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Approval Sheet

"If students know about trachoma, they will teach their families:"
Turning to students and teachers in Amhara, Ethiopia to promote
Facial cleanliness and Environmental improvement

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“If students know about trachoma, they will teach their families:” Turning to students and teachers in Amhara, Ethiopia to promote Facial cleanliness and Environmental improvement

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
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2017

Abstract

"If students know about trachoma, they will teach their families:"
Turning to students and teachers in Amhara, Ethiopia to promote
Facial cleanliness and Environmental improvement

By Nicole S. Devereaux

Objectives: Trachoma is the world's leading preventable cause of blindness with the highest known prevalence of trachoma in the Amhara region of Ethiopia. Facial cleanliness 'F' and Environmental improvement 'E' are two of the main pillars of the World Health Organization approved SAFE strategy to reduce and eliminate trachoma. This thesis aims to study the education practices regarding the 'F' and 'E' components to evaluate opportunities to improve messaging for behavior change in face washing and latrine usage.

Methods: Qualitative data was collected through focus group discussions with teachers and students grades 1-5 at primary schools in all ten zones of the Amhara region. The focus groups asked about routines, washing behaviors, latrine usage, and perceived barriers to others partaking in washing and latrine usage. Answers to these questions were analyzed for recurring and novel themes.

Results: Students, teachers, and schools face challenges in achieving education goals and activities related to face washing and latrine usage due to lack of universal water and sanitation infrastructure and teaching aids/resources. In light of these limitations, students and teachers believe that given proper training, visual aids, and information on trachoma, sanitation, and hygiene, individual and community adherence to face washing and latrine usage will increase.

Conclusions: To strengthen the 'F' and 'E' arms of the SAFE strategy in Amhara, Ethiopia, educational materials and trainings for teachers regarding trachoma, sanitation, and hygiene are recommended, with particular emphasis on providing visual aids. Continued communication and collaboration with pertinent ministries within Ethiopia to expand rural water and sanitation infrastructure would increase the population's ability to sustain trachoma reductions through regular 'F' and 'E' activities.

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Introduction

Trachoma, a neglected tropical disease (NTD), is the world's leading cause of preventable blindness. Worldwide, the World Health Organization (WHO) estimates that over 39.3 million people are blind and another 246 million have/or are afflicted with low vision (WHO WER, 2014). Of those 39.3 million people, 2.2 million suffer visual impairment due to trachoma. (Ibid). In 2006, the Ethiopian Federal Ministry of Health (FMoH) conducted a national survey that found that 1.6% of the population of Ethiopia, or 1.2 million people, were blind with 11.5% of that figure attributable to trachomatous corneal opacity (Berhane et al. 2006). Many international partners and countries are working under WHO guidelines to eliminate trachoma as a public health problem by the year 2020, a plan known as Global Elimination of Trachoma by 2020 (GET2020) (WHA, 51.11). This thesis aims to aid those efforts by evaluating current practices in trachoma prevention through facial cleanliness and environmental improvement by identifying possible opportunities for behavior change, education, and messaging regarding facial cleanliness and environmental improvement through latrine usage.

A brief description of the disease:

Trachoma is caused by a bacterial infection of *Chlamydia trachomatis*. Trachoma is spread through contact with nasal or ocular discharge of an infected person (WHO WER, 2014). The bacteria can be transferred through direct contact, contact with dirty clothing or other objects (fomites), and by vector flies, *Musca sorbens*, carrying the bacteria on their feet (Ibid).

At the onset, trachoma can be symptomless, but often causes inflammation of the eyelid and produces nasal and ocular discharge (WHO WER, 2014). This stage is called trachomatous inflammation-follicular (TF) and is most common in young children (Ibid). Over time and after repeated infections, the eyelid becomes scarred (Ibid). Severe conjunctival scarring causes the

eyelid and eyelashes to turn inwards (Ibid). In this stage called trachomatous trichiasis (TT), the cornea is scratched by the in-turned eyelashes, and this scratching results in pain, visual impairment, and blindness (Ibid).

The country and population:

Ethiopia is a large country in east Africa with a total population of 73,918,505 people (50.5% male, 49.5% female) at the last full census in 2007 (Federal Democratic Republic of Ethiopia Population Census Commission, 2008). Within Ethiopia there are 3,953,115 reported households, with 3,339,043 (84.4%) being rural; the average household size is 4.3 persons, 4.5 in rural areas (Ibid).

This thesis will focus on the Amhara National Regional State in northwest Ethiopia. Amhara is one of the ten regions in Ethiopia.

It should be noted that this thesis will include only a nested analysis of the total study BCCE data. The full study included data from groups of community leaders, women's health workers, teachers, students, and surveys at the household level. Due to limitations on time and given the amount of data encapsulated in all groups mentioned above, it was not feasible to include a full analysis of all groups included in initial data collection. The data from the other groups of participants will be analyzed and addressed in other publications outside of this thesis.

This analysis will focus on the data most directly pertaining to children aged 1-9 years. Children ages 1-9 are significant to the full study due to their role in the measurement of TF prevalence. As explained more thoroughly in the literature review, TF_{1-9} prevalence is one of the indicators that measures successful reduction of trachoma in an area. Therefore, this thesis will look at data from only teachers at primary schools who encounter children aged 6-9 years and

students in grades 1-5. To understand the scale of the role of children in Amhara, below is the breakdown of the child population in Amhara:

Children aged 1-9: 4,515,728	Male: 50.4%	Female: 49.6%
Rural children 1-9: 4,143,431	Male: 50.4%	Female: 49.6%

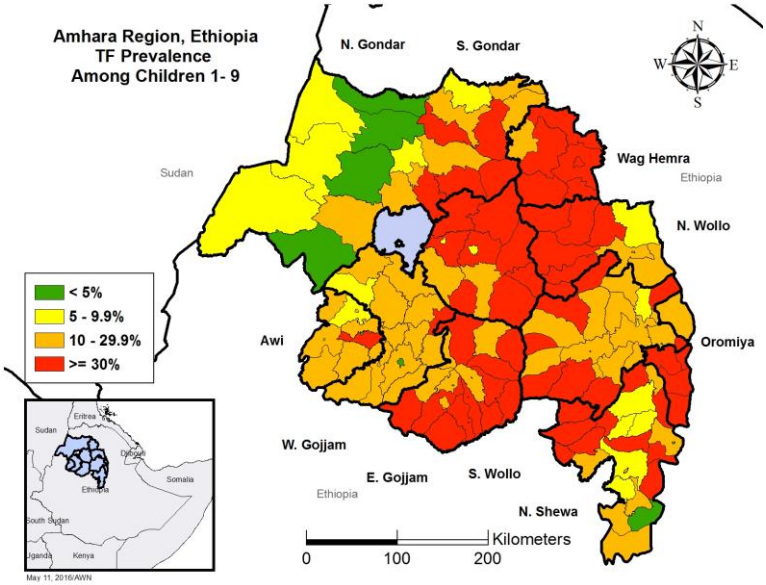
(Federal Democratic Republic of Ethiopia Population Census Commission, 2008).

Problem

The Carter Center has been assisting the Amhara Regional Health Bureau with the elimination of trachoma as a public health problem in Ethiopia since 2001 (The Carter Center Program Review, 2015). The Carter Center supports the Amhara Regional Health Bureau to implement the WHO endorsed SAFE strategy in the Amhara National Regional State of Ethiopia. SAFE stands for surgery, antibiotics, facial cleanliness, and environmental improvement[1].

The Amhara Regional National State has the highest known prevalence of trachoma within Ethiopia: in 2006, TF in children aged 1-9 years was 26.8% and trachomatous trichiasis (TT) in the general population was 2.16% - well above the elimination standards of less than 5% and 0.1% respectively (Berhane et al., 2006). Since the regional trachoma program began in 2001 and baseline surveys were conducted in 2006, many programmatic efforts have been made to reduce the prevalence of trachoma in Amhara. Below, in figure 1, is the most recent map of Amhara displaying TF_{1-9} prevalence, the prevalence of TF in children ages 1-9 years old. :

Figure 1: TF_{1-9} Prevalence in Amhara, Ethiopia (The Carter Center Program Review, 2016)



While great strides have been made in the region, TF_{1-9} prevalence needs to be below 5% region wide to achieve elimination as a public health problem by the year 2020. Again, since TF prevalence is measured in children ages 1-9 years, it is imperative to address trachoma, specifically TF, in children. The problem this thesis aims to address how to reduce trachoma and sustain reductions by identifying new messages and, through the improvement of existing messages, to increase knowledge about the 'F' and 'E' components of the SAFE strategy.

Purpose

In recent years the Amhara Regional Health Bureau (ARHB) with support from The Carter Center have recognized a need to intensify the SAFE strategy, with special focus on 'F' facial cleanliness and 'E' environmental improvement (The Carter Center Program Review, 2015). Facial cleanliness is monitored by the presence of ongoing health education on hygiene and face washing in every village while environmental improvement is measured by number of latrines built compared to a yearly target of latrines to be built (The Carter Center Program Reviews).

In 2003, the ARHB with support from The Carter Center developed a co-curricular teacher's manual to include trachoma specific lessons into the education system in Amhara. In

2008 the manual was revised and trainings for teachers were conducted. In 2014, the program began planning a qualitative study to look closely at barriers to and opportunities for school and community education around facial cleanliness and environmental improvement. In February 2015, the Behavior Change Communications and Education (BCCE) study was piloted, launched, and completed in June 2015. The purpose of this thesis is to analyze the BCCE study data from focus group discussions (FGDs) of teachers and students to answer the following research questions and provide programmatic information to strengthen approaches to 'F' and 'E' education and messages.

Research Questions

The thesis aimed to answer:

1. What is the current state of education and awareness around trachoma among teachers and students in schools, specifically related to hygiene and sanitation?
2. What are students' and teachers' perceptions about barriers pertaining to sanitation and hygiene behaviors that prevent trachoma transmission?

Significance

The answers to these questions will provide evidence to The Carter Center and the ARHB as to what is needed to deliver 'F' and 'E' messages for behavior change in the school setting. These messages will be built on local context and needs to promote behavior change around face washing and latrine usage while increasing knowledge about trachoma among school children and community members. More successful 'F' and 'E' approaches will help sustain reductions in trachoma prevalence in Amhara. Lessons learned can then potentially be shared with other country programs to strengthen 'F' and 'E' strategies worldwide.

