversion to OD.**
  - Definitions matter – what is meant by latrine coverage, and what is meant by ODF need to be clearly stated. Owning a latrine is not a guarantee of latrine usage.
- **Moving up the sanitation ladder needs to be a focus of efforts to reduce OD.**
  - Poorly constructed latrines were more likely to be abandoned, leading to OD of the entire household.
  - Many issues perceived by HH can be prevented by better construction of the superstructure, and presence of a washable slab with a cover.
- **Follow-up is important. However, HEW are stretched thin and relying on them for HH follow-up is not practical**
  - Despite all HEW interviewed reporting monthly visits to HH, 68.9% of respondents had not been visited by a HEW in the past month.

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Future Analyses to be performed

- **Creating graded scales for superstructure durability and cleanliness**
- **Logistic regression of factors most related to OD**
- **Logistic regression of factors most related to having an improved latrine**
- **GIS of prevalence of pit collapse by elevation**
  - Give recommendation for different pit type dependent on soil structure
- **Sustainability over time based on ODF declaration date per kebele**
- **Analysis for clustering of slab ownership and improved latrine status**
- **ODF status per cluster by average time since HEW visit**

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Thanks to:

- **The WASH team, particularly Wondy and Lema**
- **The ICT4D team, particularly Meron**
- **The enumerators** for data collection and photographs
- **Matthew Freeman** Emory University, for instrument feedback
- **Meki Catholic Secretariat** for assistance with enumerator recruitment

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Questions?

