EXPLORING DETERMINANTS OF COMMUNITY LED TOTAL SANITATION (CLTS) ON LATRINE ADOPTION AMONG RURAL CAMBODIANS UTILIZING THE DIFFUSION OF INNOVATION THEORY: A PRAGMATIC APPROACH

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ABSTRACT

Open defecation is a global health problem in which 90% of the cases observed occur in rural settings among developing countries. Individuals exposed to open defecation may face higher risks of diarrheal diseases and health consequences. Basic sanitation facilities may mitigate adverse health effects associated with open defecation. In Cambodia, the lowest percentage of basic sanitation (48.3%) has been reached compared to neighboring countries. This dissertation research explored determinants of Community Led Total Sanitation on latrine construction and usage among rural Cambodians. This exploration was guided by diffusion of innovation theory.

This multi-site study included a stratified sample of six community meetings (n=61) conducted across six villages in two districts of Pursat Province, Cambodia in August 2019. Small connected community methodology was employed to gather qualitative data and semi-structured community meetings were utilized to collect data. Thematic analysis and diffusion of innovation theory was used to analyze data derived from this study.

Qualitative findings identified the following facilitators of latrine construction: relative advantage (overall health and well-being, convenience, and environmental awareness); complexity (perceived level of simplicity); compatibility (obligation to others); and observability (demonstrations, observable improved health of others). Latrine construction barriers included complexity (lack of resources) and compatibility (interferences to daily life). Facilitators of latrine construction included: relative advantage (overall health and well-being, convenience,

economic advantages, and environmental impacts), complexity (ease of use); compatibility (obligation to others); and observability (demonstrations). The latrine uptake barrier was compatibility (misalignment with current practices).

Compared to neighboring countries, basic sanitation within Cambodia continues to be a challenge. Rural Cambodians lack resources pertaining to knowledge (of how to build latrines) and cost (of materials). The development and implementation of health education and health promotion programs may effectively address the sanitation challenges in rural communities in low income and developing countries, while simultaneously enhancing the quality of life and well-being of communities.

DEDICATION

This dissertation is dedicated to my late father, Stanley W. Hendrix (1954-2019) and my mother. Thank you for your persistent encouragement and support over the years.

LIST OF ABBREVIATIONS AND SYMBOLS

CCWC	Commune Committee for Women and Children
CLTS	Community Led Total Sanitation
DOI	Diffusion of Innovation
iDE	International Development Enterprise
ODF	Open Defecation Free
MDG	Millennium Development Goals
NGO	Non-Government Organization
NODF	Non-Open Defecation Free
NOURISH	Nutrition, Hygiene, and Sanitation Project
NPO	Non-Profit Organization
SDG	Sustainable Development Goals
SNV	Netherlands Development Organization
k	Cohen's Kappa: indicator of interrater reliability

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CHAPTER ONE

INTRODUCTION

Overview

Open defecation is the practice of defecating in open fields, waterways, and open trenches without proper disposal of human excreta. Approximately 90% of these cases occur in rural regions (Saleem et al., 2019). Globally, it is estimated that 673 million individuals practice open defecation (WHO, 2019). This practice poses a significant public health problem, as individuals living in communities or villages where open defecation is practiced are at a higher risk of contracting diarrheal diseases (Islam et al., 2018). Open defecation results in fecal contaminated soil, thus increasing the risk of fecal exposure by soil to hand contact (Islam et al., 2018). Additionally, feces found in shared villages or areas may attract flies, which are vehicles of diarrheal pathogen transmission (Islam et al., 2018).

Diarrheal disease is characterized by stool that is abnormally loose or watery often leading to severe dehydration and fluid loss (WHO, 2020). Diarrheal disease may be classified under one of following three clinical types: acute watery, lasting several hours to days; acute bloody, also referred to as dysentery; and persistent, lasting 14 days or longer (WHO, 2020). The epidemiological pattern regarding the trend of diarrheal diseases are particularly notable among young children in developing countries. The health consequences of diarrheal disease among children include malnutrition, diminished growth (stunting), and impaired cognitive development (Podewils et al., 2004). In regard to the global toll of diarrheal disease, in 2017, roughly 1.2

million people died. One-third of these deaths were children under the age of five (Our World, 2019).

Diarrheal disease risks may be managed through the utilization of basic sanitation facilities, such as latrines, and cut the prevalence of diarrheal diseases by up to 44% (Mosler et al., 2018). Basic sanitation includes a range of facilities which separate human excreta from human contact (Heijnen et al., 2014).

A sanitation behavior change approach which has gained global attention in rural settings to reduce or eliminate open defecation and promote the construction of latrines is Community Led Total Sanitation (CLTS) (Harter et al., 2018). A common goal of CLTS is gaining ownership of a latrine at each household within a community (Mosler et al., 2018). CLTS concentrates on the whole community instead of individual behaviors with the overall aim to eliminate open defecation. This is often achieved through raising awareness of the collective benefit from ending open defecation (Harter et al., 2018; Zuin et al., 2019). In order to reach open defecation free (ODF) status, CLTS follows a series of steps or phases: 1) pre-triggering, which is the initial phase of identifying a community to receive CLTS; 2) triggering, which implements a variety of events to encourage eradication of open defecation; 3) post-triggering, which consists of monitoring the progress and reinforces the messages from triggering phase (Chambers & Kar, 2008; Sigler et al., 2014; Venkataramanan et al., 2018). Latrine ownership, specifically the construction and usage of latrines, is addressed within the triggering and post-triggering phases.

While using a latrine over open defecation provides protection against intestinal infections and adverse health effects, many rural regions have neither constructed nor currently use a latrine (Forrer et al., 2019; Saleem et al., 2019). Rural regions appear to not value, use, or

maintain latrine facilities, and efforts to build latrines in these areas often fail (Zuin et al., 2019). Garn et al. (2017) suggested the continued practice of open defecation being linked to a variety of intrapersonal, interpersonal, and household factors, and these factors are highly contextualized. For example, studies conducted in African countries suggest that households subjected to CLTS programs were 1.78 times more likely to have latrines. It is suggested this increase is due in part to the teaching approach CLTS implements. CLTS teaching and demonstration is more successful through the use of providing evidence and examples, along with tools for the development of internal motivation (Zeleke et al., 2019). This success can be observed through achievements in Nepal, in which a CLTS campaign was attributed to a decrease in ODF, resulting in 47 out of 77 districts declaring ODF (Zuin et al., 2019). In rural Indonesia, sustainability for longer-term latrine use was observed in communities where a total sanitation program was implemented, specifically, through community leadership, community support for removing barriers to adopt new behaviors, and continued encouragement (Odagiri et al., 2017). With nearly half the population in Cambodia practicing the health risk behavior of open defecation, lessons learned from neighboring regions, such as Indonesia, may hold promise for future strategies to better understand latrine behaviors such as adoption and uptake (Treglown, 2019).

Background of Study Area

Cambodia is a Southeast Asian country bordering Thailand, Laos, and Vietnam with a total land area of 181,035 square kilometers. While urbanization is occurring in Cambodia the majority of the population (80.5%) resides in rural areas (Cambodia Demo and Health Survey, 2014). To this day, Cambodia is still recovering from extreme hardships and is currently in its third decade of peace and economic growth (Cambodia, 2019). From 1975 to 1979, the Khmer

Rouge genocide resulted in the death of a quarter of the population, roughly two million highly educated teachers, doctors and government officials (Hill & Menon, 2014). Specifically, 80% of teachers and 95% of doctors were killed, creating a major regression in Cambodia's academic and medical fields (Brinkley, 2012).

While distinctive progress has been made over the past few decades, Cambodia is still considered one of the poorest and least developed countries in Asia. The health status of Cambodians, especially vulnerable populations such as women and children, and the rural poor, continue to be a challenging area, with 90% of the poor residing in rural areas. At least 32% of children under the age of five suffer from malnutrition (Cambodia Demo and Health Survey, 2014; Bateman & Engel, 2018). The fall of educational institutions during the genocide led to limited opportunities available to vulnerable Cambodian populations. These pressing concerns continue to create barriers for Cambodians pertaining to their health status. The situation of inadequate sanitation is one barrier which negatively impacts physical, social, and economic components of an individual's life (Bateman & Engel, 2016). Within Cambodia, at least 34% of the population are without access to improved sanitation (The World Bank, 2020).

Statement of the Problem

There is limited understanding of the factors which influence a community's sanitation behavior such as constructing and using a latrine. While open defecation rates have dropped from 94.4% in 2000 to 48.3% in 2017, when compared to neighboring countries, 48.3% of the rural households in Cambodia presented the lowest minimum basic sanitation coverage (Joint Monitoring Programme, 2017). More information is needed for health education and health promotion professionals to understand this behavior; furthermore, the actual usage of the latrine upon construction remains a problem in rural settings, especially Cambodia. The decision to

construct or not construct a latrine following a CLTS program is unclear (Harter et al., 2018). Zuin et al. (2019) addressed how rural regions often appear to not value, use, or maintain latrine facilities, thus resulting in failed efforts to construct latrines in these regions. Latrine construction has also been linked to the presence of pre-existing social context factors such as the individual's awareness of how health is impacted by open defecation, cost and/or benefits toward latrine construction, and social pressure (Harter et al., 2018). Latrine usage may be dependent on maintenance requirements, accessibility, privacy, and access to hygiene amenities such as water or soap (Garn et al., 2017). Effective implementation of future sanitation interventions or programs depends on understanding current latrine behaviors (Aiemjoy et al., 2017).

Theoretical Framework

The diffusion of innovations (DOI) theory applies diffusion as a process in which an innovation, in this case the latrine, is communicated or spread over time to participants in a community or from one community to another (Rogers, 2010). The DOI theory was used to explore how attributes (i.e., complexity, comparability, relative advantage, observability, and trialability) influence the adoption of latrine construction and usage among residents in rural Cambodia. Helgegren et al. (2018) further justified the use of this theory through the utilization of the DOI theory in a qualitative case study which focused on understanding the adoption mechanisms for improved sanitation. Findings from this study assist with providing quicker access to sanitation through applying effective frameworks that target sanitation adoption within households. Additionally, the benefits of applying the DOI theory within a qualitative approach enabled an in-depth understanding and inclusion of information which is not initially observed in questionnaires (Helgegren et al., 2018).

Statement of Purpose

The purpose of this dissertation research is to explore the determinants of CLTS on latrine construction and usage among rural Cambodians. Qualitative data were collected from six communes across one province in Cambodia to address the following two research questions:

RQ1. How do rural Cambodians describe facilitators and barriers of latrine construction within the context of diffusion of innovation theory?

Research question one focuses on the facilitators or barriers rural Cambodians identify as determinants to construct or not construct a latrine as a result of CLTS. The diffusion of innovation theory's five characteristics (relative advantage, compatibility, observability, complexity, and trialability) were used to identify themes related to DOI attributes as they pertain to latrine construction. These characteristics have been identified in determining why some innovations are more successful than others (Rogers, 2010).

RQ2. How do rural Cambodians describe facilitators and barriers of latrine usage within the context of diffusion of innovation theory?

Research question two focuses on the facilitators or barriers rural Cambodians identify as determinants to use a latrine as a result of CLTS. The diffusion of innovation theory's five characteristics (relative advantage, compatibility, observability, complexity, and trialability) were used to identify themes related to DOI attributes as they pertain to latrine construction. These characteristics have been identified in determining why some innovations are more successful than others (Rogers, 2010).

Methodological Approach

A small connected community methodology approach was employed to gather qualitative data from rural Cambodians representative of six communes within Pursat province. A small

connected community methodological approach involves reducing ethical vulnerabilities through the process of not collecting identifying information on demographic forms, identifying participants by codes only, and anonymizing transcriptions (Damianakis, 2012). The target sample population consisted of males and females aged 18 years and older. The community meetings were guided by a semi-structured data collection tool (Appendix A). Each community meeting was audio recorded, translated, and transcribed from Khmer to English by a bilingual translator. NVivo 12 was utilized for thematic analysis, following a deductive, semantic approach. A deductive approach was driven by preexisting codes based on the theoretical framework (Nowell et al., 2017). A semantic approach identifies themes within explicit meanings and does not seek additional information (Braun, & Clarke, 2006).

Significance of Study

This study provides new information to the field of health education and health promotion, allowing for an increased understanding of latrine construction and usage among low-income, developing countries, which contributes to the limited literature pertaining to this topic. Understanding the decisions rural Cambodians make regarding latrine construction and usage warrants valuable insights from a cultural perspective, which will add to the existing knowledge on global health communities available for public health professionals. Additionally, this study helps identify the potential next steps to take in order to address Target 6.2 of the Sustainable Development Goals, which specifically aims to 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 by 2030 (Saleem et al., 2019). Public health professionals will be able to use the information obtained from this study to

develop persuasive latrine construction and usage messages in health promotion campaigns and interventions across Cambodia.

Delimitations

Participation in this study was delimited to male and female Cambodians over the age of 18, residing in rural communes of Pursat province, who had participated in CLTS activities as part of a larger independent study. I chose to conduct community meetings with both males and females to better represent the community responses to the impact CLTS had on the construction and usage of latrines. Secondly, the DOI theory was selected in order to understand the attributes to latrine construction or adoption and usage (Rogers, 2010). Finally, thematic analysis as a data analysis was chosen due to its explorative nature in identifying, analyzing, and reporting patterns in the data (Braun, & Clarke, 2006).

Limitations

This study included several limitations which may have impacted the results. First, this study consisted of cross-language qualitative research (Temple, 2004). While measures were taken to ensure the trustworthiness and rigor of the study, the decisions regarding translation may have consequences for how research data is produced and received. Second, as a researcher from outside the culture (Naaeke et al., 2011), I could have influenced the participants' responses (Raheim, et al., 2016). Third, the dynamic of the community meetings included both male and female. Due to the patriarchal nature of the country this could have impacted participants' disclosure. Fourth, the DOI theory was not applied as a participatory approach theory which may have impacted the results. Fifth, the aspect of self-report from the participants may have influenced the quality of the responses. Sixth, the operational definition of adopter and non-adopter was dichotomous in nature versus the five phases of adoption which is normally assessed

in the DOI theory. Last, the lack of a community based participatory approach within the larger project could have impacted CLTS participation resulting in decreased latrine construction and use.

Operational Definitions

Adopter: Residents who live in villages which have constructed the percentage of latrines necessary to be declared open defecation free.

Basic Sanitation Facilities: Improved sanitation, facilities that ensure hygienic separation of human excreta from human contact ("World Health Organization," 2019).

Cambodia: Southeast Asian country bordering Thailand, Laos, and Vietnam with a total land area of 181, 035 square kilometers (Cambodia Demo and Health Survey, 2014).

Community-Led Total Sanitation: Innovative methodology for mobilizing communities to completely eliminate open defecation (Kar & Chambers, 2008).

Compatibility (DOI attribute): Degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 2010).

Complexity (DOI attribute): Degree to which an innovation is perceived as relatively difficult to understand and use (Rogers, 2010).

Connected Small Group Methodology: Approach involves reducing ethical vulnerabilities through the process of not collecting identifying information on demographics forms, identifying participants by codes only, and anonymizing transcriptions (Damianakis, 2012).

Diffusion of Innovation Theory: Theory which seeks to explain how, why, and at what rate new ideas and technology spread (Rogers, 2010).

Latrine: A toilet or simpler facility used as a toilet within a sanitation system. May consists of a direct pit or hole in the ground or a more advanced design, including a pour-flush system (Kar & Chambers, 2008).

Non-Adopters: Residents who live in villages which have not constructed the percentage of latrines necessary to be declared open defecation free.

Observability (DOI attribute): Degree to which the results of an innovation are visible to others (Rogers, 2010).

Open Defecation: The practice of defecating in open fields, waterways, and open trenches without proper disposal of human excreta (Saleem et al., 2019).

Open Defecation Free: Communities, usually set by a percentage of 80% of the community or more, have shifted to using a toilet instead of open defecation and no feces is openly exposed to the air (Kar & Chambers, 2008).

Pre-Triggering Phase: Initial phase of CLTS in which communities are identified to receive CLTS (Kar & Chambers, 2008).

Post-triggering Phase: CLTS phase which monitors the progress and reinforces the messages from the triggering phase (Kar & Chambers, 2008).

Relative Advantage (DOI attribute): Degree to which an innovation is perceived as being better than the idea it supersedes (Roger, 2010).

Trialability (DOI attribute): Degree to which an innovation may be experimented with on a limited basis (Rogers, 2010).

Triggering Phase: CLTS phase which implements a variety of events to encourage the eradication of open defecation (Kar & Chambers, 2008).

CHAPTER TWO

REVIEW OF THE LITERATURE

Chapter two begins with the public health problem of open defecation and transitions into the cultural background of Cambodia and how CLTS is utilized. The intent of this section is to orient the reader to the past events of Cambodia which continue to make an impact on modern public health problems. This chapter further reviews empirical evidence addressing the deleterious impacts of open defecation on health, vulnerable populations and challenging environments, and community led total sanitation's role in communities.

Open Defecation as a Public Health Problem

Open defecation, referred to as the practice of defecating in open fields, waterways, and open trenches, without proper disposal of human excreta, is currently estimated to be practiced by 673 million individuals with 90% of those individuals living in rural areas (Saleem et al., 2019; WHO, 2019; Venkataramanan, Crocker, Karon, & Bartram, 2018). Low income countries, such as Cambodia, are disproportionately impacted by open defecation with a strong linkage to adverse health effects such as stunting, which is below average height and chronic malnutrition, intestinal diseases, child mortality, and diarrheal diseases (Clasen et al., 2014; Coffey et al., 2017).

Open defecation is a key contributor to the deaths that occur due to diarrhea (Sigler et al., 2014). In developing countries, specifically Cambodia, intestinal worms have a national prevalence rate of at 30% and may be present in adult hosts for decades if no treatment is sought.

The presence of intestinal worms could result in abdominal pain, nausea, vomiting, and diarrhea, along with parasite migration beneath the skin. (Forrer et al., 2019).

Each year, an estimated 1.5 million children die prior to their fifth birthday due to diarrheal related illnesses. Nearly all of these deaths occur in developing countries (Mosler et al., 2012). This connection is in part due to poor sanitation conditions including open defecation, which increases the risk of fecal exposure, leading to hand contact with the feces or with soil that has been contaminated by feces (Islam et al., 2018).

In many regions where open defecation is practiced, hand washing is not a common practice due to the lack of soap and water, which results in individuals using soil or ash to clean their hands (Azeez et al., 2019). Open feces in the environment may also attract flies, which are vehicles of diarrheal pathogen transmission, potentially offering more breeding sites, thus increasing the risk of diarrheal disease (Islam et al., 2018). Additional adverse health effects from open defecation consists of a heightened surge in the transmission of communicable diseases such as cholera, diarrhea, dysentery, hepatitis A, typhoid, polio and tropical diseases such as intestinal worms (Ngwu, 2017). Protection against intestinal infections, such as worms, is supported by the use of a latrine over open defecation (Forrer et al., 2019; Saleem et al., 2019). Open defecation is a specific area of unimproved sanitation requiring the need for additional efforts (Saleem, Burdett, & Heaslip, 2019). Diarrheal disease risks may be managed through the utilization of basic sanitation facilities, such as latrines, and cut the prevalence of diarrheal diseases by up to 44% (Mosler et al., 2018).

Basic Sanitation Facilities

Sanitation is considered the provision of waste disposal facilities in order to reduce the transmission of diseases (Wasonga, Olang'o, & Kioli, 2014). Annually, 200 million tons of

human waste is uncollected and untreated on a global scale (Gebremariam et al., 2018). According to the World Health Organization (WHO), at least two billion individuals lack basic sanitation facilities such as toilets or latrines (WHO, 2019). The United States Agency for International Development (USAID), describes this lack of basic sanitation, or unimproved sanitation, as a global public health problem increasing the risks of sickness and disease (United States Agency for International Development [USAID], 2019). Basic sanitation includes a range of facilities which separate human excreta from human contact (Heijnen et al., 2014).

The Joint Monitoring Programme for Water Supply and Sanitation (2017), which monitors progress toward sanitation targets, provides definitions of varying service levels ranging from open defecation to safely managed facilities (figure 2.1). In order to meet the level of basic sanitation, the latrine must be a private flush toilet, pour-flush toilet, or latrine connected to a piped sewer or septic system, a simple pit latrine with a slab, a ventilated improved pit latrine, or a composing toilet. Failure to meet the qualifications of one of these latrines is considered unimproved, meaning human excreta is not separated from human contact (Heijnen et al., 2014).

Safely Managed	Basic	Limited	Unimproved	Open Defecation
Use of improved facilities which are not not shared with other households and where excreta are safely disposed or transported and treated off-site	Use of improved facilities which are not shared with other households	Use of improved facilities shared between two or more households	Use of pit latrines without a slab or platform, hanging latrines or bucket latrines	Disposal of human feces in fields, forests, bushes, open bodies of water, beaches, and other open spaces or with solid waste

Figure 2.1 Sanitation Facility Type Classification.