Definition of Terms

ARHB – Amhara Regional Health Bureau

BCC(E) – Behavior Change Communications (for Education)

CLTS – Community-led Total Sanitation

FGD – Focus Group Discussion

FMoH – Federal Ministry of Health

GET 2020 – Global Elimination of Trachoma by the year 2020

HE – Health Education

HEW – Health Extension Worker

IDI – In-depth Interview

NTD – Neglected Tropical Disease

PLA – Participatory Learning and Action

SAFE – WHO Strategy for trachoma elimination: Surgery, Antibiotics, Facial cleanliness, Environmental improvement

SSII – Semi-structured Individual Interview

SSGI – Semi-structured Group Interview

TF – Trachomatous inflammation – follicular

TI – Trachomatous inflammation – intense

TT – Trachomatous Trichiasis

TIS – Trachoma Impact Survey

WHDA – Women's Health Development Army

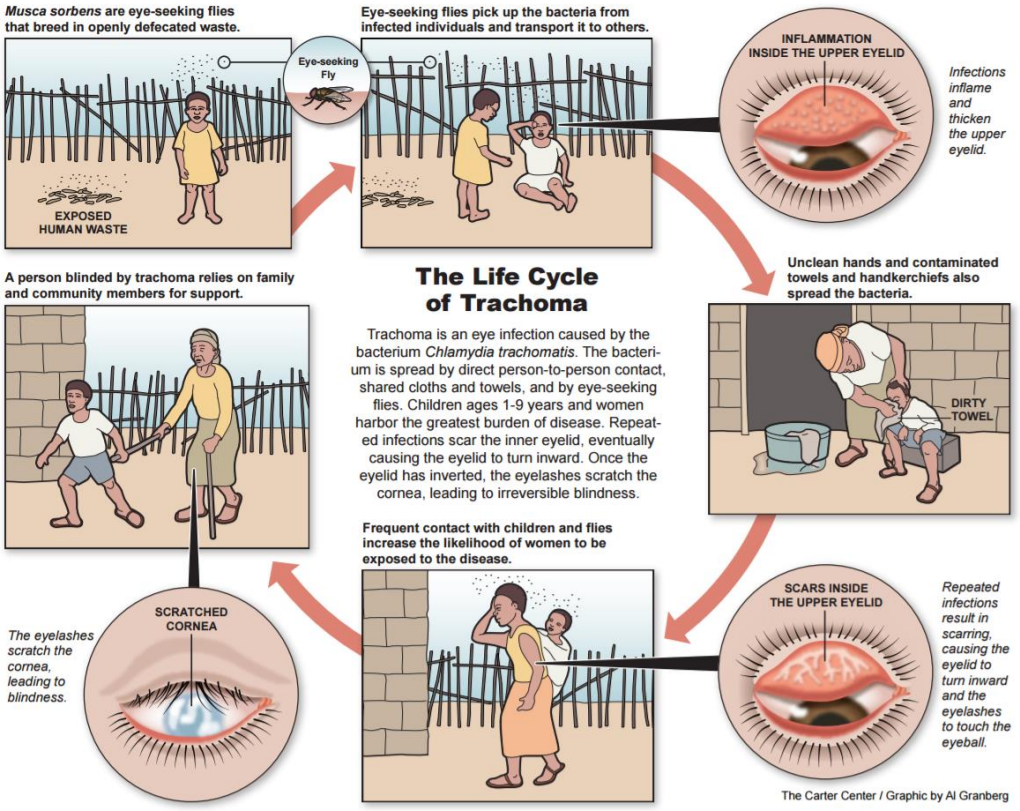
WHO – World Health Organization

Literature Review

I. Trachoma – etiology

Trachoma is classified as a neglected tropical disease (NTD) and is the leading cause of preventable infectious blindness in the world (WHO, WER 2014). The bacteria *Chlamydia trachomatis* spreads an ocular infection through eye and nose discharge of infected individuals (Ibid). Discharge can spread from person to person via direct contact, through a fomite[2], or by eye-seeking flies, particularly the fly species *Musca sorbens* (Ibid). Female *M. sorbens* prefer to lay their eggs on exposed human feces, thus disposal of solid human waste is an important step in the lifecycle of trachoma, fully illustrated below:

Figure 2: The Life Cycle of Trachoma, produced by The Carter Center / Graphic by Al Granberg:



[2] A fomite is defined as an inanimate object that may carry infectious agents. In the case of *Clyamidia trachomatis*, common fomites are clothes, towels, and other fabrics that may come into contact with the face (WHO WER 2014).

The diagram shows that children are the most susceptible to the *C. trachomatis* infection through contact with others and lack of hygiene habits like face washing (WHO, WER 2014). The eyelid in the upper right corner shows the condition known as TF associated with inflammation of the inside of the upper eyelid (Ibid). Repeated infections, if left untreated, over an individual's life result in scarring of the upper eyelid as seen in the lower right-hand corner of the diagram (The Carter Center, Granberg). In some individuals, the scarring leads to the stage of trichiasis, in which the scarring turns the individuals' eyelashes to touch the eyeball (WHO, WER 2014). If not corrected by surgery, trichiasis is an extremely painful condition that leads to blindness as eyelashes scratch the cornea, depicted in the lower left-hand corner of the diagram (The Carter Center, Granberg).

Antibiotics, specifically azithromycin, treat the "active trachoma" stage (TF and/or TI) TF is measured as an indicator of prevalence of the disease in children aged 1-9 years and indicated by $TF_{1\text{-}9}$. Trachoma is controlled through face-washing to cleanse any ocular or nasal discharge, and by disrupting fly reproduction through the use of latrines[3] to collect feces as opposed to open defecation.

II. Trachoma as a Global Health Problem

Trachoma, as a disease, has blinded people around the world for thousands of years (ICTC, 2011). Published literature estimates that approximately 51countries worldwide are classified as trachoma endemic, and within those countries, more than 2 million people are either blind or suffer from the pain of trichiasis (WHO WER, 2014).

[3] Latrines, in this context, refers to a simple pit latrine about 3 meters deep, built on a wood pull and mud plaster platform, with a traditional superstructure around it (Executive Summary, The Carter Center, 2005).

With the scope of the problem trachoma poses to the world, in 1998 the WHO adopted the SAFE strategy and established the WHO Alliance for the Global Elimination of Trachoma by the year 2020 (GET2020). The mandate set by WHO through the GET2020 aims to eliminate trachoma as a public health problem by the year 2020. This goal evaluated by a validating the indicators below in a report submitted to the WHO. There are two indicators that must be reached for a country to show that trachoma has been eliminated as a public health problem:

- TT: TT prevalence must be below 0.1%; fewer than 1 per 1,000 people in the total population
- TF: TF_{1-9} prevalence (TF in children between ages 1-9 years) must be less than 5%

In pursuit of these elimination targets, governments, non-profit organizations, universities, and corporations have united to support the WHO endorsed SAFE strategy all over the world to eliminate trachoma as a public health problem.

The SAFE strategy is a four-pronged approach to reducing the prevalence and controlling trachoma:

Surgery – to reverse the in-turned eyelashes in patients with TT

Antibiotics – oral doses of azithromycin or topical tetracycline eye ointment to treat active trachoma infections and reduce the reservoir of infection (TF and TI)

Facial cleanliness – advocacy, education, and measurement of clean faces, particularly among children, to cleanse any nasal and/or ocular discharge from the face and reduce transmission

Environmental improvement – construction and use of pit latrines to collect human feces and eliminate open defecation; limits ability of flies to reproduce in preferred feces (Emerson et al., 2006).

III. The Carter Center's Trachoma Control Program: Using the SAFE strategy

The Carter Center has been dedicated to working on trachoma control since 1999 (The Carter Center Program Review, 2001). The Carter Center has supported trachoma control efforts in 9 countries: Sudan, Ethiopia, Niger, Ghana, Mali, Yemen, South Sudan, Uganda, and Nigeria (Ibid). The aim of the Carter Center's Trachoma Control Program has always been to assist national and regional governments in the surveillance and reduction and control strategies toward the elimination of trachoma as a public health problem (Ibid).

As the program has progressed, the countries it assists have changed. At present date, the Carter Center Trachoma Control Program assists and supports programs in Ethiopia, Mali, Niger, Sudan, South Sudan, and Uganda (The Carter Center Program Review, 2016). The Carter Center assists in training and supplying equipment for surgeries to relieve trichiasis, fulfilling the 'S' in the SAFE strategy. For the 'A' of SAFE, a major part of the Carter Center's support is directed toward Mass Drug Administrations (MDAs) and subsequent Trachoma Impact Surveys (TIS) to evaluate the prevalence of trachoma. The 'F' of facial cleanliness is addressed through various health education approaches carried out through school curriculum and clubs, teacher trainings, community based education through health professionals, and information given during MDAs. Environmental improvement, the 'E' of SAFE is accomplished through support of latrine construction via trainings in masonry, lessons on how to build pit latrines, and materials provided.

IV. Ethiopia

Ethiopia is a large country with a total population of 73,918,505 people (50.5% male, 49.5% female) (Federal Democratic Republic of Ethiopia Population Census Commission, 2008). In order to understand the specific context of Ethiopia it is helpful to understand the government structure in Ethiopia and Amhara. The hierarchy of government structure as seen in the figure below:

Figure 3: Governmental Structure and Outline Map of Ethiopia

Diagram created by N. Devereaux; Map reproduced from Google

This set-up of government administration has been an integral part of implementing SAFE strategies to remote, rural populations. A woreda is the third-level administrative division of Ethiopia. Woredas consist of multiple kebeles, which are groups of villages. Below kebeles, gotts make up the smallest unit of local government consisting of villages of about 100 households

Also of note in the ability to implement the SAFE strategy is the infrastructure built into the healthcare system. As with the government structure, healthcare is carried down to the

individual level through similar branching. Health Extension Workers (HEWs) are instrumental in providing care at the local level. Every kebele is assigned two HEWs that also run a local health post. At the woreda level, there is a more robust health center. Health centers are overseen by zonal officials; the most robust care sites can be found at regional and federal capitals. It is through this structure, and particularly with the cooperation of HEWs that the SAFE strategy can reach individuals all over the region.

a. National Progress Toward Elimination of Trachoma as a Public Health Problem

In terms of Ethiopia's progress regarding trachoma, the following timeline of events outlines national milestones in the country's work to eliminate trachoma (The Carter Center Program Review, 2014, 2016):

1976: National Blindness Program and Trachoma Control Program Started

2000: Prevalence and KAP (Knowledge, Attitude, and Practice) surveys in four districts of South Gondar Zone, Amhara region

2001: National guideline for Primary Eye Care developed[4]

2002: Amhara regional program expands to 15 districts in South Gondar and East and West Gojjam

2002: Vision 2020 launched in Ethiopia

2005: First national strategic plan for eye health written for 2006-2010

2006: National guideline for mass antibiotics distribution developed; national task force for trachoma control established

2006-2007: Amhara region's baseline survey at zonal level

[4] A five-year document, currently in 3rd cycle

2008: MalTra MDA campaign launched[5]

2010: 50 millionth dose of azithromycin distributed

2012: National Trachoma Action Plan (TAP) was prepared

2010-2017: GTMP (Global Trachoma Mapping Project) and trachoma impact surveys (TIS) conducted in Ethiopia and Amhara region respectively

2013: Trachoma becomes part of national NTD program under disease prevention and control directorate

2020: Target date for elimination

b. Regional

Within Ethiopia, there are 10 national regions plus the special area of the capital city, Addis Ababa: Afar, Amhara, B-Gumz, Dire Dawa, Gambella, Harari, Oromiya, Somali, SNNP, and Tigray (Federal Democratic Republic of Ethiopia Population Census Commission, 2008).

c. Amhara

The Amhara National Regional State of Ethiopia shares many characteristics with other regions in the country, yet maintains some distinct features.. Within Amhara, there are 17.2 million people, 15.1 million of whom live in rural areas (Federal Democratic Republic of Ethiopia Population Census Commission, 2008). The religious breakdown of Amhara is: 82.5% Orthodox Christian, 17.2% Muslim, 0.2% Protestant, 0.1% Other, and less than 0.1% Catholic and/or Traditional (Ibid). There are 93 reported nationalities or ethnic groups in Amhara, with

[5] MatTra (Malaria and Trachoma) week was a biannual weeklong outreach campaign that involved the mass distribution of azithromycin to prevent and treat trachoma. Additionally, recipients were provided with health education and testing and treatment for malaria with Coartem®

the vast majority (91.5%) being Amhara (Ibid). The majority ethnic Amhara separates the region from the rest of the country; additionally, the relatively small Muslim population also makes Amhara different from other regions. Nationally, 27% of the population identifies as ethnic Amhara; 34% practice Islam, and 66% practice some version of Christianity with 44% defining themselves as Orthodox Christians (Ibid). Amhara's geography is characterized by expansive highlands, including the highest peak in Ethiopia. Many areas in Amhara have a climate that receives limited rainfall over the year with a rainy season over the summer months during which children do not go to school. Dry and dusty conditions are typical throughout Ethiopia and are prevalent within Amhara.