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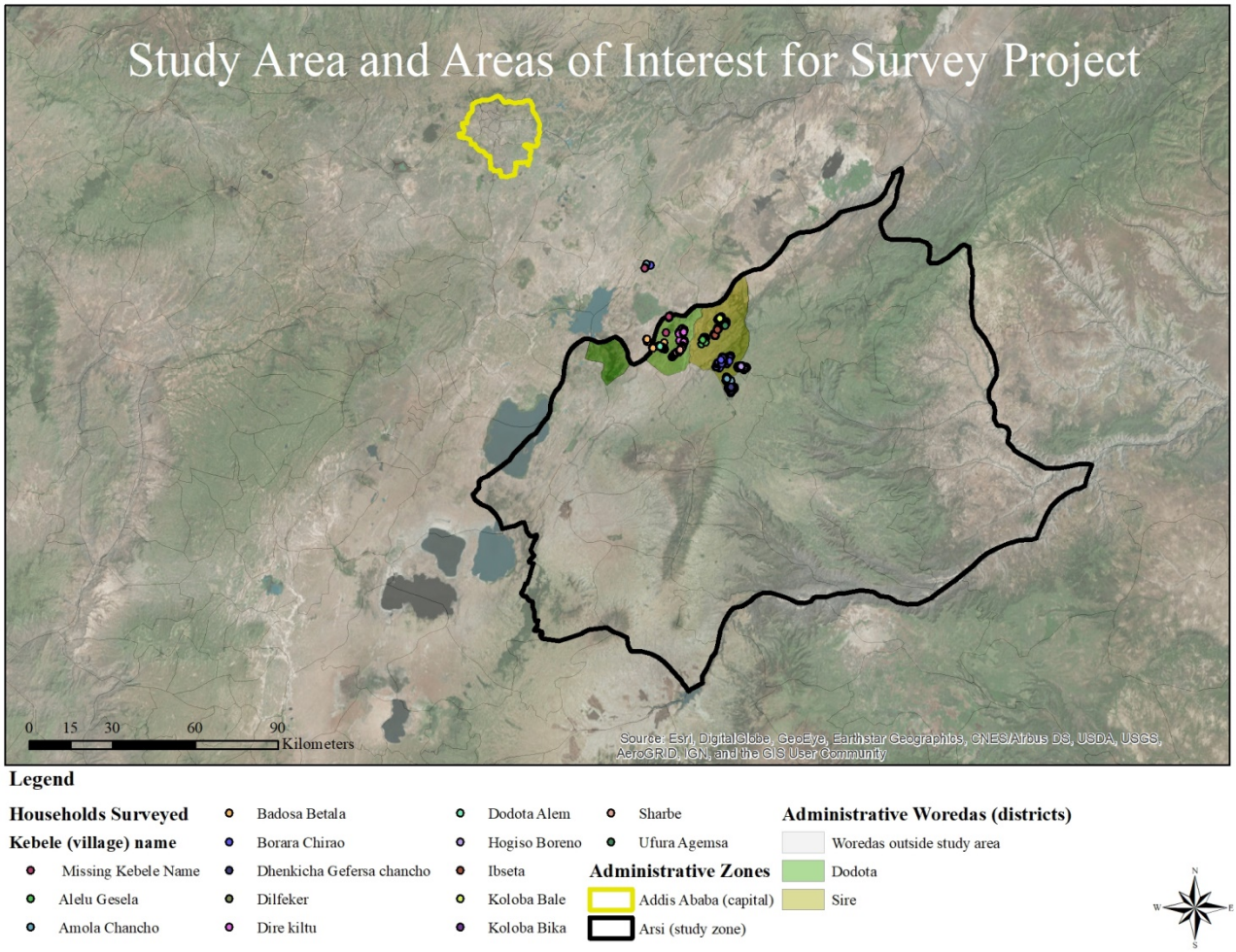
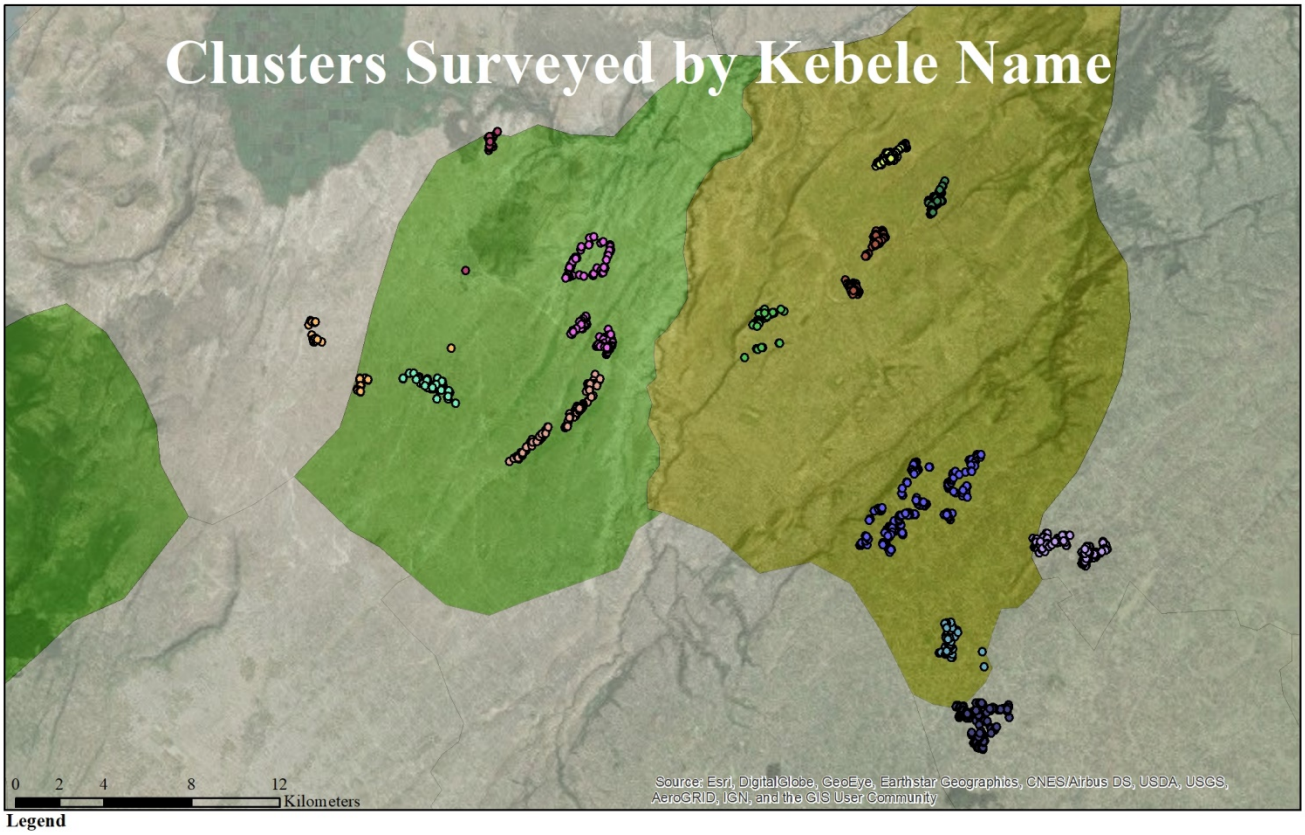
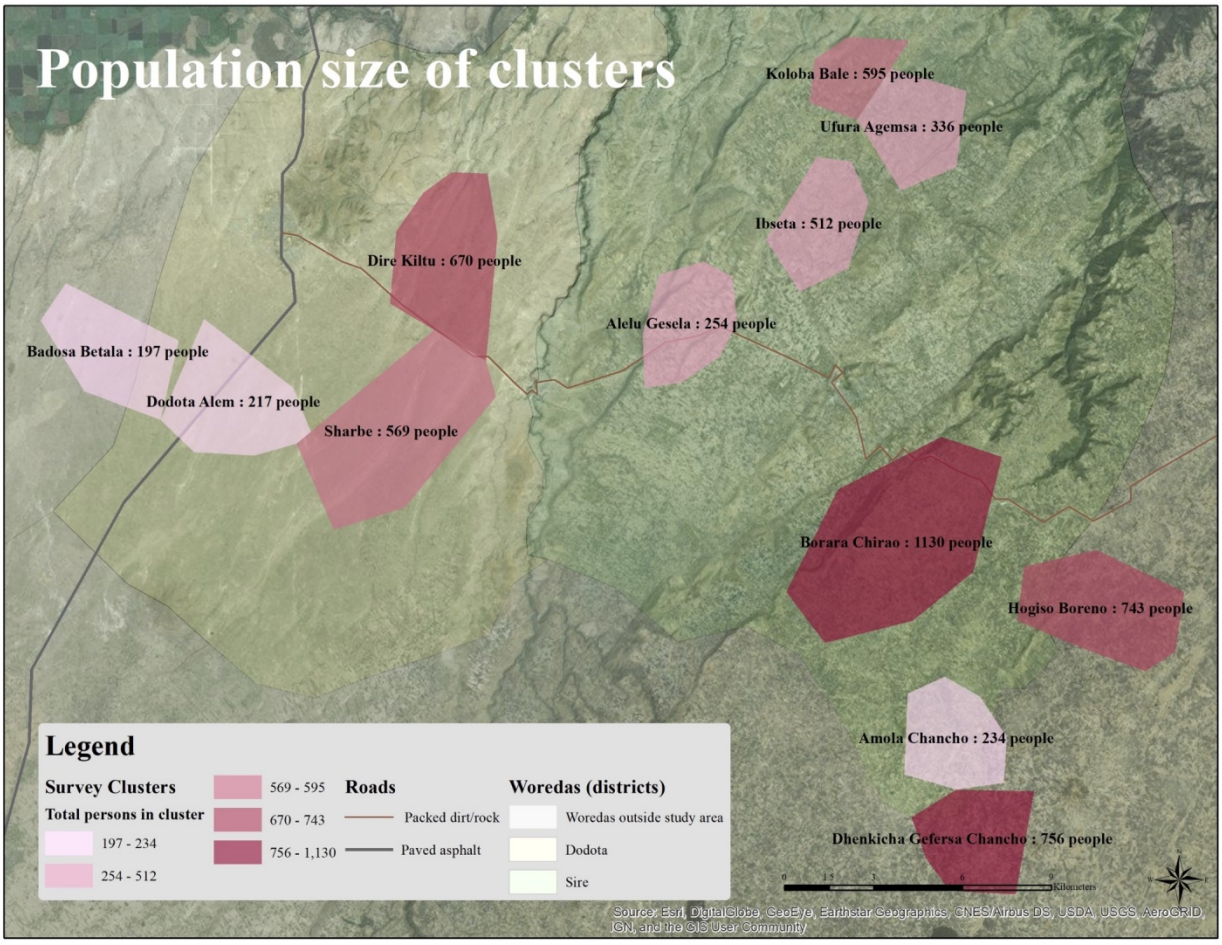
Appendix F Additional Maps




Clusters Surveyed by Kebele Name
0 2 4 8 12
Kilometers
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Households Surveyed
Kebele (village) name
Missing Kebele Name
Alelu Gesela
Amola Chancho
Badosa Betala
Borara Chirao
Dhenkicha Gefersa chancho
Dilfeker
Dire kiltu
Dodota Alem
Hogiso Boreno
Ibseta
Koloba Bale
Koloba Bika
Sharbe
Ufura Agemsa
Administrative Woredas (districts)
Woredas outside study area
Dodota
Sire
N
W
E
S


Population size of clusters
Koloba Bale : 595 people
Ufura Agemsa : 336 people
Ibseta : 512 people
Dire Kiltu : 670 people
Alelu Gesela : 254 people
Badosa Betala : 197 people
Dodota Alem : 217 people
Sharbe : 569 people
Borara Chirao : 1130 people
Hogiso Boreno : 743 people
Amola Chancho : 234 people
Dhenkicha Gefersa Chancho : 756 people
Legend
Survey Clusters
Total persons in cluster
197 - 234
254 - 512
569 - 595
670 - 743
756 - 1,130
Roads
Packed dirt/rock
Paved asphalt
Woredas (districts)
Woredas outside study area
Dodota
Sire
Kilometers
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community