Additionally, a facility is not considered basic or improved in the case a latrine facility is shared by two or more households (Heijnen et al., 2014). As of 2017, when compared to neighboring countries 48.3% of rural households in Cambodia presented the lowest minimum basic sanitation coverage (Table 2.1) (Joint Monitoring Programme, 2017). While open defecation rates have dropped from 94.4% in 2000 to 48.3% in 2017, more planned efforts are needed to improve access to basic sanitation in order to end open defecation (Joint Monitoring Programme, 2017).

Table. 2.1

2017 Southeast Asia Household Sanitation Service Level

Country	Rural Households	Urban Households	Total Households
Thailand	98.3%	99.2%	98.8
Vietnam	77.7%	94.3%	83.5
Indonesia	64.5%	80.3%	73.1
Myanmar	59.3%	76.0%	64.3
Cambodia	48.3%	95.8%	59.2

*The service level of 'at least basic'.

A number of suggestions support why households and communities elect not to construct adequate sanitation facilities. The absence of latrines has been connected to household views of saving money, effort, and time in electing not to construct a latrine; thus, they continue to participate in open defecation (Harter, et al., 2018). Additionally, for some cultures, open defecation is viewed as an ancient practice occurring purposively in response to cultural beliefs, superstitions, and personal hygiene behaviors (Ngwu, 2017). In India, the adoption of new practices such as defecating inside latrines is seen as a sin, which is in part due to the impurity of feces. Pictures of gods are often kept in each house and having toilets inside or next to the house

makes the entire house impure (Routray et al., 2015). While open defecation is a global public health problem, there is a set of goals in place to address this problem.

Vulnerable Populations

While open defecation has the potential to affect everyone within a village or community, it is suggested that the health and well-being of women, children, and the elderly is at a disadvantage (Saleem et al., 2019; Azeez, et al., 2019; Khanna & Das, 2016). Elderly populations often rely on the women of the household or communities to assist them with the physical requirements of walking extended distances to a field. Additionally, the elderly requires assistance with what was once simple latrine tasks, such as squatting; thus, placing both the younger woman and elderly in an increased vulnerable position when open defecation is the only option (Azeez, et al., 2019).

Women and children face increased risks of violence and health vulnerabilities. A lack of adequate facilities also plays a role on the distance women must travel to find private places to practice open defecation, making women more vulnerable to verbal, physical, or sexual violence (Saleem et al., 2019). Open defecation has led to an increase in women experiencing non-partner sexual assault and the demoralization of their privacy and dignity. Women are also at a disadvantage regarding menstrual hygiene and a link has been established between inadequate sanitation facilities and education to poor menstrual hygiene (Azeez et al., 2019). High absenteeism during menstruation is also higher for young girls, due to inadequate facilities available in schools (Khanna & Das, 2016). Many women have expressed fear of being exposed during open defecation, along with the struggle of finding privacy leading to heightened shame and helplessness, which creates an argument that health implications linked to access to sanitation and open defecation is a breach of human rights (Saleem et al., 2019).

Many women also encourage their children to eat less in the evening in order to avoid having to urinate or defecate at night, which potentially results in a higher frequency of urinary tract infections (Azeez et al., 2019; Khanna & Das, 2016). Among women, the development of hookworms increases the likelihood of negative pregnancy outcomes such as growth retardation, which occurs when the fetus does not develop at a normal rate (Forrer et al., 2019; Saleem et al., 2019). While diarrheal diseases are commonly found among children, women with inadequate sanitation access are also victims of diarrheal disease, resulting in undernutrition during their reproductive age (Saleem et al., 2019). Additionally, the health of women is often correlated with children and overall community health, due to the occurrence of women disproportionately supporting economic and community activities (Corburn & Hildebrand, 2015).

The response to open defecation consists of an agenda to eradicate this public health problem through the utilization of Sustainable Development Goals (SDGs) presented by the United Nations. The global agenda for sustainable development consists of 17 SDGs, which were adopted by 193 countries in 2015 with the intent to be fully implemented by 2030. The goals are universal and address both developed and developing countries in order to implement strategies to improve health and education, reduce inequality, spur economic growth, and address climate change (Transforming our world, n.d.). Goal number 6 of the SDGs is to "Ensure availability and sustainable management of water and sanitation for all", in which Target 6.2 specifically aims to 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 by 2030 (Saleem et al., 2019). More recently, in order to reach the SDG 6 by 2030, a Global Acceleration Framework has been initiated to deliver quick results at an

increased scale as part of the Decade of Action. The Decade of Action was promoted in 2019 to move progress along more quickly in order to reach the SDGs.

Cambodia: Background and Cultural Context

Cambodia is a Southeast Asian country, comprised of 25 provinces, bordering Thailand, Laos, and Vietnam with a total land area of 181,035 square kilometers. The country's primary source of economic activity includes tourism and textiles; although, agriculture, specifically rice production, is the primary source of income among rural Cambodians. The country experiences two seasons the dry season from November to February and the rainy season from May to October. While urbanization is occurring in Cambodia the majority of the population, 80.5%, resides in rural areas (Cambodia Demo and Health Survey, 2014). Although Cambodia is projected to achieve high levels of universal access to basic sanitation, there are insufficiencies regarding the progress being made in these rural areas. Unfortunately, these rural areas are often at the highest risk of being left behind (Treglown, 2019).

To this day, Cambodia is still recovering from extreme hardships and is currently in its third decade of peace and economic growth (Cambodia, 2019). From 1975 to 1979, the Khmer Rouge genocide, under the leadership of Pol Pot, resulted in the deaths of more than two million individuals. Among those which were killed were the country's educated teachers, doctors, and government officials (De Walque, 2006). Pol Pot sought to achieve an agrarian society and Cambodians were sent to the countryside and forced to work under harsh conditions (Clayton, 1998). A quarter of the population died due to mass executions, malnutrition, disease, or fled the country. Additionally, the Khmer Rouge wiped out most formal institutions, private property, and money. Following the genocide, Cambodia experienced a decade long civil war involving Vietnam, along with international isolation and sanctions (Hill & Menon, 2014). Social

behaviors in Cambodia were impacted by the genocide and the hostile environment, and it is suggested that community trust and reciprocity were shattered (Bateman & Engel, 2018).

While distinctive progress has been made over the past few decades, Cambodia is still considered one of the poorest and least developed countries in Asia. As of 2017, Cambodia's annual household income per capita was 1,376 USD (CEIC, 2019). While the entirety of the country is in a delicate position, there are certain groups deemed more vulnerable than others, such as women and children, along with the rural poor. The health status of Cambodians, especially these vulnerable populations, remain to be a challenging area (Cambodia Demo and Health Survey, 2014; Bateman & Engel, 2018). Cambodians continue to suffer from psychosocial and adverse educational effects of the Khmer Rouge. High rates of Post-Traumatic Stress Disorder (PTSD) have been linked to poverty, violence, depression, and mistrust in authority (Bateman & Engel, 2018). The fall of educational institutions during the genocide has led to limited opportunities available to vulnerable Cambodian populations. The mother's level of education has even been identified as a factor in determining hygiene practices, such as proper stool disposal creating an imbalance in safe hygiene and sanitation practices in the community (Cambodia Demo and Health Survey, 2014). These pressing concerns pertaining to inadequate sanitation situations negatively impact the physical, social, and economic components of an individual's life; thus, creating barriers for Cambodians to improve their health status (Bateman & Engel, 2016).

While some improvement has been made over the past few years within Cambodia, 47% of the population continues to practice open defecation (Treglown, 2019). Almost 30% of children's stools are left uncontained in Cambodia, which could potentially spread disease. Among children in Cambodia, 13 percent under age five suffer from diarrhea (Cambodia Demo

and Health Survey, 2014). In regard to sanitation, toilet facilities are considered hygienic if it is only used by household members and effectively separates human waste from human contact. These facilities are often flush or pour flush into a piped sewer system, septic tank, or pit latrine, ventilated improved pit, pit latrines with a slab, and composting toilets (Cambodia Demo and Health Survey, 2014).

Emergence of Community Led Total Sanitation

The rural sanitation challenge was for years considered to be due in part to a lack of access and was often addressed by governments and nongovernmental organizations (NGOs) by providing free or subsidized latrines (Venkataramanan et al., 2018). However, this approach of providing free or subsidized latrines was questioned by many practitioners and blamed for creating a dependency syndrome, countering the concept on community self-help (Zuin et al., 2019). This so-called dependency syndrome potentially lessened the effectiveness of a guaranteed consistent latrine use, thus leading to hygiene and health education programs, combining latrine subsidies, such as the Participatory Hygiene and Sanitation Transformation (PHAST) approach. PHAST, considered a participatory approach, encourages people to analyze their own situation, identify key problems, decide on what needs improvement, plan how they are going to do it, and then take action (Dumba et al., 2013). This approach is dependent on health education facilitators and attempts to help people become self-reliant and capable to take action in their communities (Almazan, 2014) Lessons learned from PHAST eluded that education alone was insufficient in converting awareness into behavior change (Peal et al., 2010). From these experiences, a new approach emerged, Community-Led Total Sanitation (CLTS), which strives to create open defecation-free (ODF) communities (Venkataramanan et al., 2018; Chambers & Kar, 2008).

In 2000, CLTS was developed by Kamal Kar and introduced in Bangladesh in response to unsustainable sanitation programs (Harter et al., 2018; Sigler et al., 2014). CLTS was introduced at a time when a variety of donors and governmental agencies were seeking strategies to meet the Millennium Development Goals (MDG) for sanitation (Zuin et al., 2019). Improved sanitation interventions such as CLTS is primarily utilized in addressing rural regions of developing countries and may be able to assist in the role of disease prevention (Bateman & Engel, 2018; Saleem et al., 2019). Within Southeast Asia, in 2004 Cambodia was the first country to adopt CLTS; however, the country continues to struggle in regard to its access to basic sanitation (Bateman & Engel, 2018). CLTS is also considered the predominant rural sanitation behavior change approach (Venkataramanan et al., 2018) and has been found to be successful in increasing latrine use (Garn et al., 2017). As explained in the official handbook for CLTS, the approach concentrates on the whole community instead of individual behaviors with the overall aim to raise awareness of the collective benefit from ending open defecation (Harter et al., 2018). Specifically, the approach focuses on eradicating open defecation by triggering collective community behavioral change with anticipation of leading to long term abandonment of open defecation practices while stimulating the demand for latrines without the use of incentives or financial award upon reaching ODF status (Gebremariam et al., 2018; Tessema, 2017; Bateman & Engel, 2018).

CLTS also utilizes empowerment as a tool to encourage communities to strive for ODF status among their villages through the process of taking their own initiative and deciding on their own set of solutions. While the approach is inspired by participatory rural appraisal, it is more heavily reliant on the disgust factor associated with open defecation (Sigler et al., 2014). Distinct from other approaches regarding sanitation solutions within a community, the emphasis

on shame, disgust, and public humiliation are vital in the triggering process to change behavior and attitude around sanitation (Sigler et al., 2014; Bateman & Engel, 2018). The emphasis on shame, disgust and public humiliation is intended to provoke is for communities to stop practicing open defecation and construct their own toilet facilities (Zuin et al., 2019).

While shame may be viewed as a potential problematic emotion, it is still observed in many CLTS programs. In 2013, the Royal Government of Cambodia's Ministry of Rural Development opted to remove shame from its program due to shame being viewed as a culturally unacceptable form of social coercion. However, shame has yet to be entirely removed from programs in Cambodia because it is innate in the CLTS approach and donor funding opportunities (Bateman & Engel, 2018).

It should be noted that the perception of what is considered moral behavior in collectivist cultures, such as Cambodia, varies across settings and is decided by a higher sense of collective duty to others, thus making individuals in collectivist cultures more susceptible to shame. Interestingly, shame in these cultures is not viewed as entirely negative due to a distinction in philosophical and spiritual beliefs and such beliefs promote shame as a technique to aid in self-development (Stamkou et al., 2019; Batman & Engel, 2018).

Since CLTS is primarily conducted in rural farming settings, the villages which are recruited are usually smaller and tend to communicate the messages delivered regarding sanitation more easily from one community member to another. This is in part often due to the presence of a clearly selected village leader (Gebremedhin et al., 2018). CLTS follows three steps to reach ODF status: pre-triggering, triggering, and post-triggering (Chambers & Kar, 2008; Sigler et al., 2014; Venkataramanan et al., 2018). A post-ODF follow-up may also be observed in various programs (Sigler et al., 2014).

Pre-Triggering

The first step or phase is pre-triggering. In this phase, the communities or villages are targeted and identified to receive CLTS. Depending on the size of the village, the length of this phase ranges from half a day to one week (Bateman & Engel, 2018). Once facilitators are trained, they are responsible for evaluating the physical and social contexts and existing conditions within the community to better implement CLTS to the current situation (Harter et al., 2018). Additionally, baseline data or information is collected, and the coordination of the entry into the community is arranged (Venkataramanan et al., 2018). During the pre-triggering phase, potential success of CLTS is implicitly understood due to the process of better understanding the clarification of how ready a community is for an effective CLTS implementation (Harter et al., 2018).

Triggering

The second step of CLTS is the triggering phase, and it is considered to be the most important (Bateman & Engel, 2018). In this phase, the community appraisal, observation, and analysis are conducted (Sigler et al., 2014). It is common for community-wide meetings to be conducted in which facilitators conduct the triggering activities of shame and disgust (Venkataramanan et al., 2018). These meetings may also be referred to as "triggering events" in which case a number of activities take place to encourage the collaborative action to eradicate open defecation (Harter et al., 2018). The triggering events may include the following: participatory village mapping of open defecation spots, a community "transect walk" to identify open feces, calculation of the volume of feces produced by the community, and demonstrations of fecal-oral contamination pathways, such as observing flies traveling between food placed near feces. Upon completion of triggering events, if successful, community members adhere to ending

open defecation and construct latrines. Often, the latrines are constructed through using local materials and available resources (Zuin et al., 2019).

Post-Triggering

The third step or phase is post-triggering. The post-triggering phase consists of monitoring the progress and reinforcing the message from the triggering events. This may take place in the following weeks or months of the triggering events and could entail repeated visits (Zuin et al., 2019). The verification and certification of ODF status in communities are identified in this phase and consists of routine follow-up visits (Venkataramanan et al., 2018; Harter et al., 2018). ODF is verified when there are no visible signs of open defecation and communities reach the latrine construction threshold, dependent on the country, which varies between 80 to 100% of households (Zuin et al., 2019). In this phase, communities with a positive triggering response are provided with follow-up and support (Sigler et al., 2014). Often, ODF achievement is celebrated through the presentation of a ceremony and village recognition (Zuin et al., 2019)

Post-ODF Follow-Up (optional)

This phase may or may not be exercised by practitioners or researchers. This specific follow-up is meant to address issues regarding the sustainability of CLTS interventions. (Sigler et al., 2014)

While some have expressed concern with how empowerment is applied via shame (Engel & Susilo, 2014), it is necessary to reiterate how the CLTS approach has been considered the predominant rural sanitation behavior change approach (Venkataramanan et al., 2018). The knowledge and education provided during CLTS potentially results in a heightened awareness of disease risk, which might be a better trigger of hygienic behavior change (Forrer et al., 2019). The uptake of CLTS has been adopted and implemented across numerous regions and many

traditional CLTS practices have been modified to provide subsidies and latrine construction assistance (Sigler et al., 2014).

In the case of subsidies, a community's prior participation with sanitation subsidy interventions proved to be a negative contributor to non-subsidy interventions. Additionally, in regions where building materials and resources are not easily attainable or there is a lack of knowledge regarding the construction process, no-subsidy interventions may be less successful (Garn et al., 2017). Due to the implementation of CLTS among so many regions, it is critical implementers take into account the varying cultural norms and behaviors when developing interventions in their selected region (Sigler et al., 2014)

CLTS and Developing Countries: Existing Evidence and Knowledge Gaps

Existing evidence across the literature have documented the international implementation of CLTS programs. Of importance is the recognition of the combination of various interventions often applied to communities in conjunction with CLTS. For this reason, it is vital to maximize the behavior change component in order to compete with other potential objectives. Many NGOs and national governments have adopted CLTS interventions due to its quick uptake by communities and cases of immediate success (Sigler et al., 2014).

Harter et al. (2018) analyzed how latrine owners differ from non-owners taking into account social, physical, and personal context factors among four districts in Mozambique surveying 603 households across 32 communities. The project followed the three triggering phases and included communities in which CLTS had been completed at least 8 months prior to the survey and control communities absent of CLTS. Results of the study supported that increased latrine ownership occurred alongside the increased extension of CLTS-related information and was highest in the group which participated in CLTS. Latrine ownership was

also more likely to be supported if the community was perceived as collectively expressing ambition to reduce open defecation, practicing greater solidarity within the village, observing higher trust between residents, and modeling a stronger sense of cohesion and inclusion within the village. Vulnerability, feelings, cost beliefs and benefits, the approval or disapproval of others, confidence to rebuild and communication played important roles to promote latrine ownership (Harter et al., 2018).

Participants who received CLTS felt a stronger sense of cohesion and inclusion within their community, felt less vulnerable to diarrhea, associated lower cost expectations about latrine construction, estimated rate of latrine ownership within their community as higher, felt stronger approval of others, and felt more confident in their ability to repair their latrine. CLTS also enhances the perception that prominent community members boost latrine construction through increased promotion and attention to latrine construction. Additionally, CLTS improves confidence to build and repair latrines (which is noteworthy in flood-prone areas) and reinforces the belief that latrine ownership improves health (Harter et al., 2018).

In a study conducted in Ethiopia, a total of 422 households, which were exposed to CLTS, were surveyed on their knowledge, acceptance, and attitude toward CLTS, latrine availability, and open defecation behaviors. Open defecation was observed to be practiced in regions due to poor follow-up consisting of a lack of effective social mobilization and engagement of significant portions of the community such as women, under-resourced families, and children. Results informed researchers that 66 percent of the respondents had knowledge of CLTS and 88 percent of those respondents received their knowledge from health professionals working in their region. Of the respondents, 14 percent did not view CLTS as a tool for eradicating open defecation and 52 percent were not aware of the triggering events. Prior to

CLTS, only 22 percent of the respondents owned a latrine with the remaining percentage constructing latrines post CLTS (Tessema, 2017).

Prior to the implementation of CLTS within the communities, 37% of respondents identified as practicing open defecation, when compared to 11% post CLTS implementation. Increased latrine ownership, access, and cleanliness were observed with the implementation and it was communicated there was a lack of in-depth training, promotion of latrine use, and hygienic practice. Results revealed an overall misconception regarding CLTS among the population, which is noteworthy in order to achieve sustainable behavioral change. Additional qualitative responses revealed a father recognizing his children had unknowingly consumed feces through water and food which was contaminated via hand. The children had frequent bouts of diarrhea and had to visit the clinic three to four times a month. Additionally, the smell of feces surrounded the house and after the implementation of CLTS, the individual was relieved of such issues. CLTS has been the sole approach to initiate community-wide behavioral change assisting in improving the community's overall sanitation (Tessema, 2017).

Evidence from Northern Ghana represents the factors associated with latrine completion and use. CLTS was implemented to address the 70% of the population participating in open defecation. A survey addressed the socio-demographic characteristics, open defecation habits, latrine construction and use, psychosocial determinants of latrine construction and latrine use of households, and the physical and social contexts of the households. Observations within the community were also observed by the researchers. Findings from the study represented a more frequent use of latrines among those that had a stronger construction and provided more privacy. CLTS was found to be supportive in addressing perceived risks involved with open defecation which led to higher latrine construction. CLTS also promoted a higher sense of community

camaraderie allowing an exchange of knowledge and ideas on the uptake of healthy behaviors. Additionally, a snowball effect was observed which included the motivation of other members to construct a latrine after another member completed construction (Nunbogu, et al., 2019). It has been noted that CLTS initiates a snowball effect resulting in the construction of latrines even among those who do not attend the triggering events, thus supporting the effectiveness of CLTS in promoting latrine ownership (Harter et al., 2018). ODF status was also observed faster in communities where leadership and adoption of CLTS among key community figures existed (Nunbogu, et al., 2019).

Gebremariam et al. (2018) assessed how CLTS improved latrine utilization in North Ethiopia.. A cross sectional study was implemented involving data collection via questionnaires and interviews among 776 kebeles, or neighborhoods, owning latrines, equally separated by CLTS implemented and non CLTS implemented among those households. Findings supported that health extension workers provided minimal education on proper latrine utilization and promoted latrine construction rather than utilization of the latrine. Households found to own a latrine for more than two years compared to those who owned for less than two years were more likely to use their latrine among those who receive CLTS, which was linked to the perception of immediate health gains. The distance of the latrine from the dwelling was associated with less utilization among those who did not receive CLTS, which was linked to inadequate information provided in the past by local NGOs. Overall, those who were provided CLTS practiced a higher utilization of their latrine and hand washing hygiene compared to non CLTS. This study supports that implementation of CLTS is beneficial to households and may serve to introduce or reinforce behavioral change related to health sanitation and hygiene practice (Gebremarian et al., 2018).