Since the start of the implementation of the SAFE strategy, the ARHB has made great accomplishments towards trachoma control. In the early years of the program, great emphasis was placed on the 'F' and 'E' branches of the SAFE strategy (The Carter Center Program Reviews 2001-05). From 2001-2005 health education activities were produced and piloted with an emphasis on school curriculum and radio messages (Ibid). Most notably, the Fifth Annual Trachoma Program Review in 2004 highlighted the fact that trachoma prevention was taught as part of the regular curriculum in grades 1-4, and that grades 5-8 taught trachoma prevention through trachoma and sanitation clubs in addition to region wide Trachoma Prevention Days (The Carter Center Program Review 2004). In 2003, 'F' and 'E' activities remained top focuses through a massive scale up in the program to include 15 additional districts outside of South Gondar and an "Executive Summary" released by Paul Emerson in September 2005 titled "Pit Latrines for All Households: The experience of Hulet Eju Enessie Woreda, Amhara National Regional State, Northwest Ethiopia" announcing an initiative to have a pit latrine for all households (Executive Summary 2005, The Carter Center Program Reviews 2006-08).

A turning point in The Carter Center's ability to better assist Amhara's implementation of the SAFE strategy came with antibiotic donations from Pfizer, Inc. and the ARHB's launch of MalTra campaigns starting in 2007 (The Carter Center Program Review 2008). The MalTra campaign scaled the region's program from 15 districts up to the entire region of Amhara (Ibid). Health education and latrine coverage continued as vital parts of the SAFE strategy, however, the influx of resources and ability to scale and measure antibiotic success could not be as easily duplicated for 'F' and 'E.' In 2008, a total of 13,553 school teachers were trained in Amhara to present using a revised version of 2003 school-based trachoma education. Emphasis was also placed on latrine construction and utilization with oversight from HEWs in both school and household latrine activities (The Carter Center Program Review, 2009). In 2009, the work of HEWs in regards to health education about trachoma was further emphasized through continued health education promotion regarding children's clean faces and latrine construction; HEWs continued to play an integral role in social mobilization during surgery and antibiotic campaigns through community advocacy and education (The Carter Center Program Review, 2010). In 2010, the ARHB adopted Community-led Total Sanitation (CLTS) as a strategy to improve hygiene and sanitation (The Carter Center Program Review, 2011). The HEWs led the CLTS charge as well as the health education outreach to communities and schools. At the Fourteenth Annual Trachoma Program Review in 2013, the issue of health education materials for school programs was raised, as well as the possibility to use a new 1:5 community learning structure, the Women's Health Development Army, to disseminate education about trachoma (The Carter Center Program Review, 2013). It was decided that the materials and health education strategies should be reassessed and explored for new opportunities.

From 2013 to 2015, facial cleanliness and environmental improvement activities continued through HEWs and CLTS activities (The Carter Center Program Review 2014-16). However, as latrine utilization numbers hovered around 40% and facial cleanliness among children ages 1 to 9 years was about 80%, it was decided that further study into 'F' and 'E' was necessary (The Carter Center Program Review 2014). In 2014, the program decided to launch a qualitative study to look closely at barriers to and opportunities for school and community education around facial cleanliness and environmental improvement (The Carter Center Program Review, 2015). In February 2015, the Behavior Change Communications for Education (BCCE) study was piloted, launched, and completed in June 2015. The BCCE study is the umbrella study under which this thesis falls.

V. Evidence for the need of 'F' and 'E'

Emerson et al. published a key piece of literature in 2008 that integrated trachoma into a baseline survey with malaria, thus providing the groundwork for future planning and implementation of a rapid scale-up of the SAFE strategy to all districts in Amhara, Ethiopia. This scale up was largely driven by a campaign-style MDA. Simultaneous scale-up of facial cleanliness and environmental improvement proved to be much more challenging to do and measure compared to MDA. However, the strong network of HEWs allowed for facial cleanliness and environmental improvement roll-out to be possible. The table presented below from Emerson et al. showed that lack of latrines and water sources greater than 30 minutes away from households posed challenges to the success of 'F' and 'E' components.

Table 1: Household Characteristics in Amhara, Ethiopia (adapted from Emerson et al. 2008)

Household Characteristics*			
Domain	Estimated Popuation**	Without pit latrine (%)	Water source >=30 minutes (%)
Amhara Region	19,391,698	75.7	25.9
Zones			
North Gondar	3,241,161	85.4	30.6
Waghemra	375,440	94.3	53.1
South Gondar	2,243,477	76.6	3.6
North Wollo	1,636,699	49.8	12.8
West Gojjam	2,674,974	82.8	39
Awi	1,090,879	54.1	25.7
East Gojjam	2,470,060	81.6	26.7
South Wollo	2,878,970	74.2	10.8
Oromiya	588,943	59.4	36.1
North Shoa	2,191,096	91.1	21.4

*Chart adapted from Emerson et al. 2008

**Bureau of Finance and Economic Development for the year 2006/2007

doi:10.1371/journal.pntd.0000197.t001

In 2009, Emerson and Ngondi expanded on the importance of 'F' and 'E' in the goal of trachoma elimination as a public health problem stating, "The message for trachoma programs is very clear: however much we may be tempted to, if we base trachoma control in hyper-endemic areas solely on antibiotic distribution, success is not likely" (p. 1, e394). They continued by concluding that without effective 'F' and 'E' components, mass antibiotic treatment will not be enough to eliminate trachoma in the most highly affected areas.

Echoing the need for effective 'F' and 'E', Ngondi et al. continued to look at the effects of 'A,' 'F,' and 'E' together in hyper-endemic areas of Ethiopia in 2010. This study used structured questionnaires to assess uptake of 'A,' 'F,' and 'E' (Ngondi et al., 2010). The authors noted that in the SAFE strategy, the 'A,' 'F,' and 'E' components are designed to work together in the community to reduce overall lifetime risk of scarring due to infection and the resulting blindness

(Ibid). This overall reduction of risk is what is believed will sustain reduction of infection prevalence at and after elimination through direct antibiotic treatment and an increase in hygiene and sanitation through reduction of fecal matter in the environment. One of the key findings the authors reported in this paper was that after antibiotic treatment stops, there is a surge in active infections after 6 months of no treatment; this resurgence has been found in other studies as well (Ibid). The study concluded that the simultaneous implementation of 'A,' 'F,' and 'E' components should be continued, noting that having a clean face and a pit latrine in the household were associated with 40% and 20% odds reductions for active trachoma respectively (Ibid).

Additional studies by Thomas Lietman's research team at the Francis I. Proctor Foundation at the University of California, San Francisco have shown that in the most trachoma endemic areas, repeated MDAs reduce trachoma prevalence, but only if the MDAs continue frequently and with high coverage, and that infection returns after MDAs are discontinued; they concluded that "sustainable changes or complete local elimination of infection will be necessary" to eliminate trachoma as a public health problem (Lakew et al., 2009). The means that without sustained, effective 'F' and 'E' activities, antibiotics alone cannot keep trachoma from returning to a community.

The continued call for "effective" delivery of facial cleanliness and environmental improvement interventions throughout the literature indicates that the search for that "effective" solution continues. This thesis aims to help find that solution with qualitative data. Mays and Pope lay out guidelines for ensuring that qualitative research is done well by checking for six qualities: 1) triangulation of more than one type of data source for confirmation of information; 2) respondent validation though incorporation of responses to findings shared with study

participants; 3) clear methods of data collection and analysis; 4) reflexivity showing all role and experience assumptions as well as "distance" between researcher(s) and researched populations; 5) due attention to negative or contradictory cases or information; 6) ensuring that the viewpoint of one group is never represented as the only truth (Mays and Pope, 2000).

With this in mind, there are multiple studies that look at formative research, qualitative data, and effectiveness of various methods and approaches for sanitation and hygiene promotion. One of these studies comes from Biran et al. regarding hygiene promotion in Krgzstan. The authors of this study used rapid-anthropological methods to collect quanitative and qualitative data for formative research over a short time-frame (Biran et al., 2005). The sample was non-random and purposive to include families with young children and high rates of poverty (Ibid). The study included a structured observation for the key behavior of hand-washing with soap as well as focus group discussions, a two week behavioral trial, and a questionnaire survey (Ibid). Hand washing after latrine use and before eating were the most commonly observed occurances, but even at these key times, less than half (49 and 47%) respectively washed hands and only 18 and 15% respectively washed with soap (Ibid).

VI. Sanitation: infrastructure and education

a. Face washing and hand washing

Access to water varies across the Amhara National Regional State. Bringing back Emerson et al.'s work mentioned above, the percentage of households whose water source was equal to or more than 30 minutes away ranged from 3.6% in South Gondar to 60.3% in North Gondar (Emerson et al., 2008). With such a large range, the regional average of 25.9% of houses with a water source equal to or more than 30 minutes away is not the best baseline for access to water across the region (Ibid). The Federal Minister of Water Resources within Ethiopia is responsible

for the implementation and planning of safe water provision; as of 2007, the Ministry was working toward 100% access to potable water within 1 km (a 40 minute round-trip) of every household (The Carter Center Program Review, 2008). Given the geography and remoteness of many households, access to safe water for washing remains a struggle in the Amhara region.

b. Latrine usage

One of the biggest pieces of the 'E' component of the SAFE strategy has been the push for latrine coverage. Again, going back to the numbers from 2008, percent latrine coverage by household ranges from 49.8% to 91.1% with a regional average of 75.7% (Emerson et al., 2008). As the data for the 2008 study was collected, Ethiopia reported needing another 2.4 million latrines built in order to reach Millennium Development Goal (MDG) 7, which requires a halving of the population without access to sanitation by the year 2015 (The Carter Center Program Review, 2008).

As of 2013, Ethiopia's Ministries of Health, Water and Energy, Education, and Finance and Economic Development have partnered to create the ONE WASH (Water, Sanitation, and Hygiene) Program to fund and support infrastructure at the national, zonal, and district levels (The Carter Center Program Review, 2016). In 2015 the ONE WASH program supported the constructions of 1.9 million latrines, 112,032 handwashing stations, and 21,520 individuals trained in community-led total sanitation and hygiene nationwide (The Carter Center Program Review, 2016). In 2015 in Amhara, over 300,000 latrines were constructed with a goal of working with the ONE WASH program to increase latrine and washing infrastructure in the following years (The Carter Center Program Review, 2016).

VII. Schools as places for change creation

A study by Scott et al.in 2007 looked at the motivation behind women's hygiene behaviors in Ghana. The authors took a market communications approach to understanding inner desires driving behavior change rather than increased knowledge (Scott et al., 2007). The study found that only 2.3% of mothers washed their hands with soap, and only 16.3% washed with water alone; the other women did not report washing behavior of any kind (Ibid). Based on the context, shortage of water, cost of soap, ability to store soap were potential, if not major constraints (Ibid). Many women cited lack of habit as a reason they did not use soap (Ibid). The motivation to use soap included nurturing/caring for children, disgust of contamination, and social concerns related to status in society (Ibid).

In discussion of the power of habit, the study is noted that habit may best be formed "at life-change events such as when mothers give birth or when children are at school, as it is at these times that people may be most susceptible to behavior change" (p. 231, Ibid). The authors list the limitations of consumer research in the types of responses people can give as well as the limitations of self-reported behavior (Ibid). They conclude that unless hygiene promotion is based more on hopes and desires as in marketing, the chance that it will be successful is limited (Ibid). When children enter school, it is considered a "life-change event," so according to this research, reaching children at school is an ideal venue for implanting 'F' and 'E' messages. The message of life-change events supports includes messages sent to children while they are at school, and thus further supports the focus on schools as the place of 'F' and 'E' messages in this thesis. Additionally, one of the authors in this study had previously published a paper that concluded, "hygiene promotion programmes can change behaviour and are more likely to be effective if they are built on local research and use locally appropriate channels of

communication repeatedly for an extended time" (p. 518, Curtis et al., 2001). Using information from the students and teachers at the same schools where 'F' and 'E' interventions will extend behavior change learned from schools well into the future.

VIII. Social-ecological model/framework: how the SAFE strategy fits

Social-ecological models for health behavior have gone through many iterations since emerging in the literature in the early 1950s (Sallis et al., 2008). The main concept of a social-ecological framework, however, is that it emphasizes both individual and contextual influences in behavior and the interdependent nature between them (McLaren and Hawe, 2005). Daniel Stokols' work comparing approaches from behavioral change, environmental enhancement, and the social ecological approach provides this description:

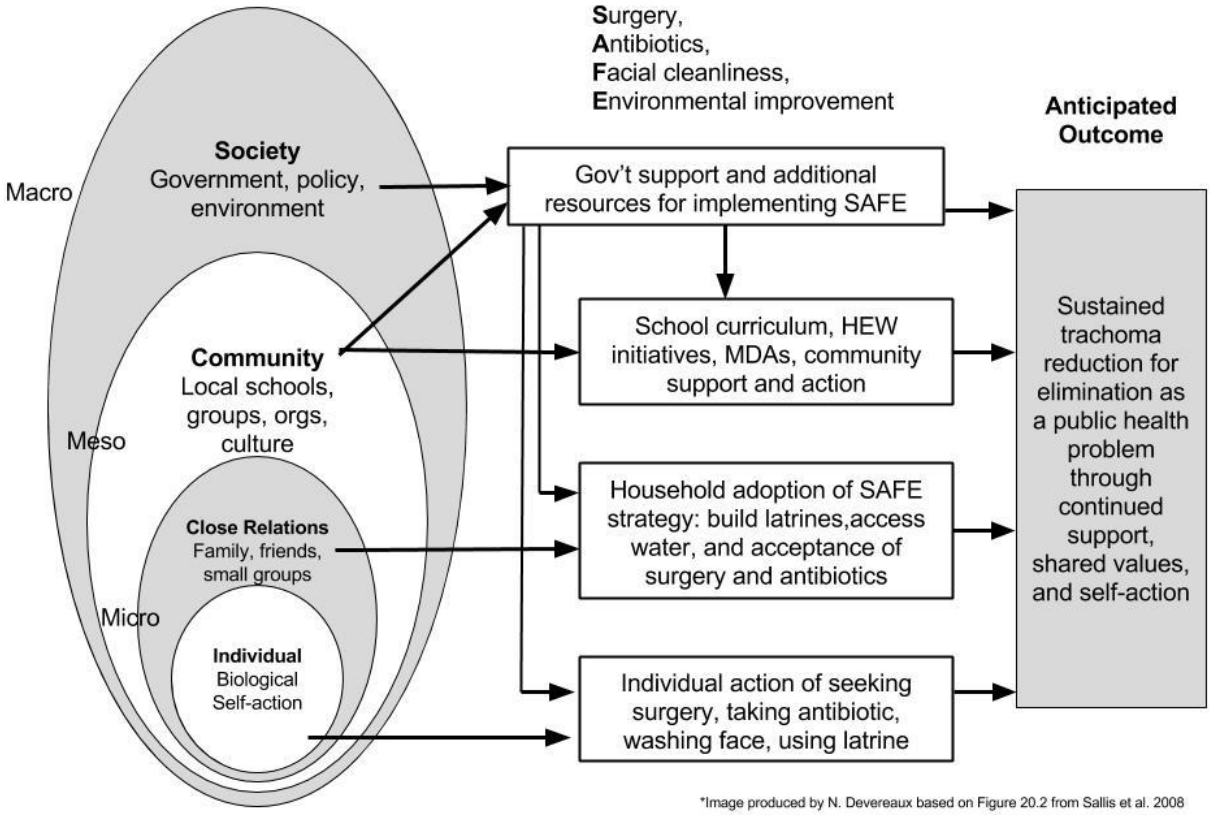
> "[…] the physical and social facets of settings are assumed to be closely interlinked and capable of exerting independent as well as joint effects on occupants' well-being. Also, the multiple domains of human activity (e.g., one's residence, neighborhood, workplace, and surrounding community) are viewed as nested structures in which local settings and organizations are embedded within larger and more remote regions. Thus, efforts to promote health must take into account the interdependencies that exist amount immediate and more distant environments (e.g. the "spill-over" of workplace and commuting stress to residential environments, and the influence of state and national ordinances on the healthfulness of occupational settings) (Stokols, 1996).

In the context of the Amhara region, this description can be applied to the levels of individual, household, school, community, community outreach through HEWs, and regional and national policies regarding education, school curriculum, and HEW focus and health initiatives.

The SAFE strategy addresses different levels of the social-ecological model and works between the levels as well. For example, all aspects of the SAFE strategy require individual action: seeking and undergoing surgery, taking an antibiotic, washing face, and building/using a latrine. However, each aspect also requires individual and community education and awareness

as to what behavior is expected and needed for each part of the SAFE strategy to be successful. Additionally, common community values need to be aligned so that all individuals within the community believe that surgery, antibiotics, having a clean face, and using latrines/keeping feces out of a clean environment are important. Beyond that, the health care workers and schools must adopt and push these community values to support the SAFE strategy. In order for HEWs and schools to officially adopt the values and knowledge and resources needed to educate and promote various aspects of the SAFE strategy, regional and national governments must support and enact policies aligned with the SAFE strategy and overall health promotion. These intersecting and collaborative forces are visualized below:

Figure 4: **The SAFE Strategy within the Social-Ecological Model**



The ovals within the figure represent a simplified social-ecological model. Each oval exerts pressure on the others and thus represent how individuals, groups, society, and the environment all affect each other. When the SAFE strategy is added, as represented by the rectangular boxes in the figure, the various interactions between the model and how the SAFE strategy are implemented shows a complex, but necessary collective effort in order to produce the outcome of sustained trachoma reduction and elimination as a public health problem.

The SAFE strategy is implemented as a whole where warranted and resources allow. Looking more carefully at just the 'F' and 'E' components of the SAFE strategy, it is important to note that the behaviors involved require a change in daily habit versus one time or annual/bi-annual initiatives as with surgery and antibiotic administration respectively. Thus, in order to successfully incorporate facial cleanliness and environmental improvement into daily practices, the individual, small group, community, and societal levels must all act to enforce and enact values and action to change the expected, normative behavior at all levels, focused on success at the individual's habits.

Methodology

Introduction

The aim of the study was to understand the behavioral factors that promote and inhibit good hygiene practices such as facial cleanliness and latrine usage across Amhara region in order to develop new trachoma health education messages and tools. This nested analysis looks at a

subset of the full data collected in the study[6]. Accordingly, this analysis looks at the following objective through the analysis of the focus group discussions (FGDs) undertaken by teachers and students

Objective

To explore existing opportunities for behavior change and communications (BCC) in Amhara region and determine appropriate messages and tools for each setting and for both the "F" and "E" components of SAFE

Population and Sample

In order to investigate the objective, FGDs using semi-structured group interviews (SSGI) among key informants including teachers in primary schools, and students from grades 1-5 in primary schools. Students FGDs also included participatory learning and action (PLA) sessions but will be referred to holistically as student FGDs.

All study methods were conducted at each study site.

Sample Selection

This study took place in all 10 zones of the Amhara National Regional State in Ethiopia. A multistage cluster sampling approach was used to select the study sites. Woredas for the study sites were selected based on zonal baseline trachoma prevalence and the most recent trachoma impact surveys (TIS). Data collection occurred in two rounds. For Round One, six study sites were chosen: three sites that have shown a decrease in TF_{1-9} prevalence at the latest TIS compared to baseline; three sites that have shown an increase in TF_{1-9} prevalence at the latest TIS compared to baseline.

[6] The data collection methodology was originally written by Tara Brant and amended by Kimberly Jensen. It has been updated to reflect the process undertaken in the field and to reflect thesis requirements.