Orgill-Meyer et al. (2019) followed up ten years after their implementation of a successful CLTS campaign to assess the long-term impact of a community in India (Orgill-Meyer et al., 2019). In the original study, 20 villages received CLTS and 20 villages receive non CLTS. Minimal sanitation exposure had been provided to the villages prior to the campaign. At baseline, 90% of the CLTS households practiced open defecation. Upon post intervention, there was a 24% increase in latrine ownership in CLTS villages, improved child health, and a quick recall of promotion activities compared to the controls. A four-year and ten-year follow-up was conducted which consisted of a resurvey among roughly 96% of the households, respectively. Continued success was observed at the four-year follow-up with a continued usage of latrines and a higher acquisition of latrines among CLTS villages compared to the original campaign. Approximately half of the CLTS villages constructed a latrine compared to a quarter in the control villages supporting that the original campaign had medium term impact on investment for at least four years. Retention rates of promotion activities at the four-year follow-up were significantly lower. The ten-year follow-up supported no significant change in latrine construction, an increase in abandonment of latrines, and any retention of activities were attributed to recent sanitation activities (Orgill-Meyer et al., 2019).

Latrine Construction and Usage

While latrines have been identified as a safe option to dispose of waste such as feces (Wasonga et al., 2014) and are simple to construct, reaching high coverage and long-term use is challenging (Aiemjoy et al., 2017). A number of local individuals in rural regions appear to not value, use, or maintain latrine facilities. Due to this observation, efforts to construct latrines in these rural regions often fail (Zuin et al., 2019). Latrine construction may also be dependent on the level of strength regarding social trust in a community on a cooperative scale and the

assessment of how individual households view the effort required of constructing the latrine (Harter et al., 2018).

Communities in which subsidies have been previously provided have been identified as less likely to construct a latrine when presented with a non-subsidy intervention. Diminished progress among communities with a higher latrine coverage have been connected to having been exposed to previous hardware subsidies (Harvey, 2011). Success in latrine construction may also be limited within no-subsidy interventions due to materials, resources, and construction knowledge not being readily available. In communities where resources are locally available along with construction knowledge, latrine construction is higher (Garn, et al., 2016).

The price of building materials and diminished awareness of open defecation health risks are also considered barriers to construct latrines (Alemu et al., 2017). This lack of awareness provides a need for programs such as CLTS, which would offer education pertaining to the health risks associated with open defecation through triggering events (Zuin et al., 2019).

Harter et al. (2018) identified the construction of latrines being dependent on the presence of pre-existing social context factors in communities. CLTS was also found to have an impact on the construction of latrines through holding a thorough social kick-off, instilling confidence among community members to support the building and maintenance of latrines and communicating the health benefits from owning a latrine (Harter et al., 2018). A number of factors are identified when considering an individual's decision to construct a latrine, including an individual's awareness of how health is impacted by open defecation and how they may be affected by diarrhea through open defecation, the cost and/or benefits toward latrine construction, potential social pressure, and the potential self-efficacy of an individual to construct a latrine (Harter et al., 2018).

Following construction of the latrine is the actual latrine usage or utilization. The following components have been identified to play a role in increased latrine utilization after construction: maintenance, accessibility, privacy, latrine type, cleanliness, newer latrines, and access to hygiene amenities (Garn et al., 2017). While construction of latrines may be improving due to interventions and programs, latrine utilization continues to remain low in regions around the world, resulting in continued open defecation practice (Gebremedhin et al., 2018; Garn et al., 2017). The decision to continue practicing open defecation has a high potential of being linked to a variety of technological and behavioral factors (Garn et al., 2017). For instance, farmers were found to be 65.2 percent less likely to utilize a latrine in part due to latrine being too far away from their field position (Gebremedhin et al., 2018). This is of importance due to the majority of CLTS implementations occurring in rural, agricultural settings.

The cost of latrines is a significant factor determining latrine construction. Many people living in rural Cambodia have expressed they prefer to purchase a high-quality latrine over one that is free or subsidized, due to households viewing toilets as a luxury good (Chase et al., 2015). International Development Enterprises (iDE) has identified the average cost of a basic latrine in Cambodia to cost roughly 55 USD (iDE, 2019). While this price appears low, the average monthly income for a Cambodian household is 115 USD (CEIC, 2019). Even with the limited financial resources among Cambodian households, it has been suggested that financial constraints are not the sole reason for limited latrine adoption among Cambodians (Chase et al., 2019).

Additionally, it is vital to acknowledge the costs related to medical treatment among Cambodians. The most recent national estimates from 2014 show that the mean cost of transport and treatment for the first, second, and third treatments are respectively $41.08, $34.27, and

$32.19. Average healthcare costs increase consistently with the patient's age, ranging from $10.74 for children age newborn to nine to $62.73 for individuals over the age of 60 (Cambodia Demo and Health Survey, 2014, pg. 36). Essentially, the adoption of a latrine could potentially mitigate the financial hardships associated with diarrheal related illnesses.

Once again, while cost is an important factor, data from Cambodia eludes that not all latrine adoption decisions take into account financial considerations. However, subsidized sanitation promotion has the potential to reduce behavioral barriers to latrine construction (Chase et al., 2015). While providing infrastructure alone does not guarantee latrine usage, especially when behavioral barriers are present or attitudes toward modern facility is doubtful, implementing interventions with a behavior change component, such as CLTS, offers a solution for many developing countries facing sanitation challenges (Ngwu, 2017).

Context factors involving social, physical, and personal situations may impact latrine construction (Mosler, Mosch, & Harter, 2018). The social context is often identified through the CLTS intervention and includes culture or social relations, policies, and environmental information (Harter et al., 2018). Additionally, villages in Sub-Saharan Africa with access to health institutes compared to those without were found to be two times more likely to have latrines (Zeleke et al., 2019). Open defecation can also be linked to social dilemmas within a community in the case of the health of everyone else being affected by the decision of as little as one other household not using a toilet or latrine and choosing to participate in open defecation (Harter et al., 2018).

The physical context regarding the environment is also a factor in latrine construction, which often considers the soil conditions and potential reasons for latrine collapse. Depending on the environment and potential weather patterns of a region, the soil composition may be looser or

firmer at any given time of the year. This determines how laborious the process of the latrine construction will be and allows the premeditation of potential latrine maintenance or rebuild. (Harter et al., 2018).

A personal context may be configured by socio-demographic factors. Personal context also takes into account how physically, intellectually, or mentally apt the individual is in successfully carrying out latrine construction (Harter et al., 2018). Higher latrine ownership among households with higher levels of education have been linked (Zeleke et al., 2019).

Sustainability and ODF

Globally, sustainability continues to be an issue specifically concerning ODF practices, as Harter et al. (2018) presents involving 24% of communities in one initiative failing to adopt latrines post CLTS and 29% of communities in a separate initiative relinquishing their ODF status in Mozambique (Harter et al., 2018). According to individuals working on organization level CLTS programs, the activity most recommended for sustainability was following-up or monitoring the activities (Sigler et al., 2014) and a main reason for slipping, or converting back to open defecation may include a lack of follow-up ultimately resulting in the collapse of the latrine (Orgill-Meyer et al., 2019). Garn et al. (2017) determined that repeated, personalized contact with a health promoter was associated with sustainability.

Latrine construction quality may also have an impact on latrine abandonment. Observable structural problems and functionality of older latrines lead to a higher abandonment rate resulting in diminished sustainability (Orgill-Meyer et al., 2019). Long-term strategies to address maintenance behaviors should be addressed in order to sustain ODF status (Sigler et al., 2014).

Although not the primary priority, a goal of CLTS is the ownership of a latrine at each household within a community (Mosler, Mosch, & Harter, 2018). While the specific priority of

CLTS is reaching ODF and not necessarily latrine status, it is still vital to recognize that components of CLTS, including individuals' latrine adoption behaviors in order to better achieve the priority of ODF status (Sigler et al., 2014; Harter, Mosch, & Mosler. 2018).

Years of research on CLTS implementation suggests this approach is successful in engaging individuals in latrine construction and usage. However, there still remains a high proportion of individuals who do not construct latrines following CLTS participation, regardless of the approach (Mosler, Mosch, & Harter, 2018; Harter et al., 2018). The conditions in which CLTS leads people to decide to construct a latrine remains unclear. A thorough understanding of how CLTS motivates people to take this decision could help improve its effectiveness (Harter et al., 2018). Additionally, while CLTS has been introduced in a number of countries the specific contexts and implementation structures have not been uniform and have led to a variation of implementation and versions (Zuin et al., 2019). In an effort to reach a sustained behavior change, it is critical implementers take into account the varying levels of international approaches observed among the CLTS interventions, cultural norms and behaviors, and the effectiveness among these populations in order to identify the most beneficial CLTS activities which support improved sanitation (Sigler et al., 2014; Zuin et al., 2019).

Evidence from meta-analyses have suggested the use of theory having primarily been used at individual level behavior change, and untested at the community level. However, individual behavior has progressively been observed in operation of interventions at a community scale (Sigler et al., 2014). In order to efficiently meet the SDGs, a more critical assessment of how sanitation interventions such as CLTS impacts latrine adoption and usage is needed (Garn et al., 2017). Due to the lack of full adoption within communities, especially rural Cambodia, it is vital to better understand why all households do not partake in the CLTS

activities and if that plays a role in a higher level of participation in latrine construction and usage. Hopeful in gaining an enhanced cultural perspective from Cambodia's point of view and adding knowledge to existing quantitative data, the purpose of this qualitative study is to explore the influences of CLTS on latrine construction and usage among rural Cambodians.

Diffusion of Innovation Theory

The utilization of theory can assist researchers to better understand the variables which are most important to behavior change while at the same offering the opportunity to explain behavior change across varying situations, populations, or contexts (Sigler et al., 2014). The benefits of applying the theory within a qualitative approach enabled an in-depth understanding and inclusion of information which is not initially observed in questionnaires (Helgegren et al., 2018). Additionally, this approach allows for further investigation into the facilitators and barriers of latrine adoption versus relying on pre-determined assumptions (Helgegren et al., 2018).

In this study, the diffusion of innovations (DOI) theory will be used to explore how attributes (i.e., complexity, comparability, relative advantage, observability, and trialability) of CLTS influence the adoption of latrine construction and usage among residents in rural Cambodia (Rogers, 2010). The perceptions of residents who have constructed latrines (i.e., adopters or ODF status) and those who have not constructed latrines (i.e., non-adopters or NODF status) will be taken into consideration to better understand the facilitators and barriers associated with latrine construction and latrine usage.

The premise of the DOI has been present for over a century and was popularized by Everett M. Rogers (Glanz et al., 2008). Essentially, diffusion is seen as a process in which an innovation is communicated or spread over time to participants in a community or from one

community to another. The elements which support the spread of the new idea is (1) the innovation itself, any item or process viewed to be new by the individual, (2) communication channels, the idea travelling from one person to another, (3) time, the adoption or rejection, relative earliness or lateness of adoption, and the rate or number of adoption among members in the community of the innovation, and (4) social system, interrelated units strategizing to solve a problem in order to achieve a common goal. The issue of sustainability comes into play when observing the adoption rate of the innovation. The varying levels of adopters include innovators, early adopters, early majority, late majority, and laggards (Rogers, 2010).

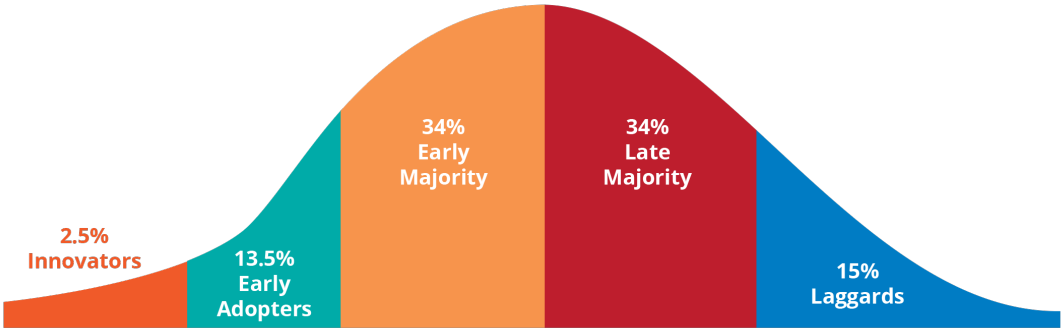

Figure 2.2 Roger's Division of Population Groups in Adopting Innovation.

Innovators begin the innovation process and consist of a small number of creative individuals who have little to lose. Early adopters, often opinion leaders, are next to adopt because of an appraisal of the innovation. Additionally, early adopters often believe it is the right thing to do because others have already adopted. The early majority adopt based on the adoption of the opinion leaders. The late majority often convert due to perceived social pressure, resulting in an imitative effect. Laggards are the last to adopt and often see a high risk involved with adoption (Dearing, 2009). While the DOI assesses adoption throughout varying levels, it is common for studies to implement a dichotomous adoption process (Emani et al., 2018). Emani et

al. (2018) took into consideration the adoption or non-adoption of a patient portal based on the impact of the attributes of relative advantage, compatibility, ease of use, and trialability.

Innovation is often communicated through a set of channels over time among members or social system, such as a community (Rogers, 2010). Diffusion occurs through a five-step decision-making process which utilizes a series of communication channels: knowledge, persuasion, decision, implementation, and confirmation (Kaminski, 2011). An individual may opt to reject an innovation at any point throughout the process. The knowledge stage is when the individual is exposed to the innovation and lacks information pertaining to the innovation. The persuasion stage is when the individual shows interest in the idea and begins to acquire more information. The decision stage is when the individual mentally applies the innovation, anticipating future situations and decides to try the innovation or not. The implementation phase is when individual makes full use of the innovation. The confirmation phase is when the individual decides to continue fully using the innovation or not (Kaminski, 2011).

Interpersonal communication passed along on an individual level is critical in the diffusion process, as this method will reach a variety of adopters. The experience each individual has with the innovation is shared with others who have yet to adopt, ultimately resulting in a potentially higher level of adoption (Sanson-Fisher, 2004). The concept of CLTS includes community involvement encouraging support of latrine uptake from one community member to another (Zuin et al., 2019). Due to the phases involved throughout CLTS, the framework of DOI is supportive for this study.

In order for latrine construction and usage to be adopted, the five attributes, associated with the persuasion stage, provided in Table 2.2 may be taken into account. The attributes are relative advantage, compatibility, complexity, observability, and trialability. The attributes may

be considered barriers or catalysts to the diffusion. Potential adopters will clarify their perceptions in regard to the attributes, in turn providing contextual information to determine the effectiveness of the diffusion (Rogers, 2010).

The DOI theory is a good fit for the study of the adoption of latrine construction and usage. While concepts of diffusion predominately originated in agriculture, concepts have since spread to a variety of fields ranging from health to education (Glanz et al., 2015). Helgegren et al. (2018) utilized the diffusion of innovation theory (DOI) in a qualitative study in Boliva. The study focused on understanding the adoption mechanisms for improved sanitation, specifically what motivates households to implement sanitation. The study site was a low-income peri-urban settlement which exhibited a relatively high improved status of sanitation, which assisted researchers with identifying factors and barriers for the diffusion of pour-flush toilets.

Table 2.2
Diffusion of Innovation Attributes

Attribute	**Description**
Relative Advantage	• Applied by considering if the gain as a result of the innovation will offset the associated costs (Glanz et al., 2008) • Strong prediction of an innovation's rate of adoption (Larson & Dearing, 2014)
Complexity	• Level to which the innovation is easy or simple to comprehend • Considers how much training will be required of the adopter (Glanz et al., 2008)
Compatibility	• Takes into account how well the innovation fits with the priority population • Considers how an innovation will interfere with an existing routine (Glanz et al., 2008).
Observability	• Degree to which outcomes from the innovation can be seen and measured • Considers how quickly results of the innovation becomes visible to adopters (Glanz et al., 2008)
Trialability	• Considers how the adopter can try the innovation before committing to full adoption (Glanz et al., 2008)

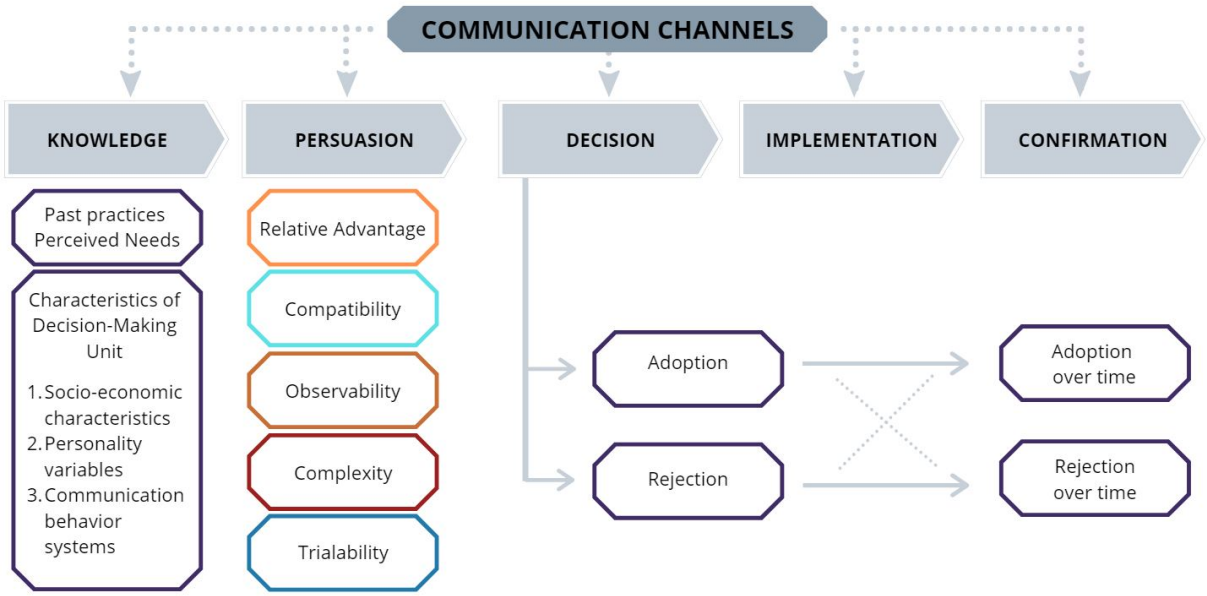

Figure 2.3 Diffusion of Innovation Model.

Factors which promoted adoption from this study included cleanliness, convenience, smell, insecurity while practicing open defecation and status. The only barrier which was presented through the findings was cost. Over time, additional factors functioned to initiate adoption due to a change in the individual's attitude or behavior, such as a violent assault or the insecurity for daughters. Findings from this research study validated the demands for pour-flush toilets in peri-urban areas (Helgegren et al., 2018).

Ramani et al. (2012) took a qualitative, grounded theory approach to understand the diffusion and adoption of toilets among the poorest socio-economic group in India. The study took place in two phases. Phase one consisted of compiling existing literature on the diffusion of pro-poor innovations, or innovations targeting poor consumers. The second phase consisted of accumulating notes over a period of five years with different stakeholders involved with sanitation projects. This information provided insight on how to diffuse pro-poor innovations. In-

depth, semi-structured, open-ended interviews were next conducted with founders of three separate non-profit organizations (NPOs).

Factors contributed to adoption included benefits, costs, and risks. The seasonal nature of agricultural employment and lack of access to financial services among the poor Indian population affected their adoption decision. Individuals from the population had less education and a higher level of unfamiliarity with the innovation pertaining to the advantages and disadvantages. The environment in which they lived did not promote the infrastructure to enable the use of specific products associated with the innovation, such as limited access to water connections. Additionally, targeting efforts of the innovation may fail due to a lack of attention to how decisions are made by poor Indians, which are more driven by their social and cultural environments. The toilet model is also important as the effort demanded of both the user and promoter may not be simple. Thus, the above-mentioned factors impact the level of adoption (Ramani et al., 2012).

Like Cambodia, India relies heavily on the activity of NPOs and NGOs who work in partnership with the local government. Successful diffusion of toilets in India are largely attributable to these partnerships, with key entrepreneurs being recognized in their involvement of diffusion. The results emphasized the adoption challenge due to the call for individual behavior change, daily routines, and potentially social norms in order to successfully adopt the innovation (Ramani et al., 2012).

Wood et al. (2012) purposively identified and interviewed pregnant and postnatal women or antenatal care-based patients (ANC), which were attending government health facilities in rural Malawi, and their close friends and relatives to determine the adoption of a chlorine disinfectant home water treatment called WaterGuard. The diffusion of innovations theory was

one of three behavior change frameworks utilized to better analyze the qualitative findings. Women enrolled in a program providing WaterGuard materials and included health workers who promoted the dissemination of behavior change messages (Wood et al., 2012).