Round Two of the data collection was collected after initial readings of the transcribed data from Round One. The study team found saturation in many key themes, however, with only six of the ten zones surveyed, each zone contained "niche," rich data not easily apparent in all or some of the other zones: variations in local traditions, beliefs, demographic and geographic differences, etc. In other words, unique, or "niche" findings appeared in most of the data read from Round One. The study coordinator, assistant, and Carter Center program staff in Atlanta discussed the need for additional data collection after Round One in order to ensure that full saturation of these outlying "niche" findings were reached. Accordingly, Round Two proceeded to collect data from the remaining four out of ten zones in Amhara. See table 3 below for information on the woredas selected:

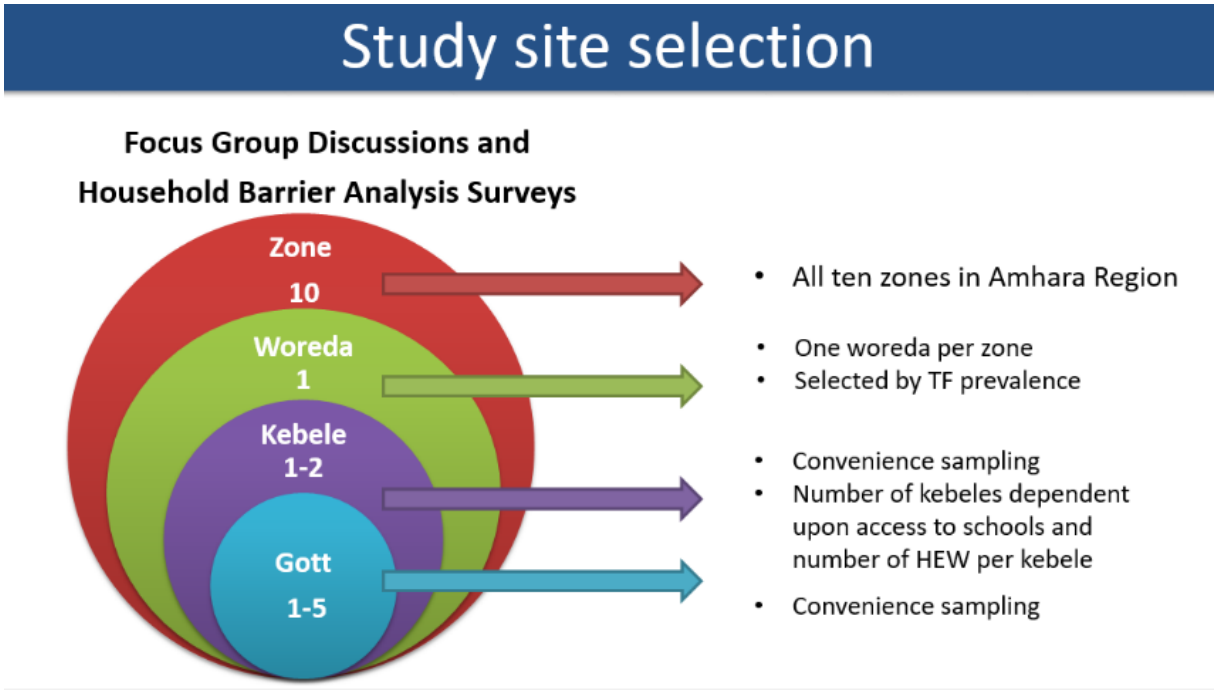
Table 2: Study Selection by Zone and Woreda

	Zone	Woreda	Most Recent Survey Year	TF% (1-9 yrs)	Baseline Point Estimate (%)	Baseline Confidence Interval (CI %)	Change
Pilot	North Shoa	Angolelena Tera	2007	23.2	49.0		
1	North Shoa	Moretena Jeru	2014	55.8	23.2	14.1-35.9	Increase
2	N. Gonder	Tach Armachiho	2013	2.42	34.7	24.4-46.8	Decrease
3	E. Gojam	Sinan	2013	13.1	48.3	44.4-52.2	Decrease
4	S. Gonder	Libo Kemkem	2014	35.8	24.3	17.9-32.2	Increase
5	S. Wello	Woreillu	2014	23	46.5	40.0-53.1	Decrease
6	Oromiya	Artuma Fursie	2012	41	28.7	19.6-39.8	Increase
7 (Round 2)	N. Wello	Guba Lafeto	2014	10.9	51.9	35.4-68.0	Decrease
8 (Round 2)	Wag Hemra	Abergelie	2012	73.4	60.1	50.4-69.0	Increase
9 (Round 2)	Awi	Dangela Zuria	2013	7.4	38.9	22.7-57.9	Decrease
10 (Round 2)	W. Gojjam	South Achefer	2012	11.2	33.1	25.3-42.0	Decrease

Zonal Project Coordinators helped facilitate the selection of study sites based upon their in-depth knowledge of the communities in their respective zones. One to two kebeles (group of villages) from each selected woreda were chosen based on convenience sampling. Kebeles for FGDs were limited to those that contained a school within a 30-minute walk from a vehicle-accessible road. If more than one kebele was needed to complete the purview of the rest of the study – not contained within this nested analysis – a neighboring kebele to the school site which was logistically feasible to reach was selected. Urban kebeles were excluded.

A gott (single village) was chosen at random from within the selected kebeles. When additional participants were needed, or if there was not a school in the selected gott, the study included the nearest neighboring gott(s) within the same kebele. The number of gotts needed per kebele was based upon the number of households in each gott (numbers of households and gotts needed for additional study data not contained within this nested analysis) and/or the presence of a school.

Sample selection is shown below in figure 5: **Figure 5:**



FGDs: In each of the 10 zones, a FGD was conducted with six to ten members of each of the following groups:

- Teachers (grades 1-5)
- Students (grades 1-5)

Upon arriving to the study site, the research team arranged for the selection of the FGD participants with the local kebele leader(s) and HEW(s) based on the criteria stated above. The total number of FGDs was 40. The FGDs with teachers and students were conducted at the school within the kebele.

Study Team Training and Quality Assurance

Study tools were translated from English to Amharic by the study assistant, a nurse, and facilitators. Study tools were then back translated from Amharic to English to check for translation accuracy and correctness. All study team members were university educated in health related fields and fluent in Amharic and English.

Before the FGDs were conducted, a pilot test was conducted in a pre-selected non-study site[7]. This ensured the survey was worded and constructed in a way that the community understood. All needed corrections to the research tools were made before the final printing.

A standardized training was developed and conducted for the data collectors and supervisors in order to orient them to the study purpose and research tools. The team practiced the household surveys and the facilitation of the FGDs during the pilot study. Trustworthiness of the FGDs was enhanced by piloting the topic guides in advance. Triangulation via data sources – specifically through multiple data points on the same topic, e.g. FDGs with teachers – allowed a rich variety of ideas and behaviors to be constructed based on the contribution of a wide range

[7] The site has been selected from North Shoa zone

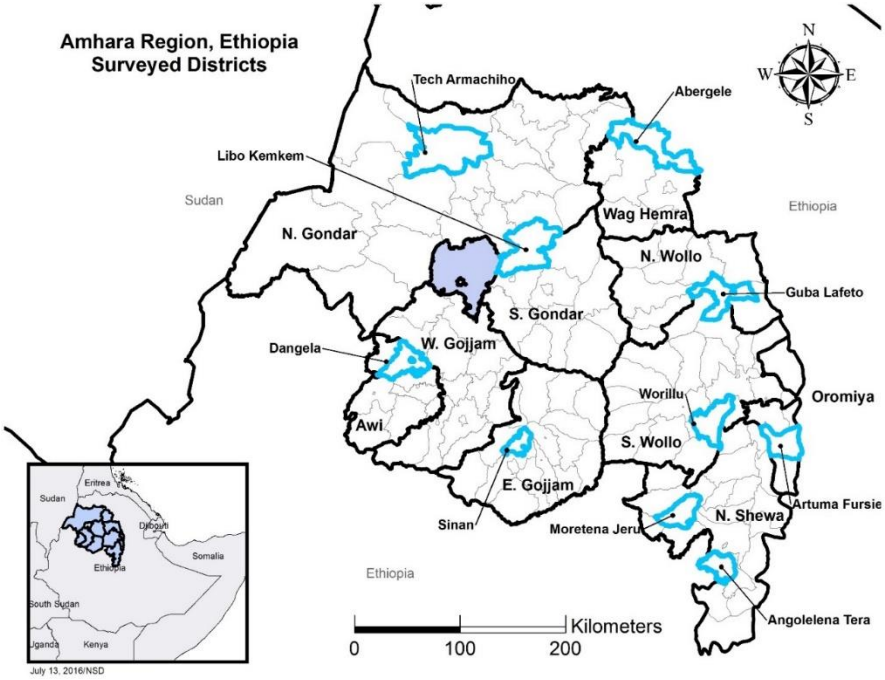
of informants (Shenton, 2004). Furthermore, respondent validation was used to ensure researcher understanding of the information obtained in the FGDs, which reduced the potential for bias of the interpreter (Mays and Pope, 2000). These measures were taken specifically to ensure that the study team, collecting the data in Amharic, understood and produced reliable data in English for the coordinators and analyst.

Procedures

The study team selected a primary school within the parameters above to hold FGDs. Half of the team held discussions with the teachers while the other half held discussions with students simultaneously. Each focus group was recorded in Amharic and translated into an English transcript. The recording was translated directly into an English transcript by one of the study team members. Work was divided equally between team members to ensure no one was overburdened. The content of the discussions was compared in and across zones to meet all study objectives. Quality control of translations occurred through double translation of random transcripts. The double translations were then compared for similarity. All doubly translated transcripts were assessed to be very similar and of equal quality.

Below is a map showing the woredas from which the study sites were selected. Limitations and logistics of travel between sites will be covered in the following “Limitations” section.

Figure 6: Woredas surveyed in Amhara



Study Instruments and Data Management

Data from the FDGs was translated into English by members of the study team and submitted to the coordinator in text documents, and then entered into MAXQDA software (Verbi GMBH, Berlin, Germany) for thematic coding. Quantitative variables about latrine presence, quality, and use were stored in a Microsoft Excel sheet.

Focus Group Discussions

A topic guide was used to offer some structure in the FGDs and to ensure the key issues were covered. Instructions for beginning and ending the focus group were written for the facilitators. The guide included questions that covered face washing, latrine usage, and the importance or reasons for those behaviors. Each guide contained a participatory activity and asked what the best methods for learning/teaching were in the classroom. FGDs took place in comfortable and safe environments and were conducted in Amharic. All members of the study team were fluent in both Amharic and English. All FGDs were recorded for ease of transcription

and translation, and a note taker was present. A sample of the FGD topic guides can be found in Appendices 2 through 3. Also included is a demographic form, which can be found in Appendix 4.

Transcriptions of the FGDs were translated into English text documents from the Amharic audio files. Every translator, the BCCE (Behavior Change Communications for Education) consultant, and the BCCE assistant reviewed all audio files and transcripts. As such each person involved had a copy of the translated transcript and raw audio file.

Data Analysis

After all transcripts were completed and collected, they were uploaded to MAXQDA qualitative analysis software. Based on notes from the research team from each collection site and an initial read through of three zones of data, the analyst created a coding scheme. The coding framework was formed based upon the key recurrent themes in the data. This data was first grouped into main themes and sub themes based upon the pre-existing definitions the analyst created for each theme and sub-theme. However, upon advisement and preliminary coding of half the data, the sub-themes were eliminated to produce the codes and definitions found below in Table 4.