Interviewees expressed behavioral perspectives surveys missed. There was a theme of participants switching back and forth from WaterGuard to other methods. Health workers were primarily attributed to the influence of adoption at every stage. Results of the study contributed to a better understanding of critical factors involved with adoption of an innovation and behavior change throughout a community. Such results include the benefits of interpersonal communication in less-developed or rural countries which helped to build a trust among local sources. Additionally, free trials allowed individuals to try the product which offered participants and their husbands the opportunity to experience beneficial health outcomes (Wood et al., 2012).

A more thorough understanding of the issues surrounding the adoption of latrines may be accomplished through the use of the DOI theory. Studies have successfully identified factors influencing the adoption of specific innovations through the implementation of the DOI theory, as a result providing a framework for future researchers to apply toward future training programs which focuses on the innovation adoption (Helgegren et al, 2018; Scott et al., 2008; Mohammadi et al., 2018). The use of the diffusion of innovations theory in collaboration with small connected community methodology will assist in creating a firm understanding of the factors which serve as facilitators and barriers to latrine construction and usage within the context of rural Cambodia.

Small Connected Community Approach

In addition to the DOI theory, a small connected community methodological approach was utilized. Damianakis and Woodford (2012) adopted a term referred to as "small connected community" which focuses on identifying research ethics in regard to small geographic

communities. This approach involves reducing ethical vulnerabilities through the process of not collecting identifying information on demographics forms, identifying participants by codes only, and anonymizing transcriptions (Damianakis, 2012). While collecting new information on a topic, researchers should strategically develop and implement plans to protect participants. An important reasoning behind the avoidance of obtaining identifying participant information is to prevent the potential risk of exposing others in the community (Damianakis, 2012). Providing anonymity and confidentiality of participants during a research study also has the potential to enhance participation (Udo-Akang, 2013).

The small connected community has been applied within a study focusing on fishing communities in the Azores. Researchers from this study acknowledged their positions within the research community pertaining to "small connected communities." This study involved researchers recognizing themselves as insiders due to living within the "small connected community" but did not recognize themselves as being fishers or from fishing families. Therefore, they were also outsiders (Neilson et al., 2014).

Another study focused on understanding how to include community members from rural areas as partners on research teams. Community engagement in this study was observed as having the potential to encourage development of health promotion interventions to address health inequities. Researchers from this study utilized the element of anonymizing interview transcripts within the context of small connected communities. This decision was based on the often conflicting roles of community members (Pelletier et al., 2020).

Reflexivity Statement

It is common for the beliefs, values, and actions one honors as a researcher to influence how data are collected, analyzed, and interpreted (Lincoln & Denzin, 2003). The positionality of

a researcher takes into consideration a person's overall view of the world and that person's position of choice within a research study (Savin-Baden& Major, 2013). Of specific importance to my position as a researcher is my stance on how reflection and reflexivity impacts my obligation to the field and the current study.

Reflection involves thought and meditation in relation to processes or products of a study. Due to the prior time living and immersing myself into Cambodian culture, I experienced a prospective reflection. Reflection on past experiences enabled me to move into a space of reflexivity, which is a process in which self-awareness between the investigator and research environment is present and assisted in determining the best approach for the current research design, planning, and methods (Savin-Baden & Major, 2013, p. 75).

Reflexivity offers one an enhanced understanding of one's role as a researcher and advantages of trustworthiness of the data, thus providing an empowering effect (Palagana et al., 2017). Through the application of reflexivity, I acknowledged my role in having an obligation to document my own role in the research process. Reflexivity contributes to the confirmability of the results (Ulin et al., 2012, p. 26).

I am a Caucasian, female, first generation college graduate and I grew up in rural Alabama. I have lived in the southeastern United States the majority of my life and worked in elementary education and taught adjunct at the local university. In all respects, I have always been eager to recognize and interpret the lesson each person in my life provides and in turn teach others through those lessons. I am an individual who seeks continuous opportunities to evolve into a better version of myself. After eight years as a professional, I decided to take on a personal challenge and move to Cambodia in order to gain a global perspective prior to starting a PhD program in Health Education and Health Promotion.

I am not naïve to believe there are vast differences between myself and my study population; however, I can attest from my immersion in the culture that I experienced a shift from the position of a complete outsider to an accepted insider. While my own reflexivity continues to develop, my intent is to allow each experience as a researcher guide me in discovering the truth within each reality as it presents itself. In order to help me maintain my reflexivity, a field diary was kept during the research study.

CHAPTER THREE

METHODS

Chapter three details the overall study setting, inclusion and exclusion criteria, instrument development, human subject protection, data collection methods, and data analysis procedures. Small connected community methodology is utilized for this study. The rationale for using community meetings as the method of data collection is presented and thematic analysis will be used to analyze data.

Research Design

Pragmatic Approach

Pragmatism in research follows the concept of utilizing the methods considered to be the most appropriate for the research question, in some cases following multiple methods (Kaushik & Walsh, 2019). Additionally, the research should be conducted in a natural context (Savin-Baden & Major, p. 24, 2013). Many pragmatist scholars support utilizing multiple scientific methods in order to access reality (Kaushik & Walsh, 2019).

The central concept of pragmatism is action. Under pragmatism, human thoughts are linked to actions and it is not possible to separate human actions from past experiences or from the beliefs which have stemmed from those experiences. Therefore, pragmatists believe reality, and the world, is constantly changing and they focus on the nature of experience versus the nature of reality. Three widely share ideas highlight the pragmatist focus on experience. The first idea references actions not being separated from the situations in which they occur. The second

idea states actions are linked to consequences in ways that are open to change. The third idea is actions depend on worldviews that are socially shared sets of beliefs (Kaushik & Walsh, 2019).

Pragmatism accepts there can be single or multiple realities that are open to empirical inquiry. When designing a research project, pragmatism allows for researchers to consider the various differences that designing and conducting a research project would make (Creswell & Clark, 2011). Researchers are able to pull from previous experiences and consider potential consequences of their choices regarding the design and conduct of their research project. Evaluation of the potential consequences of the choice of methodology can only be based on the original research question, goals, or purposes of the research project. A pragmatic approach is utilized within this study, which allows for multiple views and methods to be part of the overall research plan (Kaushik & Walsh, 2019).

Methodological Approach

Qualitative research has been observed more regularly in health research and offers the opportunity to better understand a phenomenon through the experiences of others (Castleberry, & Nolen, 2018). A small connected community methodological approach was utilized for this study and a semi-structured data collection tool was utilized to gather qualitative data during community meetings. The research team decided on the use of the term of community meetings based on the informal and cultural setting in which many community members would come in oud out of the meeting locations as they were carrying out their daily responsibilities.

A small connected community methodological approach involves reducing ethical vulnerabilities through the process of not collecting identifying information on demographics forms, identifying participants by codes only, and anonymizing transcriptions (Damianakis, 2012). The small size of the community in which data were collected could lead to potential identification;

therefore, measures were taken in order to protect participants (Mcgrath, 2006). The utilization of this approach is beneficial within the field of health promotion and health education to better address the issues related to ethical vulnerabilities, which will provide opportunities to develop and implement stronger research studies, while placing emphasis on the best interest of the community and community members.

Sample

The sample for this study included rural Cambodian men and women, 18 years and older, who resided in communes which were exposed to CLTS throughout Pursat Province.

Setting

Pursat Province. The issue of water and sanitation resources in rural Cambodia sets an ideal environment to explore latrine behavior among rural Cambodian communities. Pursat, subdivided into six districts with over 45 communes and more than 500 villages, is the fourth largest province of Cambodia. Ranking 14th in population in Cambodia, Pursat has more than 400,000 residents. Bakan district is comprised of 10 communes and considered the most populated district with more than 100,000 inhabitants and Kandieng district is comprised of 9 communes and more than 55,000 inhabitants (Pursat, 2013). With one of the largest coastlines along the Tonle Sap Lake, the province is predominantly rural and considered one of the poorest provinces in Cambodia. Roughly 40% of the Pursat's population is below the poverty line. Compared to other provinces, it remains relatively untouched by tourism and development (Teh et al., 2019).

Recruitment

This study was part of a larger project which focused on delivering CLTS across three provinces within communes where at least 30 percent of the population lived below the poverty

line and no latrine subsidies were in place. Participants in this study were recruited from this pre-existing population; therefore, participants were still actively enrolled and engaged.

Figure 3.1 Map of Cambodia.

Gaining access to community meeting participants consisted of a multistep process involving a variety of coordinators, gatekeepers, and key informants (Figure 3.2). I contacted the project coordinator of the larger project which provided me Pursat's provincial coordinator's contact information. The Pursat provincial coordinator served as the point of contact on the research team for gaining information and approval needed to gain entry into Pursat Province's site locations. The Pursat provincial coordinator provided the point of contact for the village chiefs of each selected village and the Commune Committee for Women and Children (CCWC)

coordinator. The CCWC is a government appointed entity at the commune level who are actively engaged within their community and responsible for women and children in Cambodia. The CCWC coordinator of each commune worked closely with myself and my bilingual English-speaking research assistant. They contacted each village chief and arranged the approval of village entry and recruitment of participants. Due to each CCWC coordinator living within the commune where each community meeting was held, they were able to easily identify the community meeting location based on their knowledge of the area. My research assistant and the CCWC coordinator of each commune communicated via telephone to arrange each community meeting date and time. All communication with the CCWC was performed by my bilingual English-speaking research assistant and shared and confirmed with me.

Each CCWC coordinator assisted with village approval into the commune by contacting each village chief prior to entry and recruited 4-10 community meeting participants by word of mouth the days leading up to the scheduled community meeting. The community meeting location was determined based on where meetings were normally held within the village. This ranged from community pagodas to village leader homes.

The village chief of each location served as a gate keeper. The chief provided the necessary approval into each village and assisted in recruiting village members through telephone, face-to-face contact, and word of mouth tactics. Recruitment took place via the CCWC coordinator working with the village chief of the prospective commune to identify households and community members. All recruitment activities took place in August 2019.

Human Subjects Protection

Study approval

The study was reviewed and approved by the Institutional Review Board (IRB) of the University of Alabama on August 1, 2019 (Appendix B). Additional approval was obtained through Cambodia's Ministry of Health (Appendix C) and the Evaluation and Monitoring organization (Appendix D).

Informed Consent

A bilingual speaking moderator, which served as my research assistant, read aloud the formal verbal consent form (Appendix C) to participants prior to the start of each community meeting in their native language Khmer. Participants were informed that the community meetings were being audio-tape recorded. Community meeting participants were informed of the voluntary nature of the study and were provided the option to not answer any question they felt uncomfortable with or leave at any time without penalty. No personalized identifying information (i.e. names, village positions, etc.) was collected, only generalized information regarding ODF/NODF village status was collected and documented. All information was provided in the Cambodian national language, Khmer.

Confidentiality

The confidentiality of participants, participation privacy, and participation questions was explained to the participants. No identifying information regarding community meeting participants were included in community meeting transcripts and only the researcher was provided access to this file. Audio recordings from the community meetings and data from the audio files was transcribed for data analysis. The audio recordings were stored on UA Box and deleted after transcription.

Data Collection

Data Collection Tool

A semi-structured data collection tool was developed prior to the community meetings. The responses provided information to generate themes related to the DOI attributes regarding rural Cambodian's descriptions of their latrine construction and usage experiences. The semi-structured interview guide was developed in English and translated into Khmer using a back-translation method. A bilingual research assistant translated the English version into Khmer, which was then reviewed by a project coordinator from the larger project. A separate bilingual project coordinator assisted with back translation from Khmer to English. Throughout the process, there were no significant discrepancies between versions. Project coordinators contributed to the translation process to ensure effective facilitation among participants and to ensure proper cultural representation of the priority population. The interview guide included 7 overarching questions with 15 sub-questions and the Khmer version of the interview was used for moderator efficiency.

Sampling

Community meeting participants consisted of rural Cambodian men and women aged 18 and older (figure 3.3). Community meetings were conducted across six villages throughout Pursat Province. Districts, villages, and communes were stratified based on the exposure of CLTS.

The following districts, communes, and villages were excluded from the sampling frame: 1) districts and communes not exposed to CLTS and 2) villages who did not participate in CLTS activities. Communes were stratified based on their ODF status. Based on these indicators, an equal number of ODF declared villages and NODF villages were identified. The choice of stratified sampling design offers a representative sample of villages within communes and districts of Pursat province.

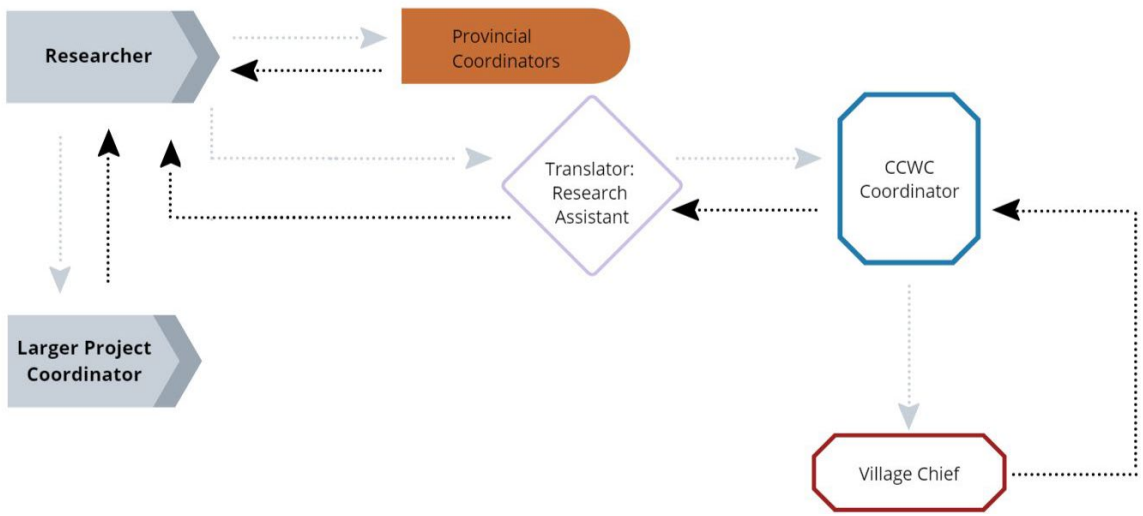

Figure 3.2. Recruitment Flow Chart.

Site Selection

CCWC coordinators were tasked with selecting an easily accessible site within each commune. The site accessibility was determined by selecting a central location familiar for community members to find and a short distance to travel (Litoselliti, 2003, p. 48). Meeting sites took place at community pagodas, commune meeting centers, or village member homes.

Community Meetings

Six communes across Pursat Province were selected for community meetings in August 2019. Meetings were held in three ODF villages and three NODF villages. The number of

community meetings were agreed upon based on a conversation with organizers from the larger project.

Each community meeting was facilitated by the same native Cambodian, bilingual English- speaking research assistant. Prior to the study and field work, I provided a two-hour training with the research assistant. The major responsibilities of the moderator were to guide the community meetings in the native language, Khmer, and obtain verbal informed consent of participants. I was present at each community meeting and served to answer any of the research assistant's questions, resolve logistical issues, and label each audio recording. Prior to each community meeting, both myself, and the research assistant ensured the recording equipment was fully functional. The recording equipment used during community meetings was an iPhone 10s and the average length of the community meetings were forty-five to sixty minutes. Light refreshments were served at each community meeting. Participants received no compensation for participation.

Translation Approach

Qualitative cross-language assignments are challenging for researchers due to a lack of set guidelines for translating and interpreting such work (Arriaza et al., 2015). This challenge often leads to an absence or brief mention to the methods utilized in translation (Arriaza et al., 2015). In order to enhance the rigor of the research, it is important for qualitative research to be transparent in addressing both personal and methodological challenges surrounding the research project (Arriaza et al., 2015).

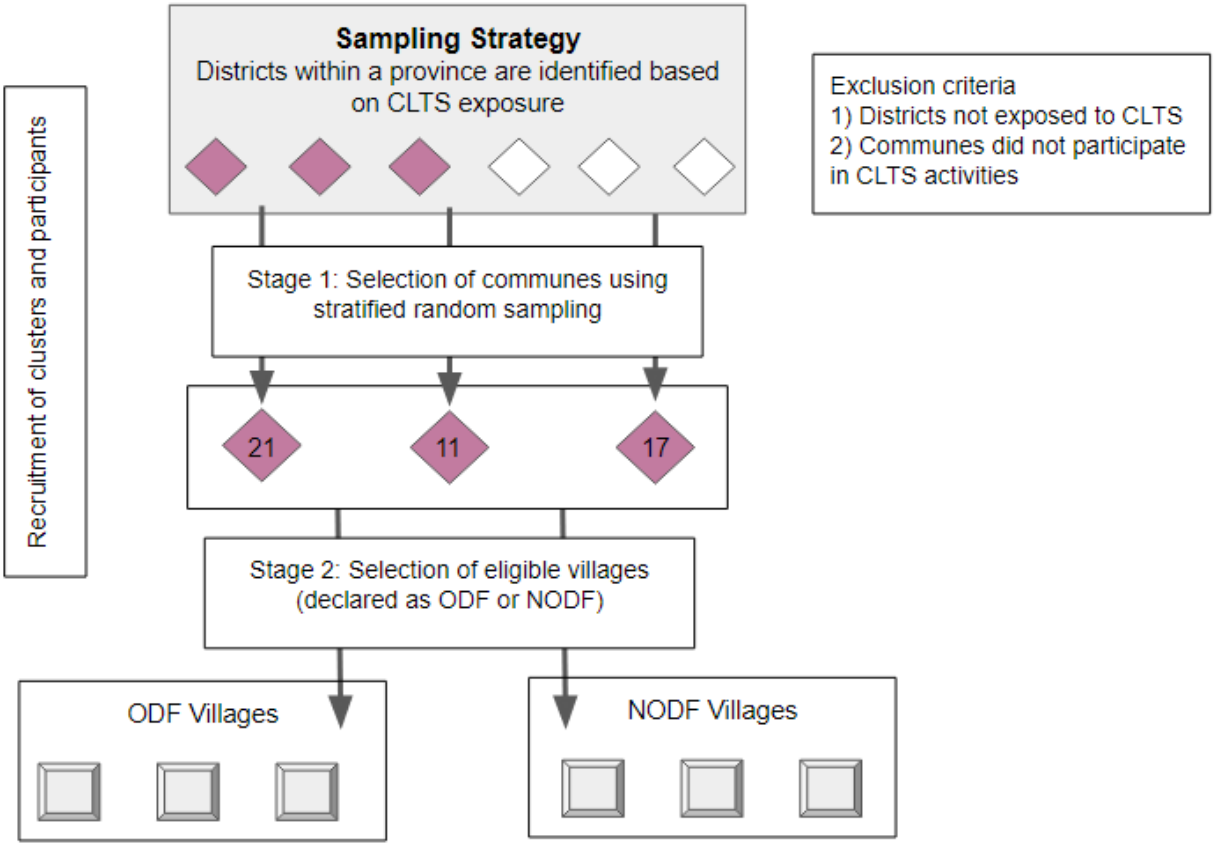

Figure 3.3. Pursat Province Sampling Strategy.

Larkin et al. (2007) promotes a multilingual translation process, which offers a variety of choices often overlooked in more standard methods of translation. This process is an alternative translation process in response to potentially weaker processes such as forward and backward translation (Larkin et al., 2007). The translation process includes two phases consisting of accessing the target language and accessing multiple languages following four constructs (cohesion, congruency clarity, courtesy) to add value to the translation process (Larkin et al., 2007).

In phase one, bilingual English-speaking translators were identified and trained to assist with the data collection tool. The research assistant which was a recent Cambodian baccalaureate graduate working in environmental studies and a coordinator from the larger project working in water and sanitation assisted. Each translator provided independent translations, which served as a comparison and a creative process valuing logical and rhetorical dialogue (Larkin et al., 2007). Upon completion of the translations, meetings between the researcher and translators occurred to take into consideration any inconsistencies in order to create one version of the data collection tool in Khmer.

In phase two, cohesion was addressed. Cohesion refers to the connection of dissonant parts and addresses the relationship between the researcher and translator along with the potential researcher and respondent (Larkin et al., 2007). Translation is dependent on the balance between the translator's knowledge of the language and the researcher's expertise, which in turn supports a sensitive translation. In this study, I was able to work closely with the translator throughout this phase and explain each item in depth to ensure a high quality translation prior to each meeting. Congruence was then addressed, consisting of agreement of words or terms used during the community meetings. Certain words or phrases may vary from one region to another and this offered an extra step to ensure potential issues were properly addressed prior to the meetings. Potential issues were identified and translated in appropriate local language, thus supporting a mutual consultation process.

Clarity ensures the clearest meaning possible and takes into account the potential multiple meanings of words or terms. The importance of clarity is to adapt translations to meet the highest level of equivalence throughout interviews (Larkin et al., 2007). Clarity was applied in this study through the application of the term hygiene. There are multiple words which mean hygiene in

Khmer; however, each refers to different elements of hygiene. Pronunciations vary from hygiene regarding the body and health to more of an environmental reference. Clarity of this correct pronunciation was important to ensure each community meeting was being prompted the same way.

Courtesy takes into account the formal and informal techniques of language. This construct takes into account the varying level of politeness expressed by translators (Larkin et al., 2007). Translators most familiar with the communities in which they are working may prove most beneficial in creating a high level of trust and respect. The research assistant which led each community meeting grew up in a rural, impoverished setting, which created a level of connection with the participants. She was able to speak with each group in a way which made them feel comfortable and more willing to share.

Data Analysis

Community Meeting Transcription

All community meetings were translated and transcribed from Khmer to English simultaneously utilizing a near-verbatim style, where fillers, background noises, and repetitions were not included. Translations and transcriptions took place from August 2019 to September 2019 and were conducted by the bilingual research assistant. A single translator offers consistency leading to a more congruent overall translation process (Squires, 2008). Additionally, I worked with the research assistant during the translation/transcription process. This process has been observed across the literature in an effort to engage with diverse cultural reasoning (Temple, & Young, 2004). Audio recordings were repetitively listened to by the translator to ensure highest translation quality. Each community meeting took approximately three hours to transcribe and translate.

Thematic analysis

All transcriptions were uploaded from word document format and analyzed through the qualitative data analysis software program QSR International's NVivo 12 for thematic analysis. A thematic analysis approach is in line with the purpose of this study which is to explore, analyze, and report the determinants of CLTS on latrine construction and usage among rural Cambodians. For this study, thematic analysis followed a semantic approach in order to identify themes within the explicit meanings of the data and not seeking additional information from what the participant stated (Braun & Clarke, 2006). It has been recommended to engage in the following guidelines when conducting thematic analysis: familiarize oneself with the data, generate initial codes, search for themes, review themes, define and name themes, and produce the report (Savin-Baden, & Claire, 2013).

Coding and Analysis

Upon completion of the transcriptions, data was analyzed by following the aforementioned guidelines. Eighty-nine pages of text were produced from the transcribed community meetings and coded using Nvivo 12. A doctoral student within the Institute for Rural Health Research at the University of Alabama and myself coded the transcripts utilizing the codebook, which followed a deductive, semantic approach. The assistance of an external coder provided a more accurate representation of the participants by decreasing biased views of the researcher. Prior to coding I met with the external reviewer and provided an overview of the project and coding process.

For this study, the template for code development was hybrid, in which NVivo nodes were set a priori with the allowance to add codes within the node as themes emerged throughout the analysis process. A hybrid option also offers more rigor within the thematic analysis

(Fereday & Muir-Cochrane, 2006). The basis of the a priori nodes were developed in regard to the research questions and theoretical framework of the Diffusion of Innovation theory, which included the five attributes pertaining to understanding the facilitators and barriers of latrine behavior in regard to construction and use of latrines. A priori coding schemes were also a way to ensure that coding was performed in a consistent way throughout the project (Flick, 2013).

In order to be more familiar with the transcripts and coding process, the two-member coding team each coded a pilot transcript. Both researchers independently coded the transcript and compared codes. Any revisions deemed necessary were made at this time. This additional step assisted in developing the code manual. The coders worked simultaneously and collaboratively through the use of NVivo 12, allowing for open discussion throughout the process.

The codes developed were entered into NVivo and segments of the text were sorted. Analysis of the data at this stage was guided by the preliminary nodes. Coding took place within one phase, due to the collaborative nature of coding. Themes were developed among the coders upon the completion of an interrater agreement. The interrater agreement was run through constant comparison query in NVivo 12.

Interrater Reliability

Interrater reliability was utilized for the analysis of this data to provide an indicator of reliability among coders. Interrater reliability is a measure of agreement among various data collectors. Interrater reliability agreement test statistic was set at 80%, which allows for almost perfect agreement (McHugh, 2012).

Each transcript was imported in NVivo 12 and each coder utilized the feature to work within the same workbook, independent of one another. Once each transcript was coded, the

interrater reliability test was performed using the coding comparison query option within the NVivo 12. In any case the 80% test statistic was not met, the two-coder team held a discussion until an agreement was determined. This discussion was held upon the completion of the first phase of initial coding. The interrater reliability test was run again upon each agreement and this process was followed until interrater reliability met the minimum of 80% for throughout each transcript.

Content validity

The intention of content validity involves collecting research materials and content in the most representative of ways in order to better generalize a specific collection of materials or content to a broader domain (Brod, Tesler, & Christensen, 2009). Content validity was established in this study through the use of multiple individuals serving throughout the translation phase of the semi structured data collection tool to ensure and enhance the overall trustworthiness and credibility of the research project. Specifically, through the utilization of congruence and clarity to ensure the highest quality of the translation was provided.

Quality control

Guba (1981) proposed a model for assessing trustworthiness of qualitative data. The strategies utilized within the model to assess qualitative data is vital for researchers to ensure rigor of their projects. The model of trustworthiness of qualitative research is evaluated by the following four components: truth value, applicability, consistency, and neutrality (Krefting, 1991).

Truth value establishes the researcher's level of confidence within the truth of findings based on the research design, informants, and context. Lincoln and Guba (1985) referred to truth value as credibility. In qualitative studies, the researcher obtains truth value through exploring

human experiences. In this study, I was there and kept a reflexive journal to ensure the steps taken at each community meeting remained consistent. Additionally, the study allowed for the local community to fully engage with the population and multiple coordinators to ensure their knowledge and perspective was accurately recorded. Researchers must be able to clearly and accurately represent the varying levels of knowledge revealed by the participants as adequately as possible (Krefting, 1991). Following the meetings, the transcripts were listened to multiple times and discussed with the research assistant to ensure proper transcription was achieved.

Applicability refers to the generalizability from the findings to larger groups or populations (Krefting, 1991). Applicability was addressed through the utilization of a multi-site, six village study. In qualitative studies, applicability is not as relevant as in quantitative studies, as there are few controlling variables and phenomenon specific. Transferability in regard to applicability is more relevant, which refers to how well the findings from one study fit into other contexts dependent on the level of similarity between the two contexts (Krefting, 1991). In this case, the results from this study would be applicable to the remaining provinces across Cambodia based on the rural, demographic background which predominantly makes up Cambodia.

Consistency of trustworthiness refers to the consistency of the data or the findings from one study remain consistent if replicated in a similar setting. Within qualitative research, consistency may be achieved by learning from the informants rather than controlling for them (Krefting, 1991). Consistency was addressed through an effective communication channel among the research team in order to follow protocol from one site to the next. This ensures the research could be followed in other provinces and similar conclusions would be expected. Neutrality of trustworthiness in this study was addressed through the participation of external individuals to serve in the coding process in order to eliminate bias. Due to the application of the

data analysis in this study, a semantic approach ensures transcriptions are within the explicit meanings of the data and did not seeking additional information from what the participant stated.

Research Questions

RQ1. ***How do rural Cambodians describe facilitators and barriers of latrine construction within the context of diffusion of innovation theory?***

Research question one focuses on the facilitators or barriers rural Cambodians identify as determinants to construct or not construct a latrine as a result of CLTS. The diffusion of innovation theory's five characteristics (relative advantage, compatibility, observability, complexity, and trialability) were used to identify themes related to DOI attributes as they pertain to latrine construction. These characteristics have been identified in determining why some innovations are more successful than others (Rogers, 2010).

RQ2. ***How do rural Cambodians describe facilitators and barriers of latrine usage within the context of diffusion of innovation theory?***

Research question two focuses on the facilitators or barriers rural Cambodians identify as determinants to latrine usage as a result of CLTS. The diffusion of innovation theory's five characteristics (relative advantage, compatibility, observability, complexity, and trialability) were used to identify themes related to DOI attributes as they pertain to latrine usage. Justification for using this approach within this population and problem is included in the literature review (Rogers, 2010).

CHAPTER FOUR

RESULTS

Chapter four presents the responses to the community meetings which were conducted to explore the study's research questions. First, the demographic characteristics of the community meeting participants and villages will be presented. Next, the qualitative community meeting findings will be presented. A summary of findings is provided, followed by specific respondent excerpts that support findings. Multiple quotes are included for each point that is made in order to illustrate consensus and variations in perspective pertaining to the provided theme.

Demographic Characteristics

Six community meetings were held across two districts and six villages. All interviews lasted from forty-five to sixty minutes. Based on the demographic data from this study, the non-adopter or NODF villages consisted of 711 households and a total of 521 latrines or 73% latrine coverage and the adopter or ODF villages consisted of 631 households and a total of 552 latrines or 88% latrine coverage. A majority (54%) of focus group community participants were female (Table 4.1 and Table 4.2).

Eighty-nine pages of text were produced from the six community meetings. The two-member coding team generated a total of thirty-three codes. A thematic analysis of the community meetings revealed nine over-arching themes related to latrine construction and seven over-arching themes related to latrine usage (Table 4.3).

Table 4.1

Community Meeting Participants and District Demographics

Characteristics	Kandieng District NODF Villages	Bakan District ODF Villages	Total
Community Meeting Gender			
Male	14	14	28
Female	17	16	33
Households (n)	711	631	1352
Latrines (n)	521	552	1152

*Kandieng District represents non-adopters; Bakan District represents adopters

Table 4.2

Community Meeting Participants and Village Demographic Characteristics

Characteristics	A Non-Adopters	B Non-Adopters	C Non-Adopters	D Adopters	E Adopters	F Adopters
Community Meeting Gender						
Male	2	3	9	5	6	3
Female	8	6	3	5	5	6
Households (n)	181	225	305	101	436	94
Latrines (n)	127 (72.9%)	172 (84.7%)	222 (75.2%)	82 (86.3%)	384 (90.5%)	86 (98.8%)

*Villages A, B, and C are representative of Kandieng Districts (non-adopters) and villages D, E, and F are representative of Bakan Districts (adopters)

Research Question One Findings

RQ1. How do rural Cambodians describe facilitators and barriers of latrine construction within the context of diffusion of innovation theory?

Research question one focuses on the facilitators or barriers rural Cambodians identify as determinants to construct or not construct a latrine as a result of CLTS. The diffusion of innovation theory's five attributes (relative advantage, compatibility, observability, complexity, and trialability) was used to identify themes related to DOI attributes as they pertain to latrine construction.

Findings from research question one will inform the study's overall purpose of exploring the determinants of CLTS on latrine construction among rural Cambodians.

Overview of Findings A total of nine overarching themes and three sub themes related to latrine construction were identified, which attributed to the facilitators and barriers related to latrine construction. Among the non-adopters and adopters, a number of similar responses occurred. Each section is described below.

Facilitators. A total of five overarching nodes were utilized to identify facilitators or barriers related to latrine construction. Community meetings presented the following facilitators which impacted one's decision to build a latrine. Facilitators which demonstrated the relative advantage of building a latrine consisted of the overall health and well-being, convenience, and environmental awareness. A contributing facilitator which demonstrated complexity was the level of simplicity in which the latrine was perceived to offer the adopter. A facilitator which demonstrated compatibility was the obligation one had to another. The facilitators which demonstrated observability were the demonstrations provided by CLTS coordinators, along with community members, and the observable health improved health of others.

Barriers. The nodes most representative of the barriers identified by community members were complexity and compatibility. Barriers pertaining to complexity consisted of an overall lack of resources. Barriers pertaining to compatibility consisted of interferences to one's daily life in regard to migration patterns and habitual behaviors. It should be noted the role trialability played on latrine construction was minimal. While participants had opportunities to share and trial latrines, trialability served as neither a facilitator nor barrier in this study.

Table 4.3
Latrine Construction and Usage Themes

Latrine Construction		
Theme	**Type**	**Quote**
Health and Well-Being	Facilitator	Before I did not have latrine and did open defecation and got illness. When I got the latrine, I have better hygiene.
Convenience	Facilitator	The benefits of latrine take away not getting wet in rainy season. When we don't have it is very difficult during the rainy season.
Environmental Awareness	Facilitator	When I build a latrine I also do a bio-gas program. Bio-gas is a system where a tube is connected from the latrine into a tank and the gas slowly releases and is turned into energy for cooking and lights. I use that gas every day and it is beneficial for environment.
Lack of Resources	Barrier	Because of lacking resources, some members of the community are poor. For some people who do not have money they won't build.
Ease	Facilitator	It is easier for my blind husband. I just guide him once and he is able to do by himself.
Interference to Daily Life	Barrier	Other people are working in the market and they don't come to learn how to build the latrine.
Migration	Barrier	Some challenges are members of families migrate to Thailand. So, they do not build a latrine because they do not know when they are coming.
Livestock	Barrier	My buffalo was stuck between cement during the construction and broke his leg and now I have to sell those buffalo at a lower cost. When the water comes in during the rainy season, the soil around the cement gets wet and the cow gets crushed between it. The buffalo is very expensive and waste a lot of money.
Habitual Behaviors	Barrier	I had the old traditional latrine where I built a hole and used the ashes to cover and did not think about building a new latrine.
Obligation to Others	Facilitator	I told my daughter she needed to help me build a latrine. I will pass away soon so the latrine will belong to her.
Demonstrations	Facilitator	Many people have come to tell and encourage. The number one (reason people build) is people look at each other.
Improved Health of Others	Facilitator	People see and know one household that has the latrine and they have good hygiene. People keep participating. We look at others who have the latrine and all come to participate.
Latrine Usage		
Health and Well-Being	Facilitator	Pooping in the latrine does not spread infection, such as diarrhea. We wash our hands and clean the latrine and bring good health.
Convenience	Facilitator	Some neighbors just come to visit. The visitor comes to visit and they are able to poop if they need to.
Economic Advantage	Facilitator	There is no infection, now. The children do not get sick and is the reason we have lower costs and save money. No cost of infections. I now save money.

Environmental Impact	Facilitator	In the past, it was difficult to walk because of the poop that was around. The poop would flow in the water and make it difficult to work in the rice fields.
Ease	Facilitator	It has been easy for everyone to poop at night.
Behaviors	Barrier	If I stay in the forest for work or another reason, I will stay in the forest. It is too far away to walk back to house.
Obligation to Others	Facilitator	Now, people have thrown away their old habit of open defecation because it is not only for their own hygiene and health but for other people's hygiene and health.
Demonstrations	Facilitator	In the past, people in the village do not know how to use the latrine and did not know how beneficial it was until the intervention and their official came to introduce the use of the latrine. The official came to introduce the latrine and the people came to see and hear and we have now participated for such a long time until we became an ODF village.

Interrater Agreement

Interrater agreement analyses were computed in NVivo 12. For this study kappa was set at 0.80 ($k \geq 0.80$). Table 4.4 interprets Cohen's kappa. In order to maintain a reflexive and creative stance, any disagreements were thoroughly discussed upon completion of coding and addressed accordingly in order to obtain the desired *k* score. Discussions were conducted via virtual conversation while both coders simultaneously accessed each transcript within NVivo and individually addressed each score below 80%. Any score of 100% is attributed to coders not identifying text within that specific transcript to the correlated code. Those scores are reflected in Table 4.5 and Table 4.6 pertaining to research question one and Table 4.6 and Table 4.7 pertaining to research question two.

Table. 4.4

Interrater Reliability: The Kappa Statistic

Value of Kappa	Level of Agreement	% of Data that are Reliable
0-.20	None	0-4%
.21-.39	Minimal	4-15%
.40-.59	Weak	15-35%
.60-.79	Moderate	35-63%
.80-.90	Strong	64-81%
Above .90	Almost Perfect	82-100%

*Interpretation of Cohen's Kappa (*k*).

While the scores of the interrater reliability demonstrates agreement among the coders, it is vital to express the intent of the researcher to maintain a reflexive and creative stance regarding the community meeting responses and themes presented (McDonald et al, 2019).

Relative Advantages of Latrine Construction

Viewed as a strong prediction of an innovation's adoption rate, relative advantage involves the consideration of a gain from building a latrine will offset any associated costs. A total of 96 reference codes pertaining to relative advantage emerged from the transcriptions. A number of relative advantages to constructing a latrine emerged among both non-adopters and adopters.

Table 4.5

Interrater Reliability and Percent Agreement of Latrine Construction Non-Adopters

NODF Villages Construction	**Village A**		**Village B**		**Village C**	
Code Description	Kappa	Inter-Coder Agreement Rate %	Kappa	Inter Coder Agreement Rate%	Kappa	Inter-Coder Agreement Rate %
Relative Advantage						
1. Better Environment	0.984	99.99	0.852	99.63	0.923	99.86
2. Improved Health	0.885	99.89	0.961	99.97	0.971	99.97
3. Mosquitos	0.809	99.92	0.962	99.99	1.000	100.0
4. Rainy Season	0.991	100.0	0.957	99.97	1.000	100.0
5. Safety	0.810	99.53	0.887	99.88	0.813	99.86
Complexity						
6. Difficult to Build	0.801	99.83	0.992	100.0	0.878	99.58
7. Easier that OD	0.803	99.60	0.905	99.72	0.992	99.98
8. Lack of Resources	0.804	99.48	0.850	98.99	0.874	99.56
Compatibility						
9. Current Needs	0.906	99.86	0.995	100.0	0.893	99.83
10. Life Interference	0.954	99.62	0.991	100.0	0.987	100.0
11. Migration	1.000	100.0	0.844	99.80	0.996	100.0
12. Obligation to Others	0.996	100.0	0.998	100.0	0.997	100.0
13. Old Habits	0.860	99.46	0.972	99.94	0.990	99.98
Observability						
14. Neighbors Building	0.983	99.98	0.991	99.82	0.996	99.99
15. Demos	0.842	99.51	0.998	100.0	0.991	99.99
16. Improved Health	0.964	99.99	0.809	99.91	0.993	100.0
Trialability						
17. Sharing	0.989	100.0	0.937	99.94	0.965	99.08

Perceptions of latrine construction from villages identified as non-adopters (i.e. those who have not met the minimum of latrine construction throughout their village to be declared ODF).

Table 4.6

Interrater Reliability and Percent Agreement of Latrine Construction Adopters

ODF Villages Construction	**Village D**		**Village E**		**Village F**	
Code Description	Kappa	Inter-Coder Agreement Rate %	Kappa	Inter Coder Agreement Rate%	Kappa	Inter-Coder Agreement Rate %
Relative Advantage						
1. Better Environment	0.907	99.63	0.994	99.99	0.996	99.98
2. Improved Health	0.831	99.63	0.991	99.98	0.871	99.53
3. Mosquitos	1.000	100.0	0.982	99.97	1.000	100.0
4. Rainy Season	0.990	99.99	0.983	99.99	0.872	99.49
5. Safety	1.000	100.0	0.930	99.68	0.994	99.98
Complexity						
6. Difficult to Build	0.996	99.99	0.895	99.61	1.000	100.0
7. Easier than OD	0.934	99.84	0.972	99.99	0.994	99.99
8. Lack of Resources	0.882	99.45	0.965	99.97	0.991	99.98
Compatibility						
9. Current Needs	0.997	99.99	0.991	99.99	0.866	99.37
10. Life Interference	0.849	99.87	0.989	99.99	0.802	99.26
11. Migration	0.988	99.97	0.990	99.99	1.000	100.0
12. Obligation to Others	0.856	99.88	0.994	99.99	0.996	99.99
13. Old Habits	0.994	99.99	0.893	99.70	0.840	98.74
Observability						
14. Neighbors Building	0.948	99.97	0.821	99.53	0.934	99.56
15. Demos	0.997	99.99	0.990	99.97	0.918	99.25
16. Improved Health	0.993	99.99	0.925	99.79	0.886	99.56
Trialability						
17. Sharing	0.825	99.48	0.810	99.33	0.878	99.84

Perceptions of latrine construction from villages identified as adopters (i.e. those who have met the minimum of latrine construction throughout their village and have been declared ODF).

Health and Well-Being

A primary advantage to building a latrine were the perceptions related to health and well-being. Specifically, community meeting participants identified the improved health and removal of dangers as being key advantages. Participants provided responses regarding the reason to

build a latrine. The following comments pertaining to the benefits of building a latrine were addressed:

> *...good health, if do not have latrine, the children get sick. If they have the latrine they will not [Bakan District adopter participant].*
>
> *Before I did not have latrine and did open defecation and got illness. When I got the latrine, I have better hygiene [Kandieng District non-adopter participant].*

Additionally, participants mentioned areas of concern regarding their well-being and how building a latrine is advantageous. Participants stated the following advantages to building a latrine in regard to their well-being:

> *Open defecation is very harmful and very dangerous, especially for young girls because a rape case could happen to her [Kandieng District non-adopter participant].*
>
> *It will reduce the risks of pooping in the forest. There are snakes and rats in the forest. In the forest, snakes chase you. I was pooping, saw a snake, and ran. The snake came to bite me [Bakan District adopter participant].*

Convenience

Convenience was identified as an advantage to building a latrine. Community meeting participants identified such conveniences as a reduction in mosquito bites from practicing OD and not getting wet from having to practice OD during the rainy season. One participant stated an advantage of individuals not participating in open defecation was the decrease of mosquito bites. Another participant stated that:

The benefits of latrine take away not getting wet in rainy season. When we don't have it is very difficult during the rainy season [Kandieng District non-adopter participant].