Table 4: Themes and Codes for Students' and Teachers' FGDs

Theme	Code	Code Name Description	Code Definition	Possible/Expected Values (if applicable)
Students				
Absenteeism	ReasonsAbsent	**Reasons for self or other children to be absent**	Student identified reasons for absenteeism in themselves and peers	Community forces them not to; family are farmers; no knowledge of importance of education; have to work at home; fighting with father and running away; **work overload at home**
Importance of Education	FamilyGoals	**What would make family happy**	Student perceived goals that family has for them that would make the family happy	Become educated, make money, become teacher, become doctor, get married, stay close, take care of family, not forget family
Hygiene activities	WashRemind	**Who reminds students to wash?**	Who reminds students to wash	**Self-directed; some parents remind; some parents do not remind; family**
Hygiene activities	WhyWash	**Reasons to wash**	Student identified reasons to wash regularly	to be clean; prevent trachoma; prevent flies; avoid disease; avoid common cold; keep from getting sick; parents don't want to pay doctors' fees for sick children
Trachoma knowledge	CorrectKnow	**Correct trachoma knowledge**	Correct information held by students about trachoma	Flies cause eye disease; flies associated with trachoma; washing hands before food avoids vomiting, diarrhea, and other diseases; prevent trachoma by keeping hygiene and talking the tablets;
Trachoma knowledge	IncorKnow	**Incorrect Trachoma knowledge**	Incorrect information held by students about trachoma	**Flies cause HIV because they go to dirty places; Prevent trachoma by not picking up dirt, eating dirty things, or touching other people's blood; Toilet causes dirt and trachoma; toilet causes disease; Flies and toilets cause trachoma; toilets cause trachoma**

Latrines	LatrineReason	**Reasons for people to use latrines**	Student identified reasons to use latrines	Use latrines to be clean and not get smelly; neighbors get offended by smell of open defecation and will insult and make fun of us; "shiek" will curse us when he sees we defecate in field; it smells bad when we urinate outside so people will talk badly; you will be cursed if you defecate in field; **in the latrine, the dirty thing is hidden, so it is good even though dirty things are bad**
Teachers				
Lack of Resources	SchoolResource	**Resources needed at school**	Teacher identified resources that schools are lacking	**No water source; no student latrines; lack of textbooks; no electric power; no tradition of education in community; lack of parental support**
Trachoma Knowledge	TrachKnow	**Teacher's knowledge about trachoma (unsorted in addition to above)**	Teacher identified knowledge of trachoma	Caused by dirty environment and bacteria; can be transmitted by dirty cloth; may cause night blindness; impact varies by age of victim and stage of disease; **Latrine could be source of trachoma**
Worries and Problems	TrachProb	**Teachers' insights on problems related to trachoma**	Teacher identified problems with students and in community related to trachoma	Students request/compete for front seats due to vision problems; road construction increased trachoma incidence in students; sometimes shortage of trachoma drug; effects victims' daily activities, economic, and social impact; **students with signs of trachoma do not want to wash faces because soap makes their eyes burn more**
Teaching Materials	Curriculum Wants	**What teachers want for trachoma curriculum**	Teacher identified needs for new curriculum and planning	Want separate trachoma textbook; **more health issues in English textbooks;** trachoma not part of annual plan; cannot add to annual plan without awareness, resources, and follow-up; must be in formal

				curriculum in order to plan to teach
Teaching Materials	TeacherTraining	**Teachers call for training**	Teacher identified need for teacher training to teach trachoma	Training for teachers mandatory before teaching on trachoma; training should be practical with needs in reality; refresher trainings
Teaching Materials	CurrentTeach	**Current methods for teaching**	Teacher identified current methods to teach hygiene and trachoma	Students use 1:5 groups for learning and monitoring personal cleanliness; draw house, person, latrine, and flies on blackboard; used lens to show students fly anatomy that allows for transport of dirty materials
Teaching Materials	ComMaterials	**Need for materials to teach community**	Teacher identified materials necessary to teach community	**Audiovisuals, dramas, written guide books; supplies for coffee ceremony like HIV; poster guide, books, rewards for best performers;**
Teaching Materials	Material Specifics	**Specific requests for material content**	Teacher identified requests for specific content for trachoma teaching materials	Pictures with no text for students to brainstorm about; no text allows teacher to identify gaps in understanding; pictures with text; "real" pictures; pictures showing each stage of disease
Teaching Materials	FollowUp	**Offical Follow-up on teaching**	Teacher identified needs for offical follow-up on trachoma teachings	**Need higher officials to monitor program; need continues follow-up and support for change to happen**

In order to ensure consistency of coding, the analyst coded all study documents once. After all documents were coded, the analyst assessed the first and last document coded to check that coding and code definition were consistent. After the assessment, the analyst decided it was necessary to read through all study data a second time to ensure that code definitions were assigned consistently and accurately. Any deviations were addressed and fixed in the second close reading of the data.

Ethical Consideration

Ethics approval were obtained from both the Emory University Institutional Review Board, case number IRB00004035, and the ethical review committee of the Amhara RHB. The zonal coordinators helped to sensitize the communities before the study started by visiting two weeks before the study, and getting permission from the local kebele leaders to approach individuals within each kebele.

Informed Consent/Assent

The purpose of the study was shared on an information sheet written in a manner that was easy to understand and also explained in Amharic to the study participants. Participants had the option to ask for further clarification and were free to decide whether or not to participate. They were made aware that they could quit the study at any point in time with no repercussions. Verbal informed consent was obtained from each participant. Verbal consent was given for study participants less than 18 years of age and a parent or legal guardian then gave consent on behalf of the participant. A sample of the information sheet for consent can be found in Appendix Six.

Confidentiality

Each focus group was conducted in a private, separated space away from possible spectators and/or onlookers. Participants were assured full confidentiality and anonymity by assigning each participant a number. For example, teachers were numbered according: teacher 1, teacher 2, teacher 3, etc. No names or identifying information were collected.

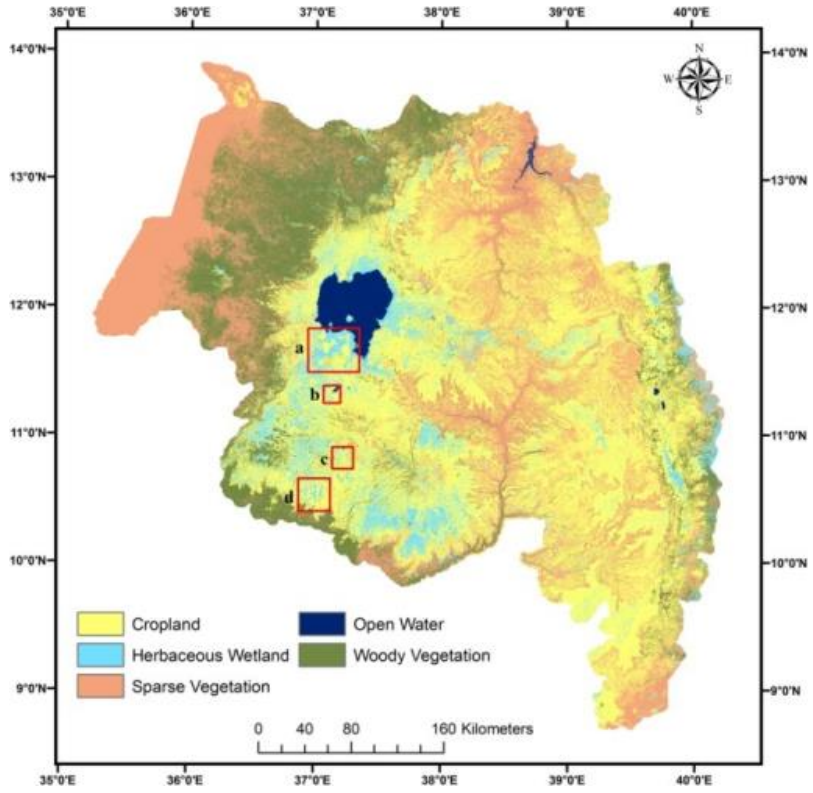
The team conducting the surveys and interviews were all workers in the health and research field, with experience in sensitivity and confidentiality. Hard copies of data were locked at all times other than when in active use. All data were stored on a password protected

computers, and only the BCCE consultant, BCCE assistant and supervisors had access to the raw data during data analysis.

Limitations and delimitations

One of the biggest limitations in data collection stems from the geography and topography of the Amhara region. Amhara covers an expansive space just over 79,000 mi^2, about the same land area as Minnesota, USA (Google Maps). However, unlike Minnesota, the elevation in Amhara varies from below 1000 m to the tallest point in the country, Ras Dasheen at 4,533 m (Google Maps). Below is a map showing the various land cover in Amhara:

Figure 7: Map of Land Cover in Amhara Ethiopia



Map reproduced from open access content by: Midekisa A, Senay G, and Wimberly M

The land covering begins to show the topography through ridgelines seen as indicated by pink as "sparse vegetation" (Midekisa et al., 2014). In comparison, the "herbaceous wetlands" are lower

in elevation (Ibid). Additionally, roads connecting the diverse landscape of Amhara are not well marked (if marked at all) and can become impassable during the rainy season. Accordingly, the study team had a limited window of opportunity to traverse the region before schools let out and the rainy season started. Because each zone is geographically, topographically, and to some extent religiously and culturally different, it took considerable coordination, resources, and efforts on the part of the study team and supporting staff members to complete travel to all zones in order to ensure that all "niche" data was collected.

On top of travel and terrain challenges, the study team went through some personnel turnover. Before any data collection began, time and training occurred to acclimate all study members to procedures and study expectations. Between Round 1 and Round 2 data collection, the team lost a member, and the whole study team underwent retraining to ensure that the team stayed up to date and current on the study procedures. Having a smaller team put a greater task burden on the remaining members, which meant that extra time had to be allowed for individuals to translate and transcribe more transcripts.

In addition to the logistical obstacles, the study methods described above are all qualitative in nature, limiting the generalizability of the study findings. The qualitative nature of the questions asked by the team also means that the study team encountered some hesitation among participants to be fully open and honest with outside researchers. Because the data was collected at sites across the entire Amhara Regional National State, it should provide a deeper understanding of the facial cleanliness and environmental improvement status in Amhara, and potentially provides insights for further testing in other regions of Ethiopia. However, the great breadth of data collected meant that the time for coding and analysis took longer than anticipated.

Results

Introduction

Over 30 hours of audio recordings and hundreds of pages of transcripts were obtained from the combined ten zones of Amhara. A comparative look across teachers and students and within schools in each zone shows that despite challenges raised in each section, it is still possible to influence positive change regarding latrine usage and washing behaviors.

Students

There were many commonalities among student FGDs. Every student discussion started with students stating that education was important so that they could gain knowledge and get better jobs. Each discussion listed becoming a teacher or a doctor as the heavy majority for future career aspirations. Every student discussion also had students describe washing as part of their morning and weekend routine. Many students, particularly, but not exclusively female

Students in North Shoa answer facilitators' questions about face washing and latrine usage.

students, listed retrieving water as part of their daily chores. Water sources vary, even within a school; students cited boreholes, wells, springs, rivers, and taps as sources for retrieving water

with tap water being the best option when or if it is available. All students across the region requested visual aids and pictures to help them learn new concepts and ideas.

Latrine Usage According to Students

When the topic of latrine usage was raised, most students identified latrines as good things that people should use. As far as barriers to latrine usage, students in Awi, East Gojjam, North Gondar, North Wollo, Oromiya, and West Gojjam all mentioned smells from latrines and/or open defecation as bad for health. Students in East Gojjam and North Wollo had solutions for the smell that included chemicals, ash, and smoke. Students also reported that they did not like using latrines that were not clean, including one fourth grade student who said, "If it [the latrine] is used properly I like to use it but, if the surrounding of the hole is dirty, I don't like to use it at all."

Facilitators asked students if they had latrines at home. Due to the fact that not all students answered this question in each zone, it is impossible to know exactly how many students in the FGDs did not report having a latrine at home. Based on those who did answer, there was not universal coverage of latrines at the homes of the 96 student participants.

Among the zones with lower prevalence than baseline, there was a trend of students mentioning monetary fines for households without and not using latrines. Students in North Wollo and North Gondar identified a 500 birr (approx. $22 USD) penalty for people found to not have latrines. Students in South Wollo also mentioned a fine, but did not know the exact amount. These discussions cannot provide a definitive answer as to whether or not fines do actually incentivize latrine usage, nor can it confirm the validity of student's claims regarding fines. However, the idea of a tangible consequence for not using latrines may be possible to implement

at the school level through some sort of demerit or honor code, if not throughout the broader community.

As seen in the student drawing and quote, despite the potential presence or absence of penalties for not using latrines, students are aware that latrines are necessary to increase health. Many students indicated that they would advise and tell their neighbors and friends to build and/or use latrines if their friends and neighbors did not already use latrines.

"If there are people who don't use latrines, I advise them to use and I would say to them "if you are not using latrines, not only you but also other member of the community gets sick too due to the smell."
-Student, Grade 4

Student Disease Confusion and Misgivings:

When students confused trachoma with another disease, they usually confused it with malaria or HIV/AIDS. In two of the zones with higher prevalence than at baseline, students confused trachoma with other diseases. In South Gondar, the students had trouble distinguishing malaria from trachoma; in Waghemra, fistulas were identified as the effects of not washing, and "kert" (see below) was described as a trachoma-like eye disease. While confusion between diseases, or between causes and effects for diseases is not entirely unique to the zones with higher prevalence than at baseline, it is more frequent – only students in West Gojjam expressed confusion as to what diseases flies could spread of the zones with lower prevalence than baseline. The confusion of diseases is an area that can be improved upon in future programming for students and trainings for teachers.

"What is kert?" A student discussion from Waghemra

Q: What do you think about latrines?

Student: Latrines are very important. If you urinate in front of the house, you may be exposed to an eye disease called "kert" which makes your eyes shut down. If we don't have a latrine and use the field to defecate, the cattle will eat the grass, and then microorganisms will replicate inside their bodies. We will then be exposed to disease when we eat raw meat.

Q: What is "kert"?

Student: It is common in our community. It happens when we pee in front of our houses. When we come out early in the morning, our eyes will be closed and swollen up. You have to press a cloth soaked with water to the infected eyes so the swelling will go away. If you use latrines you can avoid such things.

Q: What advice can you give to those who do not build and use latrines?

Student: I will ask my friends if they have a latrine or not. If they do not have one, I will advise his family about latrines so they can use them and avoid "kert," flies, and other diseases.

Student Hygiene Behaviors:

All students reported washing their faces in the morning. Whole body bathing happens over the weekend. While morning face washing is important, studies have shown that "clean faces," the measurement for facial cleanliness, varies greatly by time of day children are observed (citation). This implies that morning face washing keeps children's faces clean for at least some part of the day, but as the day continues and faces get dirty, there is not a culture or set of instilled behaviors that would remedy afternoon and evening accumulation of dirt, grime, and bacteria.

Teachers

Commonalities in teachers' FGDs included the fact that teachers did not confuse trachoma with any other diseases; teachers across the region complained that their school lacks proper resources including water and latrines to be able to properly and adequately teach about trachoma, hygiene, and sanitation behaviors.

Teachers in East Gojjam discuss how to improve student education regarding proper hygiene and sanitation behaviors.

Teachers' concerns about hygiene and sanitation practices

Teachers in Awi and Waghemra mentioned fear of cold water and/or latrine pit holes as reasons students avoid proper behaviors for both washing and latrine usage. Interestingly, teachers in Waghemra and South Gondar had some plan of how to make latrine usage and face washing more frequent: Waghemra teachers said simple encouragement and motivation for students would increase the desired behaviors, while teachers in South Gondar noted that they had built a "model health village" with aid from the HEW to teach students and the community about health and sanitation and thusly increased washing behaviors.

In line with the students, the teachers of North Shoa noted that bad smells deter people in the community from using latrines. In North Gondar, the teachers provided an interesting explanation for why some students do not wash, "For me, the reason parents' is poor awareness.

There is a false perception of associating washing with poverty. 'If we wash, it will strip us of our wealth. Consequently, we will be poor.'" Despite teachers' concerns about student and household practices, some teachers expressed uncertainty about the positive health benefits of latrines. Additionally, only one group of teachers talked of the importance of teaching face washing three times per day.

Teachers' Ask for Resources

Three main themes arose for teachers in regards to teaching trachoma: 1) the need for it to be formally integrated into the curriculum and training to teach it properly; 2) the need for resources like visual aids and textbooks, but also infrastructure for latrines and handwashing stations if they were not present at the school; and 3) The necessity for teacher training and governmental oversight and/or follow-up to ensure the continued success of the first two needs.

"Once upon a time…I have taken training about trachoma from the HEW. Then after, we were obligated to include it in our work plan. ..But later on we left it since no one asked us about it.

Non-governmental organizations working on trachoma should communicate with the Ministry of Education just to incorporate it into the curriculum. If students know about trachoma, they will also teach their families."

At the end of every FGD, the teachers were shown different types of teaching aids regarding trachoma, hygiene, and sanitation. In every zone, the teachers picked the large, pictorial flipcharts and the teacher's manual with information and pre-planned lessons to teach students. In over half of the teacher FGDs, specific requests for teacher trainings on trachoma, and continued refresher trainings were made. Additionally several of the discussions regarding training continued to ask for official follow-up from outside sources (either NGOs or the government) to ensure that trachoma is taught continuously in schools without lapses.

Schools

All schools reported having some sort of hygiene check once per week. The practice of hygiene checks every Monday at the schools' flag ceremony is well established across the region. Both students and teachers alike cited that it was common practice for the school to be reminded on Fridays to wash and to be checked on Monday for compliance.

Schools fly the Ethiopian flag in courtyards similar to this school in Waghemra. Flag ceremonies where students are checked for hygiene occur in this courtyard at the start of each school session.

Additionally, many schools observe "Handwashing Day" where they provide demonstrations on how to properly wash. However, as stated by a student in North Shoa, students cannot carry these practices to their household level if they do not have soap at home. Given teacher statements about lack of water and latrines on several school compounds, it is reasonable to extrapolate that latrine and handwashing station presence at the school level is far from universal in Amhara.

The absence of trachoma education in the formal curriculum accounts for most teachers' failure to bring trachoma education into the individual classroom. Reports of HEW supplementing health education can begin to fill the gap, but more direct and consistent approaches to behavior change education are needed.

Encouraging Latrine Usage within Schools:

Both teachers and students expressed trepidation around universal coverage and usage of latrines both at schools and in households. The most common issues raised regarding resistance to latrine usage included smell, cleanliness, fear, laziness, and lack of availability.

Taking the issue of smell into account, we can learn from select students and teachers in zones where $TF_{1\text{-}9}$ prevalence has decreased from baseline. Teaching students about chemicals and ash as ways to control smell as demonstrated in East Gojjam could be one way to increase and encourage both students and families to utilize latrines. The Community-Led Total Sanitation approach talked about by students in North Wollo, specifically the aspect of "embarrassment journeys" where communities come together to patrol and castigate open defecators was mentioned by students as a way that the community can achieve better sanitation and hygiene behaviors.

A Deviant Set of Discussions:

In the zones with increases from baseline, the most striking discussions came from the Oromiya zone on the eastern most edge of Amhara. Teachers were very concerned about students' migration out of the country. They cited the most distrust within their community of

azithromycin in previous MDAs, and mentioned traditional practices for treating trachoma more than any other zone. Additionally, not all teachers believed in the health benefits of latrines.

The teachers' concerns, however, are not reflected in the students' discussion – instead different concerns and issues were brought to light. The students in Oromiya had the most misinformation and confusion between trachoma and HIV/AIDS. Unlike the teachers, the students agreed that latrines were good, but they could not explain why. This overall state of affairs in Oromiya may be explained by its location on the outskirts of Amhara, away from the regional bureau offices in Bahir Dar, Amhara's regional capital.

Looking at the participants' ages, job titles, and club participation for the teachers, and ages and grades for the students, there is no major difference between Oromiya and the other zones. Additionally, the rural to urban population and male to female ratio in the woreda are not majorly different from any of the other study sites.

Summary

Each zone revealed different aspects of the same challenges: lack of resources to teach trachoma, sanitation, and hygiene, and in some cases, lack of hygiene and sanitation infrastructure. Given the misconceptions in students regarding how different diseases are related to hygiene and sanitation, and teachers' requests for specific resources, positive change can come from education. The differences across zones can be overcome with education materials that include visual aids and information for teachers to properly teach the content. Teachers require further training and follow-up to ensure proper and continued utilization of any resources created.

Discussion

As the target elimination date for trachoma approaches, it is imperative that national trachoma programs, implementing partners, and stakeholders working to eliminate trachoma utilize all methods available. The 'F' and 'E' components of the SAFE strategy will be vital to ensure that elimination is successful. Because Ethiopia, and specifically the Amhara region, carries a high prevalence of trachoma, understanding the needs and wants of the people in the region regarding hygiene and sanitation is key to making 'F' and 'E' activities successful.

A study by Gelaye et al. showed that the provision of latrines, water, and a school health club decreased trachoma at a school in Angolela, Ethiopia. Based on the results of this study, not all schools have latrines and water, but they do engage in some sort of school-wide hygiene activity once per week. Keeping feasibility in mind, the budgetary aspects alone of providing 8 latrines for both male and female students and dedicated water sources at every school is an enormous task. However, the education and club aspect of the Gelaye study support this thesis' call for a renewed effort in hygiene and sanitation curriculum. As noted in Oromyia, one of the outlying zones, students already report washing their faces every day. Teachers in Oromiya are the only teachers that mentioned teaching students to wash faces more than once per day.

Because students already report face washing as part of their routine, the emphasis will need to be placed on number of times and time of day when face washing should occur. However, referring back to Freeman et al., it is clear that the empirical research on directly observed handwashing behavior, that there is still much work to be done in emphasizing the importance and necessity of both hand and face washing with soap. The study looked at 14 papers from the African continent found a prevalence of only 5-22% (3-34% 95% CI) of handwashing with soap (p. 911, Freeman et al., 2014). Of the 7 African countries represented in

the data, Ethiopia contributed only 1 study, and had the highest prevalence of washing among the African studies (Ibid). This systematic review suggests that despite 100% coverage of face-washing in the students asked about their behaviors, a more objective measurement may be needed to adequately assess the reported behavior. Additionally, despite the self-reported student behavior, education and monitoring will be necessary to achieve true behavior change.