For the older people, there is no need to carry things to build under the soil and no mosquitos to bite [Kandieng District non-adopter participant].

Environmental Awareness

Another advantage to building a latrine that emerged took into consideration effects of applying certain environmentally friendly techniques. Participants shared the following statements on building a latrine:

When I build a latrine I also do a bio-gas program. Bio-gas is a system where a tube is connected from the latrine into a tank and the gas slowly releases and is turned into energy for cooking and lights. I use that gas every day and it is beneficial for environment [Bakan District adopter participant].

To collect the compost in the latrine for farming. Many benefits. Cabbage, green leafy vegetables [Bakan District adopter participant].

Complexity of Latrine Construction

Complexity of an innovation refers to how easy or simple that innovation is to understand or implement. A total of 99 reference codes pertaining to complexity emerged from the transcriptions. Issues related to latrine construction complexities among the participants from the rural villages ranged from issues pertaining to the lack of resources (money, materials, and knowledge) to the concept of ease.

Lack of Resources

Many participants expressed the difficulties involved with building a latrine as it applied to not having the money to build, knowledge of how to build it correctly, or assistance to build. The lack of resources creates an added level of complexity to build a latrine. Participants shared the following statements on what made building a latrine difficult for themselves or their village:

Because of lacking resources, some members of the community are poor. For some people who do not have money they won't build [Kandieng District non-adopter participant].

They (members of community who have not built) are lacking resources. We always tell them they need to save money…again and again, whenever we tell them they still say they are lacking of resource and money [Kandieng District non-adopter participant].

For some people, they don't have money or labor [Kandieng District non-adopter participant].

Some families are just waiting for their children to send them money [Kandieng District non-adopter participant].

Let us know step by step (how to build) because the materials are here and we should build it and still for some others not yet have the materials. For those who have the materials they need to hire someone to build it. For me, I just build it by myself and my children who come back from work will rebuild it for me. For me, I do not know how to build it so I build it a certain way to just make it work for the time [Kandieng District non-adopter participant].

Ease

The concept of ease for many were mentioned as to their decision to build. The idea that the latrine would be easy to use was a driving force behind many community members. Participants stated the following:

> *It is easier for my blind husband. I just guide him once and he is able to do by himself [Kandieng District non-adopter participant].*
>
> *The reason I build a latrine is because it is easy to poop [Bakan District adopter participant].*

Compatibility of Latrine Construction

The compatibility of an innovation takes into account how the innovation (building a latrine) will interfere with the existing values or routines of the adopters. A total of 137 reference codes pertaining to compatibility emerged from the transcriptions. While a number of interferences emerged regarding the adoption of building a latrine, community members also identified with core values which proved highly compatible. Understanding the perceptions of compatibility can be utilized to better determine the lack of latrine construction. The following represents the compatibility of latrine construction across non-adopters and adopters.

Interference to Daily Life

An overall interference to daily life and routine was presented among community meeting participants. For some these impacted their decision or ability to build a latrine. Some participants mentioned how activities required to build a latrine interfered with their daily life. The following was shared:

> *Other people are working in the market and they don't come to learn how to build the latrine [Bakan District adopter participant].*

Because I am a widow. I am looking after the grandchildren and I must work to take care of the grandchildren [Kandieng District non-adopter participant].

Migration

The migration of individuals proved to be an interference to building a latrine. Community meeting participants shared how migration resulted in many households not building a latrine. The following statements were made by participants:

Because they (those without a latrine) do not stay home. They go to Thailand. They have a house and are only here sometimes. [Bakan District adopter participant].

Some challenges are members of families migrate to Thailand. So, they do not build a latrine because they do not know when they are coming [Kandieng District non-adopter participant].

Livestock

The following statements express how an interference of building a latrine have impacted their livestock and livelihoods. One participant shared how their water buffalo became stuck and broke a leg, depreciating its worth and having to be sold for less. The impact of the statement was made when someone prompted, "What if it were your grandchild, instead?" One participant shared the following:

My buffalo was stuck between cement during the construction and broke his leg and now I have to sell those buffalo at a lower cost. When the water comes in during the rainy season, the soil around the cement gets wet and the cow gets crushed between it. The buffalo is very expensive and waste a lot of money [Kandieng District non-adopter participant].

Habitual Behaviors

For others, old habits are still performed. Many do not build a latrine because of their engrained behaviors of open defecation. Participants shared the following statements:

I had the old traditional latrine where I built a hole and used the ashes to cover and did not think about building a new latrine [Kandieng District non-adopter participant].

We use the digging tool to dig underground and cover the poop. We use the digging tool since a long time ago but sometimes we go to the rice field and poop [Kandieng District non-adopter participant].

...children poop open defecation. But, old women come and cover it up. If the old woman is not home the kids come and show someone where they pooped [Kandieng District non-adopter participant].

Obligation to Others

It was indicated by participants that having an obligation to their neighbor, family, or community was highly compatible to their values to one another. The following statements were made by participants:

I did it (built a latrine) by myself because I wanted to help my husband. Because my husband is blind, blind people need something accessible. A video was made on my story showing how I once used the tool to dig a hole and then how I built the latrine [Kandieng District non-adopter participant].

I told my daughter she needed to help me build a latrine. I will pass away soon so the latrine will belong to her [Kandieng District non-adopter participant].

I want to build a latrine because I want to be clean and have good health and be able to not affect other with bad health [Bakan District adopter participant].

Observability of Latrine Construction

Observability refers to the degree in which an innovation can be seen and/or measured (Glanz et al., 2015). A total of 79 reference codes pertaining to observability emerged from the transcriptions. The ability for community members to participate in demonstrations, such as the community mapping events from the triggering phase of CLTS, and observe their fellow neighbors building latrines served as positive examples.

Demonstrations

Demonstrations from CLTS activities and neighbors participating in building a latrine resulted in positive examples to build a latrine. Participants shared the following statements pertaining to how demonstrations impacted their decision to build a latrine:

...organization come to provide education and materials and provided some materials. I learned how to build the latrine [Kandieng District non-adopter participant].

After the program people realized how to build a latrine and keep building, following each other and each person individually follows by building a latrine [Bakan District adopter participant].

Many people have come to tell and encourage. The number one (reason people build) is people look at each other [Bakan District adopter participant].

Improved Health of Community Members

The ability for community members to observe improved health among those with a latrine was identified as a desire to build a latrine. Participants shared the following statements:

In the past we did open defecation and now everyone really wants to have a latrine. One village has a good hygiene and health because of people participating in building and using a latrine [Bakan District adopter participant].

People see and know one household that has the latrine and they have good hygiene. People keep participating. We look at others who have the latrine and all come to participate [Bakan District adopter participant].

Trialability of Latrine Construction

The trialability refers to the degree in which an innovation may be experimented with on a limited basis. While trialability was not widely expressed as a contributing reason to build a latrine, there was a presence reported of individuals having the ability to experiment with a latrine prior to building.

Impact of Sharing

In a number of situations, community members were able to share with neighbors who had constructed a latrine. While trialability was present, participants did not express how having access made them more motivated to build their own latrine. To provide an example of what participants had to say about their trial experience, the following excerpt is provided:

If the neighbor does not have the latrine we share with each other. Even though that neighbors has the material and has not finished the construction we share. When they finish the construction they will use their own [Bakan District adopter participant].

Others, if they don't have the latrine they are sharing. Two household that are close by just use one. When we try to encourage them to build their own that get mad [Kandieng District non-adopter participant].

Research Question Two Results

RQ2. *How do rural Cambodians describe facilitators and barriers of latrine usage within the context of diffusion of innovation theory?*

Research question two focuses on the facilitators or barriers rural Cambodians identify as determinants to latrine usage as a result of CLTS. The Diffusion of Innovation theory's five characteristics (relative advantage, compatibility, observability, complexity, and trialability) will be used to identify themes related to DOI attributes as they pertain to latrine usage.

Findings from research question two will inform the study's overall purpose of exploring the determinants of latrine usage among rural Cambodians.

Overview of Findings

A total of seven themes and one subtheme related to latrine usage were identified, which attributed to the facilitators or barriers related to latrine use among non-adopters and adopters. For both non-adopters and adopters, there were more facilitators than barriers. Many similarities exist with that of latrine construction facilitators and barriers. The main difference observed was the application of said facilitator and barrier in relation to the overarching node. Each section is described below.

Facilitators. Community meetings presented the following facilitators which impacted one's decision to use a latrine. Facilitators which demonstrated the relative advantage of building a latrine consisted of the overall health and well-being, convenience, economic advantages, and environmental impacts. A contributing facilitator which demonstrated complexity was identified as ease of use. A facilitator which demonstrated compatibility was the obligation one had to another. The facilitator which demonstrated observability was demonstrations provided to show how to use the latrine along with the examples set forth by others in the community.

Barriers. Community meetings presented the following barrier which impacted one's decision to use a latrine. The code most representative of the main barrier identified by community members was compatibility and how the use of a latrine did not align with their current practices or behaviors. While participants had opportunities to share and trial latrines, trialability served as neither a facilitator nor barrier in this study.

Table 4.7

Interrater Reliability and Percent Agreement of Latrine Usage among Non-Adopters

NODF Villages Usage	**Village A**		**Village B**		**Village C**	
Code Description	Kappa	Inter-Coder Agreement Rate %	Kappa	Inter Coder Agreement Rate%	Kappa	Inter-Coder Agreement Rate %
Relative Advantage						
1. Better Living Environment	0.871	99.76	0.998	100.0	0.817	99.77
2. Convenience	0.992	99.18	0.988	100.0	0.887	99.87
3. Improved Health	0.863	99.65	0.998	100.0	0.998	100.0
4. Saves Money	1.000	100.0	0.892	99.95	0.993	100.0
5. Rainy Season	0.876	99.80	0.992	100.0	0.827	99.68
6. Mosquitos	0.990	99.96	0.802	99.95	1.000	100.0
7. Safety	0.802	99.59	0.993	100.0	0.847	99.48
Complexity						
8. Easier than ODF	0.915	99.73	0.993	99.98	0.902	99.68
Compatibility						
9. Daily Life	0.922	99.70	0.969	99.95	0.992	99.99
10. Habits	0.844	99.83	0.972	99.95	0.983	99.99
11. Obligation to Others	0.995	100.0	0.990	99.99	0.930	99.84
Observability						
12. Demos	0.931	99.61	0.987	99.96	0.869	99.88
13. Observation of Others	0.995	100.0	0.975	99.98	0.823	99.77
14. Improved Health	0.997	100.0	0.904	99.98	0.997	100.0
15. Told by Others	0.882	99.7	0.821	99.83	0.801	99.56
Trialability						
16. Sharing	0.989	100.0	1.000	100.0	0.9778	100.0

Perceptions of latrine usage from villages identified as adopters (i.e. those who have not met the minimum of latrine construction throughout their village to be declared ODF.

Table 4.8

Interrater Reliability and Percent Agreement of Latrine Usage among Adopters

ODF Villages Usage	**Village D**		**Village E**		**Village F**	
Code Description	Kappa	Inter-Coder Agreement Rate %	Kappa	Inter Coder Agreement Rate%	Kappa	Inter-Coder Agreement Rate %
Relative Advantage						
1. Better Living Environment	0.996	99.97	0.997	99.98	0.997	99.98
2. Convenience	0.991	99.99	0.844	99.64	0.993	99.99
3. Improved Health	0.866	99.02	0.938	99.87	0.932	99.27
4. Saves Money	1.000	100.0	0.990	99.97	0.990	99.96
5. Rainy Season	0.988	99.98	1.000	100.0	0.986	99.98
6. Mosquitos	1.000	100.0	1.000	100.0	1.000	100.0
7. Safety	0.975	99.97	0.994	99.98	0.993	99.97
Complexity						
8. Easier than ODF	0.997	99.99	0.814	99.74	0.900	99.70
Compatibility						
9. Daily Life	0.997	99.99	0.991	99.99	0.867	99.32
10. Habits	0.979	99.93	0.820	99.18	0.929	99.76
11. Obligation to Others	0.835	99.79	0.995	99.99	0.801	98.76
Observability						
12. Demos	0.869	99.7	0.983	99.95	0.886	98.59
13. Observation of Others	0.991	99.99	0.998	99.99	0.989	99.94
14. Improved Health	0.974	99.96	0.938	99.87	0.990	99.96
15. Told by Others	0.993	99.99	0.818	99.52	0.911	99.58
Trialability						
16. Sharing	0.973	99.90	0.961	99.90	0.953	99.78

Perceptions of latrine usage from villages identified as adopters (i.e. those who have met the minimum of latrine construction throughout their village and have been declared ODF.

Relative Advantages of Latrine Usage

Relative advantage, viewed as a strong prediction of an innovation's adoption rate, involves the consideration of a gain from using the latrine will offset any associated costs (Glanz, et al. 2015). A total of 218 reference codes pertaining to relative advantage emerged from the

transcriptions. A number of relative advantages to using a latrine emerged across non-adopters and adopters.

Health and Well-Being

Many participants related gains to health and well-being due in part to using a latrine. Community meeting participants identified the improved health and removal of dangers as being key advantages. The following statements were provided:

> *Even though I need to pee, I will go to the latrine. Before I peed anywhere, everywhere. If I want to pee now, I will go to the latrine. Not the same in the past. When we do open defecation we would use a leaf to clean up. But, in the latrine we clean with water. Because of using that leaf some people are infected and tumors develop because the leaf cuts the skin [Bakan District adopter participant].*
>
> *Pooping in the latrine does not spread infection, such as diarrhea. We wash our hands and clean the latrine and bring good health [Kandieng District non-adopter participant].*

Using the latrine, I have been healthier and no flies. Less illness and no mosquito bites while pooping and it has taken away being scared of [Kandieng District non-adopter participant].

I rarely get sick. It has reduced illness [Bakan District adopter participant].

Convenience

Participants identified a number of conveniences in which they benefitted from due to latrine use. Such benefits included being better protected during the rainy season and situations pertaining to mosquitos. Participants shared the following statements:

Not having the latrine you had to poop in the rain, under the sun and then having the latrine it was easy [Bakan District adopter participant].

We don't need to go far away. The latrine is so close it has been easier to use. [Bakan District adopter participant].

Some neighbors just come to visit. The visitor comes to visit and they are able to poop if they need to [Bakan District adopter participant].

When we go to the forest we have more mosquito bites and everyone can see us and we are ashamed by that [Bakan District adopter participant].

Economic Advantages

Economic advantages were often simultaneously referenced with improved health and well-being comments. Participants shared the following statements:

There is no infection, now. The children do not get sick and is the reason we have lower costs and save money. No cost of infections. I now save money [Bakan District adopter participant].

Environmental Impact

Community meeting participants shared a number of advantages from using a latrine which have positively impacted the environment. Participants shared the following:

Poop doesn't flow through the water. Before, if we drink the water from the pond it would be affected [Bakan District adopter participant].

In the past, it was difficult to walk because of the poop that was around. The poop would flow in the water and make it difficult to work in the rice fields [Bakan District adopter participant].

In the past, you would just go outside and see poop and in the forest, it would smell very bad. But, now, not anymore [Kandieng District non-adopter participant].

In the past, when I went to transplant the rice, I felt disgusting. There was poop all along the walkway of the rice field [Bakan District adopter participant].

No bad smells to the environment [Bakan District adopter participant].

Complexity of Latrine Usage

Complexity of an innovation refers to how easy or simple that innovation is to understand or implement (Glanz, et al. 2015). A total of 57 reference codes pertaining to complexity emerged from the transcriptions. Community meeting participants indicated how using the latrine was typically very easy to perform.

Ease

There was consensus among community meeting respondents about the overall ease and simplicity of using the latrine. Participants shared the following statements:

It has been easy for everyone to poop at night [Bakan District adopter participant].

It has been very easy. My grandchild is very little and he uses the latrine [Bakan District adopter participant].

For young girls, it has been easy using the latrine when we have rainy season [Kandieng District non-adopter participant].

For the older people, it has been easier for them. Not difficult [Kandieng District non-adopter participant].

Being a women, this has been easier. Not the same as a man who can pee here and there. Easy to take a bath [Bakan District adopter participant].

Compatibility of Latrine Usage

The compatibility of an innovation takes into account how using a latrine might interfere with the existing values or routines of the adopters (Glanz, et al. 2015). A total of 81 reference codes pertaining to compatibility emerged from the transcriptions. Overall, the compatibility of using a latrine was apparent throughout the villages. The following themes regarding compatibility emerged during the community meetings.

Behaviors

In some cases, using a latrine might not fit into one's daily life or routine. In one situation, depending on whether the individual was working in the field impacted the decision to use a latrine. Other responses indicated the presence of a learned behavior involving strategies of digging holes or the utilization of digging tools they had once been taught. The following was shared:

> *If I stay in the forest for work or another reason, I will stay in the forest. It is too far away to walk back to house [Bakan District adopter participant].*
>
> *From one-year old they poop in container tank and we throw in the latrine. The 2-3 years poop in the container and bring the container to the latrine themselves. Some kids poop outside. But the older kids will go outside and dig a small hole and put in the soil. [Bakan District adopter participant].*
>
> *...we use the digging tool to dig underground and cover the poop. We use the digging tool since a long time ago but sometimes we go to the rice field and poop. [Kandieng District non-adopter participant].*

Obligation to Others

Having an obligation to others proved to be in line with one's values to use a latrine. Participants shared the following statements:

> *Now, people have thrown away their old habit of open defecation because it is not only for their own hygiene and health but for other people's hygiene and health [Kandieng District non-adopter participant].*
>
> *...only use the latrine now. It is good relationship with the neighbor, now. In the past, when we had no latrine there was a very bad smell and right now I have and the neighbor have the latrine and are not affected by each other [Bakan District adopter participant].*

Observability of Latrine Usage

Observability is the degree in which an innovation can be seen and/or measured (Glanz, et al. 2015). A total of 118 reference codes pertaining to observability emerged from the transcriptions. Indicators of observability were highlighted throughout the community meetings.

Demonstrations

Community members were able to participate in a number of demonstrations from CLTS facilitators, which proved beneficial. Additionally, many community members were able to provide guidance in the importance of using a latrine. Participants shared the following statements:

> *In the past, people in the village do not know how to use the latrine and did not know how beneficial it was until the intervention and their official came to introduce the use of the latrine. The official came to introduce the latrine and the people came to*

see and hear and we have now participated for such a long time until we became an ODF village [Bakan District adopter participant].

They (speaking of the older village members) are old but keep learning. They keep participating and paying attention, better than young people. I appreciate the older people. Those older people keep telling their children to throw their poop in the latrine because it will affect their own health and other's health [Kandieng District non-adopter participant].

Trialability of Latrine Use

The trialability refers to the degree in which an innovation may be experimented with on a limited basis (Glanz, et al. 2015). Trialability of using a latrine was not identified as an attribute to encourage latrine use. Many responded with experiences of a sharing a latrine with other households or family members but did not express that experiment impacting their decision to use a latrine.

CHAPTER 5

DISCUSSION

Discussion

Chapter five presents an analysis of the qualitative community meeting group discussions. Through the utilization of the diffusion of innovation theory (DOI), the results provided information about latrine behaviors, specific to latrine construction and usage as it pertained to relative advantage, complexity, compatibility, observability, and trialability. The findings provided a basis for the adaptation of the attributes of the DOI theory as it pertains to adoption of an innovation, in this case latrine behaviors, in a rural Cambodian context. The qualitative inquiry explored the roles of attributes as determinants of facilitators and barriers to latrine construction and usage.

The study aimed to investigate the influences of Community Led Total Sanitation (CLTS) on latrine construction and usage among rural Cambodians within a diffusion of innovation (DOI) theoretical framework. The DOI theory fits well with the public health topic of sanitation and small connected community methodology. The small connected community methodology supports research which does not collect identifying information among small geographic communities, in order to prevent the potential risk of exposing others in the community (Damianakis (2012). Participants were provided an environment which allowed them to openly share their pre to post measurement of innovation adoption and identify characteristics which impacted their adoption decision.

The DOI theory was utilized to determine which characteristics shared by the participants correlated with the attributes of persuasion (relative advantage, compatibility, observability, complexity, and trialability) (Rogers, 2010). Another sanitation based study provided additional justification for the utilization of this theory through applying it to a similar sanitation based approach. The theory was qualitatively applied to understand the adoption mechanisms and motivation factors for households to implement sanitation. The application of the theory provided an in-depth understanding which is not initially observed in questionnaires (Helgegren, 2018).

When combined, the use of the diffusion of innovations theory and small connected community methodology assists in creating a firmer understanding of the factors which serve as facilitators and barriers to latrine construction and usage within the context of rural Cambodia. The use of a small connected community methodology allowed for additional identity protection for participants. Providing additional measures for anonymity and confidentiality has the potential to enhance the participation of those involved during a research study (Udo-Akang, 2013). This extra protection might enhance a participant's response given the potential of embarrassing responses due to CLTS placing emphasis on shame, disgust and public humiliation as a way to provoke communities to stop practicing open defecation and construct their own toilet facilities (Zuin et al., 2019). Shame is often perceived as an attack on an individual's identify and involves being harshly evaluated by others (Bateman & Engel, 2016). Due to this aspect of the study, the small connected community methodology allows for reducing these ethical vulnerabilities through not collecting identifying information and exposing participants who may share vulnerable information (Damianakis, 2012).

Findings from the study provide health educators and public health professionals a more thorough understanding of why rural Cambodians decide to partake in their current sanitation behaviors regarding latrines. The findings also provide additional information on how approaching sanitation problems from a health promotion and health education perspective can decrease the occurrence of open defecation in rural, low-income settings. While open defecation rates and access to basic sanitation is improving within Cambodia, the country is still falling behind compared to neighboring countries (Joint Monitoring Programme, 2017). Additionally, prior studies suggest CLTS programs to be effective in reducing open defecation rates (Sigler et al., 2014; Zuin et al., 2019). Based on this information, more research is needed to better understand the shortcomings which still exists within Cambodia.

The data collection tool utilized during this study consisted of questions to address the impact of CLTS on latrine construction and usage among households and communities. In the following discussion I will address the attributes of the innovation as it pertains to latrine construction and latrine usage. First, the facilitators and barriers of latrine construction will be discussed in relation to participant experience with CLTS. Next, the facilitators and barriers of latrine usage will be discussed in relation to participant experience with CLTS. I will then address the limitations and strengths of the study and close with implications for future public health professionals.

Innovation Attributes of Latrine Construction

Facilitators. Existing literature in less developed regions indicate that the health and well-being of others, observation of others, support of others (Harter et al., 2018; Nunbogu et al., 2019), exchange of knowledge and monitoring and follow-up visits (Nunbogu et al., 2019; Garn, 2017) and ease of use (slekiene & Mosler, 2018), serve as facilitators to build a latrine. As

observed in a similar study, CLTS seems to even encourage those who never attended a triggering event to build a latrine. This is often through a snowball effect in which community members observe others who have constructed and follow (Nunbogu et al., 2019; Harter et al., 2018). Participants in this study shared how they were more likely to construct their own a latrine upon seeing their neighbors build. The safety and well-being of individuals, have been observed in similar studies in regard to constructing latrines (Nunbogu et al., 2019; Slekiene & Mosler, 2018). In this study, many participants shared their views on how latrines provided an increase sense of well-being by removing the dangers of animals while defecating in the open. In Ghana, the support of others and exchange of knowledge within communities which followed a collective nature was observed to influence the construction of a latrine (Nunbogu, 2019). In this study, many participants shared how the village chiefs, CLTS coordinators, and neighbors played a role in promoting and encouraging latrine construction. This facilitator may also be present in Cambodia given the collectivist nature which involves an individual's action being connected to the actions of others in the community (Bateman & Engel, 2016).

The impact of health promoters and follow-up messages provided at the community level following CLTS has been found to be beneficial in increasing additional latrine construction and the sustainability of adoption (Garn et al., 2017). Participants in this study shared how they valued the visits of CLTS coordinators and health promoters, specifically referencing how much more knowledge they were provided in regard to the importance of constructing latrines. In a study conducted in Rural Malawi, ease of use was a reason for community members to construct a latrine (Slekeine & Mosler, 2018). Participants in this study shared how their decision to construct a latrine was in part due to their perspective of how easy it would be for them in the future.

Barriers. Barriers which have been observed in previous literature include cost, time, effort (Helgegren et al., 2018; Slekiene & Mosler, 2018). Additionally, lack of resources pertaining to materials (Slekiene & Mosler, 2018) and assistance (Harter et al., 2018) play a role as barriers in latrine construction. In a study focusing on triggers and barriers of sanitation implementation in Boliva, the main barrier for construction was cost (Helgegren et al., 2018). The cost of latrines has been observed throughout the literature as a barrier to latrine construction and connected to a dependency syndrome, in which communities wait on others to provide them with money or resources, often due to past subsidy programs (Harvey, 2011). In this study, participants who did not have the money to build a latrine were either waiting on organizations to come back or for family members to send home money for them to purchase materials and build. Interestingly, another recurring response was participants wanting to wait until they had enough money to build a high-quality latrine versus a basic latrine. This is in line with previous literature which has correlated the cost of latrines, specifically in rural Cambodia, with waiting until they have enough money to purchase a high-quality latrine over one that is free or subsidized (Chase et al., 2015).

A lack of resources pertaining to knowledge of assistance and how to build, were identified. This is consistent with previous findings in Mozambique in which participants shared a need for educational trainings in order to understand the construction process (Harter et al., 2018). Many individuals in this study were not able to attend events conducted by CLTS officials to learn more about the building process. This is consists with findings from a study involving the diffusion of toilets in India in which the training sessions interfered with the community members' daily work and they were unable to attend activities related to construction tips (Ramani et al., 2012).

New findings from this research study consisted of migration and livestock related issues. Due to many migrating for work to neighboring countries, such as Thailand, they were unaware of when they would be home and viewed the process of construction as an interference to their current situation. The final barrier is livestock, which was also identified as an interference. The construction process is often halted for a length of time resulting in a dangerous environment. Participants shared how their water buffalos became stuck in the construction. In one scenario the water buffalo suffered from a broken leg which depreciated its worth. Due to the dependency on livestock, this proved to be a devastating barrier.

Innovation Attributes of Latrine Usage

Facilitators. Health and well-being, convenience, and safety have all been identified as facilitators within the literature (Chase et al., 2015; Alemu et al., 2018; Nunbogu et al., 2019). Additionally, cleanliness serves as another facilitator for latrine usage (Alemu et al., 2018; Garn et al., 2017; Nunbogu et al., 2019). Participants in this study shared how their health and well-being improved through the decrease of skin irritation associated with using leaves during open defecation. Additionally, health care costs were lowered due to sickness not being as widespread after using the latrines.

Findings from a study focusing on psychological factors in predicting latrine ownership and consistent latrine use in rural Ethiopia expressed how cleanliness was associated with latrine use (Alemu et al. 2018). Additionally, cleanliness was associated with higher latrine use compared to areas with poorer sanitation conditions were associated with lower latrine use (Garn et al., 2017). Participants in this study expressed how they enjoyed using their latrine due to the level of cleanliness and ability to have soap and water in one location readily available.

Barriers. Existing literature focusing on latrine use has identified access to water (Odagiri et al., 2017), behavior (Aiemjoy et al., 2017) and walking distance as barriers (Alemu et al., 2017) related to latrine use. In one cross-sectional study focusing on enabling factors for sustainable open defecation-free communities in rural Indonesia, findings consisted of insufficient access to water during dry seasons as being a barrier for latrine use Odagiri et al., 2017). This is consistent with findings from this study, in which rural Cambodia also suffers from a dry season and water access barriers. For many participants, they stated they are not able to use their latrine due to not having water available in the tanks inside their latrines. Additionally, if enough water was not stored during the rainy season, community members had to buy water and many were not able to afford this resource.

Latrine use behavior has also been identified as a barrier to use (Aiemjoy et al., 2017). In this study, many participants shared how the utilization of a digging tool in combination of open defecation was a habit in which they were comfortable with performing and did not see a need to use a latrine. This is in line with previous studies in which findings included the behavior of digging holes was difficult to change (Ramani et al., 2012). Poor compatibility of the latrine served as a barrier for many participants. A specific barrier included how well the use of a latrine fit in with one's daily routines in regard to the distance from agricultural fields to homes (Aimejoy et al., 2017). This finding was in line with this study when participants shared if they were working in the field they would stay in the field versus walking back home to use the latrine.

Qualitatively, this research study found the issue of pit latrines becoming full as another barrier of latrine use. Participants shared the difficulty of contacting local services to empty the

pits for continued use. This presented a barrier as many participants would stop using a latrine if their pit became full. Further research is needed in order to address this barrier.

Trialability on both latrine construction and usage played a minimal role. While participants had opportunities to share and trial latrines, trialability served as neither a facilitator nor barrier in this study.

Implications for Health Education and Health Promotion

The community meetings from this study provided valuable information for health education and health promotion practice. First, the knowledge gaps of sanitation behavior identified by participants represents a need for the development and implementation of sanitation educational interventions (Aiemjoy et al., 2017). More specifically, a school-based program which holds the potential to transfer knowledge from the children to their families in order to spread health messages and practices in the community (Aiemjoy et al., 2017).

Second, the DOI theory utilized in this study may be useful for future program planning regarding hygiene and sanitation innovation adoption. When applied to hygiene and sanitation programs, the DOI theory may explain the individual's motivation for constructing and using a latrine (Helgegren et al., 2018). In this study, the innovation has the potential to reduce or eliminate open defection. Due to this, the application and evaluation of a theory such as the DOI is considered a valuable addition to future sanitation behavior change approaches.

Last, this study has implications for academic curricula, including courses on health education and health promotion, with an emphasis on global health. The importance of learning how to effectively develop, implement, and evaluate such programs on the level of health promotion and health education is vital to better serve the overall public and global health needs (Kumar & Preetha, (2012).

Strengths of the Study

The qualitative nature of this study provides insight into the decisions and actions pertaining to latrine and overall sanitation status in rural Cambodia. Helgegren (2018) utilized a qualitative approach pertaining to improved sanitation facilities to gain in-depth information to better understand how to incorporate strategies into future sanitation interventions. The utilization of a qualitative study holds promise in advancing the cultural understanding of health-related behaviors specific to the practice of open defecation and latrine construction and usage within Cambodia.

This research study provides more detailed information which assists in explaining complex issues pertaining to sanitation in developing countries. This study assists in identifying community perspectives of sanitation behavior which may clarify why individuals within a community decide to construct or not construct a latrine following a CLTS program. The information collected from this study will help to understand how total sanitation programs such as CLTS play a role on ending open defecation and latrine usage (Sigler et al., 2014).

Third, each community meeting was conducted by the same research assistant/team. This allowed for consistency throughout the research process (Krefting, 1991). Additionally, this ensured a higher level of trustworthiness was met due to the same protocols being followed at each community meeting.

Fourth, this research takes into consideration the specific geographical region of rural Cambodia. This is important due to the need for implementers to take into consideration the varying norms across regions (Sigler et al., 2014). By taking into account the cultural norms and behaviors pertaining to latrine construction and usage in Cambodia, future public health

professionals will be able to develop more effective training programs or interventions based on the specific needs or responses provided from this research.

Last, the utilization a small connected community methodological approach may be beneficial in future health education and health promotion projects. This approach provides opportunities to reduce ethical vulnerabilities by placing an emphasis on the participant's best interest by minimizing common limitations such as removing the participant intake form and transcription identifications.

Limitations of the Study

This study included several limitations which may have impacted the results. First, this study consisted of cross-language qualitative research. Measures were taken throughout the translation approach, which utilized an in-depth process to ensure trustworthiness and rigor was met. For example, the two-phase translation approach for the data collection tool which took into account multiple versions of a translation through reviewing any discrepancies prior to the implementation of the tool. However, the decisions regarding translation may have consequences for how research data was produced and received.

Second, the researcher's presence as an outsider during the community meetings could have influenced the participants' responses. For example, I could have been a distraction to some participants and instead of their attention being devoted to the research assistant leading the community meeting, they could have had their attention on me and missed some of the questions or discussion. To minimize the impact as an outsider, my experience living and working in Cambodia along with my desire to learn more from them and their experience in order to better address their concerns was explained at each community meeting in order to address any curiosity before the meeting began.

Third, the dynamic of the community meetings included both male and female participants. Due to the patriarchal structure and traditional gender roles observed in Cambodia, women's participation in community governance remains limited (Doneys et al., 2020). This could have impacted the participants' candor toward the topic. For example, during one meeting a female participant was sharing an experience and she was quickly instructed to stop talking by a male participant.

Fourth, the DOI theory does not foster a participatory approach to adoption of a public health program. Additionally, the DOI theory was applied ad hoc and not utilized to guide the development of the collection data tool. Therefore, this could have had an impact on the adoption of the innovation due to a lack of community level involvement and participation. This could be observed when individuals decided not to adopt the innovation based on not being provided the opportunity to share their ideas for the overall project.

Fifth, the aspect of self-report from the participants may have influenced the quality of the responses. In order to limit the impact of this limitation, participants were encouraged to take as much time as needed in order to reflect on their CLTS experience.

Sixth, this study entered into the larger project at the endline phase. Due to late involvement, the study could have missed important details in the baseline phase of the project. For example, the researcher could have built a stronger relationship with the community had she entered into the project at baseline. Additionally, due to entering at the endline phase, the operational definition of adopter and non-adopter was dichotomous in nature versus the five phases of adoption which is normally assessed in the DOI theory.

Finally, the larger study did not utilize a community based participatory approach. The community was not heavily involved in the planning of the CLTS meetings which may have

impacted event participation which would have provided more information on latrine construction and use.

Future Research

The findings from this study warrant further research on the sanitation practices in rural regions of Cambodia, surrounding Southeast Asian countries, and isolated communities (Almazan, 2014). First, it might be helpful if future research combined qualitative and quantitative approaches in order to generate evidence-based data regarding intervention or program efficacy from the perspective of community members (Sigler et al., 2014). For instance, a mixed methods study approach would be beneficial in following up on findings from this study using a survey which could be administered to a larger majority of the community.

Second, a diverse research team offers the generation of high-quality data to build a robust body of literature within health education and health promotion. For instance, a collaboration between local water and sanitation agencies and research institutions would be helpful for future sanitation-based studies in low-income, developing countries. The combined resources from the collaboration would prove beneficial in developing and implementing rigorous health promotion sanitation strategies. Additionally, a collaboration of practitioners and researchers may offer strategies to improve the evidence base and sustainability of the program.

Third, future research should incorporate models such as the socio-ecological model in order to address multi-level facilitators and barriers to latrine construction and use (Alemu et al., 2017). The implementation of models such as the socio-ecological model has the potential to understand needs at the community level in order to support policy change. Policy change could be incorporated within CLTS in regard to he monitoring, follow-up, and support stages to promote an open defecation free environment.

Last, future research should focus on reaching vulnerable populations such as women, children, elderly, and impaired. Strategies regarding how to effectively engage such populations during program sessions are vital in order to observe barriers associated with sanitation access. Understanding vulnerable populations will inform effective strategies for the development of successful hygiene promotion programs and enhance the overall quality of life and well-being of communities.

Conclusion

This study sought to provide a better understanding of the attributes related to latrine construction and usage, specific to rural Cambodia following a CLTS program implementation. This study adds to an existing body of literature in support of CLTS interventions as a solution to end open defecation (Harter et al., 2018; Nunbogu et al., 2019; Zuin et al., 2019). The behavior change component in such interventions have been identified as being an effective strategy resulting in a higher installation of latrines in rural Cambodia (Harper et al., 2020; Orgill-Meyer et al., 2019). Understanding the behaviors of priority communities is vital to effectively implement future sanitation interventions or programs (Aiemjoy et al., 2017).

Collectively, participants in this study expressed the need for community resources such as education and support. Participants' indicated desire to have more educational opportunities made available to their communities, specific to the topic of health and hygiene administered as school-based programs for their children. The issue of breaking old behaviors, such as using the digging tool for open defecation practice, may benefit from programs, as well.

Health education and health promotion programs may hold potential in addressing the sanitation challenges in rural communities in lower income and developing countries, such as Cambodia. Studies evaluating the effectiveness of hygiene promotion programs revealed a

reduction in water, sanitation, and hygiene related mortality and morbidity (Sijbesma & Christoffers, 2009). I am hopeful future public health professionals will continue to develop , implement, and evaluate programs to better serve the global agenda of reaching the 2030 SDG of sanitation for all.

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APPENDICES

APPENDIX A

Semi Structured Data Collection Tool

Focus Group Questions_ CLTS Behavior

1. Explain your participation experience of the Community Led Total Sanitation activities.
2. តើពួកលោកបានចូលរួមប្រជុំផ្សព្វផ្សាយពីសកម្មភាពសហគមន៍ដឹកនាំអនុវត្តអនាម័យដែរឬទេ? តើការចូលរួមគួរជែនទីអនាម័យភូមិនិងកន្លែងទៅបត់លើង?
   a. Why or why did you not attend/participate?
   b. តើមូលហេតុអ្វីបានជាពួកលោកចូលរួមការប្រជុំនេះ?
   c. Why did you not attend/participate?
   d. តើមូលហេតុអ្វីបានជាពួកលោកមិនបានចូលរួមការប្រជុំនេះ?
   e. Positive vs negative perceptions
   f. ចំណុចវិជ្ជមាន និង ចំណុចអវិជ្ជមាន?
      i. "I thought the activity was great but people kept coming up to me…"
         ខ្ញុំគិតថាសកម្មភាពនេះគឺល្អដែលប្រជាជនតែងតែនឹងលីជ្រើន
   g. Could the CLTS activities have been more helpful for you?
      តើសកម្មភាពសហគមន៍ដឹកនាំអនុវត្តអនាម័យនេះមានអត្ថប្រយោជន៍អ្វីខ្លះដែរ?
3. Why or why did you not decide to build a latrine as a result of the CLTS activities?
   តើហេតុអ្វីបានជាពួកលោកមិនធ្វើបង្គន់បន្ទាប់ពីប្រជុំផ្សព្វផ្សាយពីសហគមន៍ដឹកនាំអនុវត្ត
   អនាម័យរួច?
   a. Did you feel pressured in any way to construct a latrine?
      តើពួកលោកមានទទួលការគាបសង្កត់ពីខាងណាទេ ក្នុងការធ្វើបង្គន់អនាម័យនេះ។
   b. Explain the main reason for/against construction.
      ចូរពន្យល់ពីការចាំបាច់នៃការសាងសង់បង្គន់ និង ការមិនមានបង្គន់?
      i. Who inspired you the most to build? How did they inspire you?
      - តើអ្នកណាជាអ្នកណែនាំ ។ ទូន្មានគាត់ ។ ជំរុញលើកទឹកចិត្តពួកលោកអោយសង់បង្គន់? តើគាត់ណែនាំបែបណា?
   c. Do you think you are more respected by the community due to latrine construction?
      នៅពេលពួកលោកមានបង្គន់ តើពួកលោកទទួលបានការគោរពនិងអោយតម្លៃពីពួកលោកបែបណា?
4. In the event of latrines becoming damaged, what is the main reason for low/no maintenance or repair?
   បើក្នុងករណីមានបង្គន់ខូចវីបាក់បែក តើពួកលោកមានជែនការជួសជុលនិងថែទាំដែរឬទេ?
   a. How much does the rainy season or over-flood affect latrine usage and/or maintenance?
      តើនៅរដូវភ្លៀងឬពេលមានទឹកលិច
      ពួកលោកមានផលប៉ះពាល់អ្វីដែរនល់ការប្រើបង្គន់និងការថែទាំបង្គន់?
5. What are the reasons individuals are not using their own latrine in your community?

តើអ្វីដែលជាបញ្ហាដែលពួកយើងអត់មានបង្គន់អនាម័យប្រើប្រាស់ផ្ទាល់ខ្លួន?

a. What is the general attitude toward sharing latrines?

តើអ្វីដែលឥរិយាបថរួមក្នុងការប្រើបង្គន់រួម?

b. How often are you using your latrine vs OD?

តើពួកយើងប្រើប្រាស់បង្គន់ញឹកញ៉ាប់ប៉ុណ្ណា បើប្រៀបធៀបពីពេលមុនដែលមិនទាន់មានបង្គន់?

i. Always or just sometimes?
ប្រើប្រាស់បង្គន់ជាប្រចាំ រឺកំណត់ម្តងម្កាល

c. Explain the accessibility of latrines in your community.

d. ចូរពន្យល់ពីការជម្រុញសហគមន៍អោយសង់បង្គន់និងប្រើប្រាស់បង្គន់

i. i.e. children, elderly, etc. ជាពិសេស កុមារ និងចាស់ជរា

6. In what ways did the CLTS activities make you aware of your own latrine behaviors?

តើកម្មវិធីសហគមន៍ដឹកនាំអនុវត្តបានជួយអោយពួកយើងមានការកែប្រែឥរិយាថ ដែរឬទេ?

a. What does hygiene and sanitation mean to you?

តើមានភាពខុសគ្នាបែបណាពីអនាម័យខ្លួនប្រាណនិងអនាម័យបរិស្ថាន?

b. How do you feel about OD?

c. តើពួកយើងមានអារម្មណ៍បែបណាចំពោះការផុះតាមវាល រឺ តាមព្រៃ ?

7. How could this community be helped to improve latrine construction and use?

តើពួកយើងគួរជម្រុញសហគមន៍បែបណា ដើម្បីអោយសហគមន៍សង់និងប្រើប្រាស់
បង្គន់។

8. Are there specific groups in the community that need additional hygiene/sanitation education? Who and why?

តើពួកយើងនៅតែត្រូវការគម្រោងនូវសិបន្ទុការអប់រំលើផ្នែកអនាម័យខ្លួនប្រាណនិង
អនាម័យបរិស្ថានដែរឬទេ?

APPENDIX B

Institutional Review Board Approval Letter

THE UNIVERSITY OF ALABAMA

Office of the Vice President for
Research & Economic Development
Office for Research Compliance

August 1, 2019

Sara Hendrix
Human Environmental Sciences
Box 870158

Re: IRB # EX-19-CM-151: "Impact of Community-Led Total Sanitation on Latrine Construction Uptake and Usage in Central Cambodia"

Dear Ms. Hendrix,

The University of Alabama Institutional Review Board has granted approval for your proposed research. Your application has been given exempt approval according to 45 CFR part 46. Approval has been given under exempt review category 2 as outlined below:

(2) Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if: (iii) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by §46.111(a)(7).

The approval for your application will lapse on July 31, 2020. If your research will continue beyond this date, please submit the annual report to the IRB as required by University policy before the lapse. Please note, any modifications made in research design, methodology, or procedures must be submitted to and approved by the IRB before implementation. Please submit a final report form when the study is complete.

Please use reproductions of the IRB-approved informed consent form to obtain consent from your participants.

Sincerely,

[redacted]

Carpantato T. Myles, MSM, CIM, CIP
Directo & Research Compliance Officer

Cc: Dr. Stuart Usdan

358 Rose Administration Building | Box 870127 | Tuscaloosa, AL 35487-0127
205-348-8461 | Fax 205-348-7189 | Toll Free 1-877-820-3066

APPENDIX C

Cambodian Ministry of Health National Ethics Committee for Research

ព្រះរាជាណាចក្រកម្ពុជា
KINGDOM OF CAMBODIA
ជាតិ សាសនា ព្រះមហាក្សត្រ
NATION RELIGION KING

ក្រសួងសុខាភិបាល
MINISTRY OF HEALTH
គណៈកម្មាធិការជាតិក្រមសីលធម៌
សំរាប់ការស្រាវជ្រាវសុខភាពដែលទាក់ទងនឹងមនុស្ស
National Ethics Committee for Health Research

№ 110 NECHR

ថ្ងៃ ចន្ទ ១០រោច ខែ ចេត្រ ឆ្នាំកុរ ឯកស័ក ព.ស.២៥៦២
Phnom Penh, April 29, 2019

Dr. Joe Brown

Project: Cambodia integrated nutrition, hygiene, and sanitation impact evaluation. Version Nº 1, dated 01st April 2019

Reference: 26th April 2019 NECHR meeting minute

Dear Dr. Joe Brown,

I am pleased to notify you that your study protocol entitled: "Cambodia integrated nutrition, hygiene, and sanitation impact evaluation. Version Nº 1, dated 01st April 2019" has been approved by National Ethics Committee for Health Research (NECHR) in the meeting 26th April 2019. This approval is valid for twelve months after the approval date.

The Principal Investigator of the project shall submit following document to the committee's secretariat at the National Institute of Public Health at #80 Samdach Penn Nouth Blvd, Sangkat Boeungkok2, Khan Tuol Kok, Phnom Penh. (Tel: 012-842-442, 012-528-789,012-203-382. Email: sarayvannat@gmail.com, nouthsarida@gmail.com):

- Annual progress report
- Final scientific report
- Patient/participant feedback (if any)
- Analyzing serious adverse events report (if applicable)

The Principal Investigator should be aware that there might be site monitoring visits at any time from NECHR team during the project implementation and should provide full cooperation to the team.

Regards,

Chairman

[redacted]

Prof. ENG HUOT

ឡូត៍លេខ៨០,វិថីសម្តេច ប៉ែន នុត (២៨៩) សង្កាត់បឹងកក់២ ខណ្ឌទួលគោក រាជធានីភ្នំពេញ, ទូរស័ព្ទ (៨៥៥-០១២) ៨៤២ ៤៤២, (៨៥៥-០១២) ៥២៨ ៧៨៩, (៨៥៥-០១២) ២០៣ ៣៨២)
Lot #80, Samdach Penn Nouth Blvd (289), Sangkat Boeungkok2, Khan Tuol Kork, Phnom Penh, Cambodia. Tel: (855-012) 842 442,(855- 012) 528 789, (855-012) 203 382

APPENDIX D

TetraTech Evaluation Letter of Support

TETRA TECH

April 23, 2019

INSTITUTIONAL SUPPORT LETTER

Research Compliance
358 Rose Administration
Box 870127
Tuscaloosa, AL 35487

University of Alabama IRB Board:

I am writing this letter in support of the endline phase for the impact evaluation of the Cambodia Integrated Nutrition, Hygiene, and Sanitation Project (NOURISH), which is commissioned by the Office of Water in the United States Agency for International Development's (USAID) Bureau for Economic Growth, Education and Environment (E3) and supported by the USAID/Cambodia Mission. The endline phase is implemented by Tetra Tech, through the Water, Sanitation, and Hygiene Partnerships and Learning for Sustainability (WASHPaLS) project, and led by Joe Brown, Oliver Cumming, Irene Velez, and Krisna Seng.

I understand that as part of the endline phase for the impact evaluation, Sara Hendrix, a doctoral candidate at the University of Alabama, will be assisting with the evaluation of behavioral components. I understand she will also be collecting data, which will support her dissertation, professional conferences, and potential publications.

I understand the purpose of the impact evaluation is to determine whether integrating hygiene and sanitation activities to nutrition programming has synergistic effects on child growth and health. The baseline phase of this impact evaluation received approval from the National Ethics Committee on September 1, 2016. The endline phase will take place in the same fifty-five communes across the provinces of Battambang, Siem Reap, and Pursat and will consist of surveys to primary caregivers as well as anthropometric measures, anemia testing and stool sample collection of children below five years of age.

I understand that this research will be carried out following sound ethical principles and that participant involvement in this research study is strictly voluntary and provides confidentiality of research data, as described in the protocol.

Therefore, as a representative of Tetra Tech, I extend support for the endline phase of this impact evaluation in Cambodia.

Sincerely,

[redacted]

Morris Israel | Project Director
Water, Sanitation and Hygiene Partnerships and
Learning for Sustainability (WASHPaLS) Project
Morris.israel@washpals.org

Tetra Tech
159 Bank Street, Suite 300, Burlington, VT 05401
Tel 802.495.0282 Fax 802.658.4247 tetratech.com/intdev

APPENDIX E

Verbal Consent Form

Information Sheet

Key Information:

- Participate in a 30-45 minute focus group about Community Led Total Sanitation
- Focus group involves an open discussion with other community members concerning CLTS implementation into your community
- No information collected that will connect identity with responses
- You may stop the focus group at any time

Purpose of the research study: The purpose of this study is to gain an in-depth understanding of the choices rural Cambodian's make in regard to latrine construction and use following a Community-Led Total Sanitation (CLTS) triggering activity.

What you will do in the study: The data collected will assist others in determining ways to improve sanitation conditions. Focus groups interviews will also be conducted to better determine the successfulness of CLTS based on community input. Participants can skip any portion that makes them uncomfortable and they can stop the interview/focus group at any time.

Time required: The focus group will require 30-45 minutes of your time.

Risks: There are no anticipated risks in this study.

Benefits: There are no direct benefits to you for participating in this research study. The study may help us understand how effective community led total sanitation is in the community.

Confidentiality: Data provided by the participant will be coded and de-identifiable. Confidentiality will be maintained during the focus groups by avoiding use of names. If names are said aloud, they will be edited and muted in the audio post-interview. Data will be stored within the University's online storage platform. Any hard copies of data will be kept in a locked file cabinet behind a locked office door and locked suite door. The results of this study will be used for dissertation purposes and may be presented or published for scientific purposes.

Voluntary participation: Your participation in the study is completely voluntary.

Right to withdraw from the study: Participation is voluntary and participants may withdraw from the study at any time without penalty. In the case an audio tape has been used, the tape will be destroyed if you decide to withdraw.

How to withdraw from the study: Participants may withdraw from the study by informing the interviewer they would like to stop. Upon completion, data will be anonymous and not possible to withdraw.

If you want to withdraw from the study, tell the interviewer to stop the interview. There is no penalty for withdrawing.

If you have questions about the study or need to report a study related issue please contact, contact:
Name of Principal Investigator: Sara Hendrix
Title: Doctoral Student
Department Name: College of Human Environmental Science, Health Science Department
Telephone: 1.251.472.6442
Email address: sjhendrix1@crimson.ua.edu

Faculty Advisor's Name: Dr. Stuart Usdan
Department Name: College of Human Environmental Science, Health Science Department
Telephone: 1.205.348.6150
Email address: susdan@ches.ua.edu

If you have questions about your rights as a participant in a research study, would like to make suggestions or file complaints and concerns about the research study, please contact:
Ms. Tanta Myles, the University of Alabama Research Compliance Officer at (205)-348-8461 or toll-free at 1-877-820-3066. You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach Website at http://ovpred.ua.edu/research-compliance/prco/. You may email the Office for Research Compliance at rscompliance@research.ua.edu.

លិខិតព្រមព្រៀង

សូមអាននិងពិនិត្យលិខិតព្រមព្រៀងមុនពេលសម្រេចចិត្តចូលរួមក្នុងការសិក្សាមួយនេះ ។

ចំណុចព្រមព្រៀងសំខាន់ៗ៖

- ចូលរួមជាមួយក្រុមបង្គោល (focus group) អំពីកម្មវិធីអនាម័យដឹកនាំដោយសហគមន៍ (CLTS: Community Led Total Sanitation).រយ:ពេល ៣០នាទី ទៅ៤០នាទី ។
- ក្រុមផ្តោតលើការពិភាក្សាបើកចំហជាមួយសមាជិកសហគមន៍ដទៃទៀតដែលពាក់ព័ន្ធនឹងការអនុវត្ត CLTS នៅក្នុងសហគមន៍របស់អ្នក
- មិនមានព័ត៌មានប្រមូលដែលនឹងភ្ជាប់អត្តសញ្ញាណជាមួយការឆ្លើយតប
- អ្នកអាចបញ្ឈប់ក្រុមផ្តោតអារម្មណ៍គ្រប់ពេល

គោលបំណងនៃការសិក្សាស្រាវជ្រាវ៖

ការសិក្សានេះមានគោលបំណងស្វែងយល់ឲ្យស៊ីជំរៅពីជំរើសដែលប្រជានជនជនបទនៅកម្ពុជាជ្រើសរើសក្នុងការសាងសង់បង្គន់អនាម័យ
និងប្រើប្រាស់បន្ទាប់ពីបានចូលរួមសកម្មភាពនៃកម្មវិធីអនាម័យដឹកនាំដោយសហគមន៍ (CLTS: Communitiy Led Total Sanitation) ។

តើអ្នកនឹងធ្វើអ្វីខ្លះនៅក្នុងការសិក្សា៖

ការស្រង់មតិនឹងធ្វើឡើងនៅតាមផ្ទះក្នុងសហគមន៍មួយដែលធ្លាប់មានកម្មវិធីអនាម័យដឹកនាំដោយសហគមន៍ (CLTS: Communitiy Led Total Sanitation) ។
ទិន្នន័យដែលប្រមូលគឺជាជំនួយក្នុងការកំណត់វិធីសាស្ត្រអភិវឌ្ឍន៍ស្ថានភាពអនាម័យ។
ដើម្បីអោយការកំណត់ភាពជោគជ័យកាន់តែមានភាពប្រសើរជាងមុន
យើងនឹងមានការសម្ភាសន៍ក្រុមបង្គោល (focus group) នៅក្នុងសហគមន៍ផងដែរ។
អ្នកចូលរួមអាចរំលងរាល់សំណួរណាដែលធ្វើពួកគាត់ពិបាកចែកចាយមតិ
ព្រមទាំងអាចបញ្ឈប់ការសម្ភាសន៍ឬស្រង់មតិ បានគ្រប់ពេល។

ថេរ:វេលាចូលរួម៖ ការស្រង់មតិត្រូវការពេលវេលារបស់អ្នកប្រហែល១៥នាទី។
សម្រាប់ក្រុមបង្គោលត្រូវការពេលប្រហែល ៣០នាទី ទៅ៤០នាទី។

ហានិភ័យ៖ ក្នុងការចូលរួមនេះពុំមានហានិភ័យអ្វីឡើយ។

អត្ថប្រយោជន៍៖ ការចូលរួមកក្នុងការសិក្សាស្រាវជ្រាវនេះពុំមានអត្ថប្រយោជដោយផ្ទាល់ទេ។
ការសិក្សានេះអាចជួយពួកយើងស្វែងយល់ស៊ីជំរៅថាតើកម្មវិធីអនាម័យដឹកនាំដោយសហគមន៍(CLTS: Communitiy Led Total Sanitation) មានប្រសិទ្ធិភាពប៉ុណ្ណានៅក្នុងសហគមន៍។

ការសម្ងាត់៖
ទិន្នន័យដែលទទួលបានពីអ្នកចូលរួមនឹងដាក់ជាលេខកូដសម្គាល់ជំនួសអត្តសញ្ញាណដើម។
ការសម្ងាត់នឹងធានារក្សាទុក ក្នុងអំឡុងពេលធ្វើការសម្ភាសន៍ក្រុមបង្គោល

ដោយមិនប្រើឈ្មោះឡើយ។ ប្រសិនបើឈ្មោះត្រូវបានហៅ នោះឈ្មោះទាំងនោះនឹងកាត់ចេញ
ឬបិតសម្លេងនៅក្នុងខ្សែអាត់សម្លេងក្រោយពីសម្ភាសរួច។
ទិន្នន័យនឹងត្រូវផ្ទុកនៅលើវេទិកាអនឡាញរបស់មហាវិទ្យាល័យ។
រាល់ឯកសារច្បាប់ចម្លងដែលនឹងត្រូវរក្សាទុកក្នុងថតសុវត្ថិភាពក្នុងការិយាល័យដែលមានសន្តិសុខ។
លទ្ធផលពីការស្រាវជ្រាវនេះនឹងប្រើក្នុងនិក្ខេបបទបញ្ចប់ការសិក្សាជាន់ខ្ពស់
ហើយអាចបង្ហាញឬបោះពុម្ពក្នុងគោលបំណងវិទ្យាសាស្ត្រ។

ទិន្នន័យទាក់ទង៖ ពត៌មានដែលអ្នកផ្តល់អោយនឹងត្រូវរក្សាទុកជាសម្ងាត់។
រាល់ពត៌មានរបស់អ្នកនឹងកំណត់ជាលេខកូដ។
កំរងលេខកូដរបស់អ្នកនឹងចាក់សោរក្សាទុកដោយសុវត្ថិភាព។
នៅពេលដែលការសិក្សាមួយនេះចប់សព្វគ្រប់ កំរងលេខកូដរបស់អ្នកទាំងអស់នឹងត្រូវកម្ទេចចោល។
ខ្សែអាត់សម្លេងទាំងឡាយនឹងលុបចោលមួយខែក្រោយធ្វើការប្រតិចារិករួចរាល់។

ការរក្សាការសម្ងាត់មិនអាចធានាបាន៖ ក្នុងករណីខ្លះ ការរក្សាការសម្ងាត់ពិបាកនឹងអាចធានាបាន
(ឧទាហរណ៍៖ ការសម្ភាសបុគ្គលដែលលេចធ្លោ និង ក្រុមបង្គោល។
សូមប្រើប្រយោគមួយនេះ ប្រសិនបើអ្នកមិនអាចធានាការសម្ងាត់បាន៖
ដោយសារតែធម្មជាតិនៃទិន្នន័យរបស់ក្រុមបង្គោល
ខ្ញុំមិនអាចធានាការសម្ងាត់នៃទិន្នន័យរបស់អ្នកបានឡើយ
ហើយអ្នកដទៃអាចដឹងពីអ្វីៗដែលអ្នកបានចែករំលែក។

ការចូលរួមដោយស្ម័គ្រចិត្ត៖ ការចូលរួមរបស់អ្នកគឺជាការស្ម័គ្រចិត្តទាំងស្រុង។

សិទ្ធិក្នុងការដកខ្លួនពីការចូលរួម៖ ការចូលរួមធ្វើឡើងដោយស្ម័គ្រចិត្ត
ហើយអ្នកចូលរួមអាចសុំដកខ្លួនបានពីការសិក្សាមួយនេះ ដោយគ្មានការផាកពិន័យឡើយ។
នៅក្នុងករណីមានការថតសម្លេង
នោះខ្សែអាត់សម្លេងនឹងត្រូវលុបចោលទាំងស្រុងនៅពេលដែលអ្នកសម្រេចចិត្តឈប់បន្ត។

របៀបដកខ្លួនពីការចូលរួម៖
អ្នកចូលរួមអាចដកខ្លួនបានដោយប្រាប់ទៅអ្នកសម្ភាសពីការសម្រេចចិត្តឈប់បន្ត។
ដោយឡែកប្រសិនបើការសម្ភាសន៍ត្រូវបានបន្តធ្វើរហូតដល់ចប់សព្វគ្រប់
នោះទិន្នន័យនឹងក្លាយជាអនាមិក ហើយមិនអាចដកចេញបានទេ។

ប្រសិនបើអ្នកចង់ឈប់បន្ត សូមប្រាប់ទៅអ្នកសម្ភាសអោយឈប់។
គ្មានការផាកពិន័យក្នុងការដកខ្លួនចេញឡើយ។

សំណង៖ ក្នុងការចូលរួមនេះគឺជាការចូលរួមឥតសំណង។

ប្រសិនបើអ្នកនៅមានចម្ងល់ពីការសិក្សាស្រាវជ្រាវមួយនេះ ឬរាយការណ៍ពីបញ្ហាទាក់ទងនឹងការសិក្សា សូមទាក់ទង៖

អ្នកស្រាវជ្រាវ៖ Sara Hendrix
មុខងារ៖ និស្សិតបណ្ឌិត

ដេប៉ាតេម៉ង់៖ College of Human Environmental Science, Health Science Department
លេខទូរស័ព្ទ៖ 1.251.472.6442
អ៊ីម៉ែល៖ sjhendrix1@crimson.ua.edu

គម្រោង៖
ប្រសិទ្ធភាពនៃកម្មវិធីអនាម័យដឹកនាំដោយសហគមន៍លើកំណើនការសាងសង់បង្គន់និងការប្រើប្រាស់នៅកម្ពុជាភាគកណ្តាល

ទិប្រឹក្សាមហាវិទ្យាល័យ៖ Dr. Stuart Usdan
ដេប៉ាតេម៉ង់៖ College of Human Environmental Science, Health Science Department
លេខទូរស័ព្ទ៖ 1.205.348.6150
អ៊ីម៉ែល៖ susdan@ches.ua.edu

ប្រសិនបើអ្នកមានសំណួរពីសិទ្ធិរបស់អ្នកក្នុងនាមជាអ្នកចូលរួមនៅក្នុងការសិក្សាមួយនេះ ឬចង់ផ្តល់មតិ ឬដាក់ពាក្យបណ្តឹង ហើយមានក្តីបារម្ភពីការសិក្សានេះ សូមទាក់ទង៖

Ms. Tanta Myles, the University of Alabama Research Compliance Officer at (205)-348-8461 or toll-free at 1-877-820-3066 ។ អ្នកក៏អាចសួរសំណួរ ផ្តល់មតិ ឬដាក់ពាក្យបណ្តឹងនឹងក្តីបារម្ភ តាមរយៈវែបសាយ http://ovpred.ua.edu/research-compliance/prco/ ។ អ្នកក៏អាចផ្ញើរសារអេឡិចត្រូនិចទៅកាន់ scompliance@research.ua.edu ។

APPENDIX F

Translator Declaration Form

AAHRPP DOCUMENT # 67

UNIVERSITY OF ALABAMA
HUMAN RESEARCH PROTECTION PROGRAM

FORM: TRANSLATOR'S DECLARATION

NOTE: *If more than one person works on a translation, each person shall sign this form but only one copy of the source and the translated document need be attached.*

IRB Study #:

PI:

To the University of Alabama Institutional Review Board:

I, _____Chansolyka Tep_____, declare that I am fluent in and understand the English language and the _____Khmer_____ language. To the best of my knowledge and belief, the attached translation(s) is true, accurate, and correct.

_____ This is a word-for-word translation, OR

__X__ This is an equivalent translation (the meaning is the same).

The original (source) English document and the translated version are attached.

Other than my role as translator:

1. _____I have no other involvement with this research proposal.
2. __X__I will be serving as an interpreter/interviewer as well as a translator.*
3. ____ I will be consulting about the findings.

Translator's Printed Name:___Chansolyka Tep_____

Address: #724E1, St. 128, Depo II, Toul Kok, Phnom Penh Cambodia

Phone: +8559233782_____ FAX ___N/A_____

E-mail:__chansolyk@gmail.com_____

**Complete investigator training and forward certificate or have PI do so.*