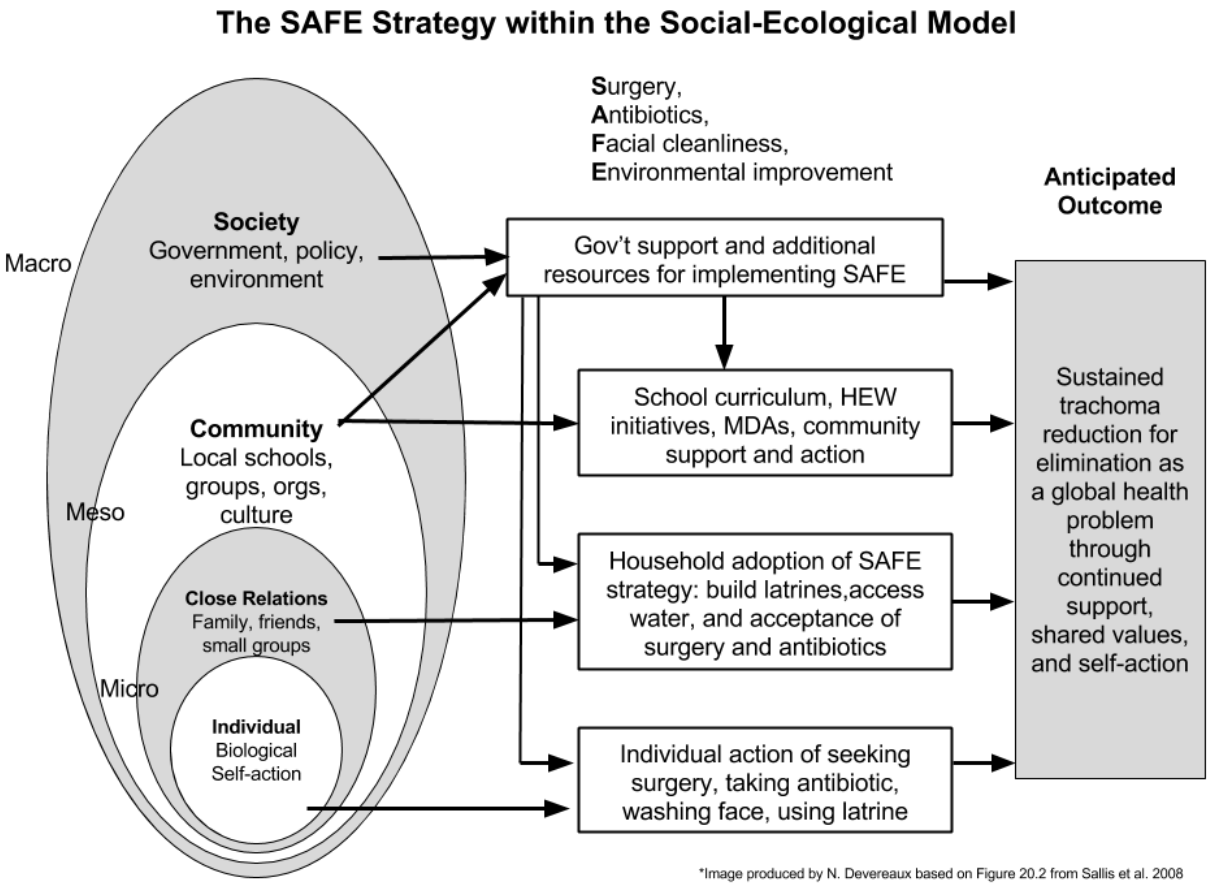
Students from North Wollo described community behaviors that correspond with the participatory methods of community-led total sanitation (CLTS). The students talked about communal criticism of open defecation and organized "embarrassment journeys" that seek to shame and punish any household found to have human feces outside of a latrine. A study in rural Mali found that in villages practicing in CLTS child growth significantly improved with individual access to latrines and behavioral sanitation interventions (Pickering et al.). However, given that child growth is not an indicator of trachoma reduction, and given that the study concluded that the authors of this study and others have found "limited success [of CLTS] in changing defecation behaviours," CLTS cannot be the sole-base of any proposed behavior change strategies or education (p. e710, Pickering et al.). It should be further be noted that CLTS is being critiqued for the use of shame, especially when focused on single individuals as a potential violation of human rights (Bartram et al.). Returning the focus to North Wollo, one of the study sites in which there has been a decrease in $TF_{1\text{-}9}$ prevalence from baseline, the study participants noted that CLTS had produced some positive community effects. Given the mixed data on the success of CLTS and how it was described by students and teachers in North Wollo, CLTS may play a role in shaping possible education materials to increase the hygiene and sanitation education at schools

CLTS as an intervention is designed to protect from diarrheal diseases, however, as noted earlier in this thesis, the transmission modes and lifecycle of trachoma requires similar strategies to eliminate human waste from the environment. Given the results presented above and students' knowledge of "embarrassment jouneys" as tools to help the community reach zero open defecation certification, the concept may still have some merit. It is this author's belief that if the shame can be shifted from the person to the presence of human feces in open fields, then the human rights violations brought up by Bartram et al. may be avoided. Unfortunately, how to shift the shame from person to feces is outside the scope of this thesis; therefore, this question should be shifted the community members and HEWs to address at the local level.

In the literature about sanitation and hygiene education, there is clear evidence that access to sanitation (i.e. the availability of household latrines and access to clean water sources) along with increased face washing are significantly associated with lowering the odds of $TF_{1\text{-}9}$ prevalence in study populations (Stocks et al.). The importance of access to sanitation infrastructure is echoed in formative research from Kyrgzstan and Ghana (Biran et al., Scott et al.) The literature does not account for the preferences and needs of teachers providing instruction and education on sanitation and hygiene, nor does it mention the preferences and needs of the children receiving the instruction. The following programmatic recommendations aim to fill the gap of knowledge in student and teacher preferences, specifically for the area of Amhara, Ethiopia. Given the results produced by this thesis and the methods used, it is possible to fill the same gap of community needs and wants in education through similar methods in a wide variety of contexts and regions.

Programmatic Recommendations:

Given the constraints of resources necessary to provide all of Amhara, Ethiopia with complete sanitation infrastructure, it is clear that a renewed push for health education specific to trachoma, sanitation, and hygiene is needed in Amhara. Even in areas with a reduction in trachoma prevalence from baseline, the goal of elimination and sustained reduction will depend on sustained behavior change in washing and latrine usage by students, teachers, and the broader community. To conceptualize the desired outcomes and programmatic capacity to support 'F' and 'E' initiatives in Amhara, recall the conceptual framework devised in Figure 4 (below):



In order for the SAFE strategy to be effective, it is known that 'F' for facial cleanliness requires access to clean water, soap, habit/regimented behavior, and education. Likewise, 'E' for

environmental improvement requires universal household (and school) latrine coverage, community certification of ODF (Open Defecation Free), habit of use/regimented behavior, and education. For both ‘F’ and ‘E’ the first two factors belong in infrastructure development. In the ecological framework laid out in Figure 4, much of the burden of infrastructure is placed on the micro- and meso-levels with support from the government at the macro level.

Across the region, teachers asked for visual aids and guidebooks (lesson plans) in order to best teach students about trachoma. This thesis, then, recommends two specific programmatic actions: 1) produce and distribute visual aids for classroom use, and 2) produce and distribute guidebooks (containing lesson plans) for teachers to use, and 3) provide teacher training and oversight of use of materials. By providing these materials, Bureau of Education in Amhara could emphasize dissemination of correct information about trachoma, the disease itself, treatment, and prevention methods.

I. Visual Aids

Based on teacher and student feedback asking for visual aids, this thesis recommends that vivid, colorful images in a flipchart format be used to supplement any other materials for trachoma education. Pending on materials used to print flipcharts and ability to print quality graphics, either color drawings or photos would be sufficient. Noting the sensitive nature of some images (for example, a child correctly using a latrine), photographs may not be the best method available for all supplementary images. Given that every teacher focus group ended with teachers reviewing, then requesting materials, and specifically visual materials, it is only makes sense that teachers be provided the best tools to help them teach about trachoma, sanitation, and hygiene.

Given the variety of religious and geographic variation within Amhara, the best solution to providing visual aids and artwork would be a local artist creating images to fit any accompanying materials. However, the universal ask for colorful and large pictures requires only that a durable and reusable visual product, preferably in the form of a large flipchart, be created and disseminated to schools throughout the region.

II. Guidebooks/Lesson Plans for Teachers

In addition to big, colorful images, teachers also requested grade-specific lesson plans to help them accurately teach various aspects of trachoma, sanitation, and hygiene to students. Since TF_{1-9} is the indicator relevant to school aged children, this thesis recommends specifically revising and reproducing the supplementary school-based curriculum provided regarding trachoma for grades 1-4.

III. Teacher Training

Based on teacher's requests, and in order to best ensure the success of any materials developed, teachers need to be trained on trachoma, and how to use the materials in their classrooms. It is further recommended that oversight and follow-up be addressed with the Bureau of Education. Some sort of reporting mechanism or other method of follow-up needs to be established to monitor progress with the education materials and any additional needs that may arise.

With emphasis placed on providing materials to schools, teachers' misperceptions about trachoma as seen in the discussions from Awi, East Gojjam, and Waghemra can be diminished. In turn, teachers confident in their knowledge will be able to more accurately transfer trachoma disease knowledge, prevention, and treatment options to their students.

Given the differences presented in Oromiya, it is advisable to implement a stronger health education curriculum that includes teaching students about the importance of face washing throughout the day, and not just in the morning. The curriculum should be closely monitored by education officials to ensure the utilization of the curriculum as well as recording intended outcomes of the curriculum. Teachers across the region mentioned having some sort of training on trachoma, sanitation, and hygiene in the past, but not sharing their training with other teachers or teaching based on these trainings for long. Therefore, it is necessary to include a monitoring and reporting mechanism with the materials to ensure their continued use.

Limitations:

The issue of latrine infrastructure and water availability at schools is key to the success of any educational intervention. If the students learn the theory of hygiene and sanitation behavior in the classroom, but are unable to practice it at schools, then they cannot be expected to carry the behaviors home and spread it their families and communities. From years of research on sanitation and hygiene behavior, it is known that "interventions that rely solely on education as the key to motivating behavior change may not fully appreciate the many routes through which the school experience might impact children's behavior (p. 219, Biran et al., 2005). However, education promoting a behavior in a space that also provides the needed context for the behavior would be the ideal situation. In order to overcome the limitations of school and home sanitation infrastructure, deep commitments from the government and continuous pressure to do so will be essential. Continued communication and collaboration with pertinent ministries within Ethiopia to expand rural water and sanitation infrastructure would increase the population's ability to sustain trachoma reductions through regular 'F' and 'E' activities.

Conversely, studies have also shown that “access does not necessarily account for use of the facility” (p. 4, Stocks and Ogden, 2014), so the completion of water and sanitation infrastructure throughout Amhara alone will not solve the need for increased latrine usage and face washing behaviors. Education and community action to increase usage of facilities will be needed to change behaviors. However, as reported across the region, beyond water and sanitation infrastructure, teachers currently lack simple educational materials in their classrooms and need training in order to best teach their students, and through their students, families and the community.

The evidence presented in this thesis indicates despite these limitations, a comprehensive hygiene and sanitation education initiative with high coverage, training, and oversight should have positive effects in the process of eliminating blinding trachoma from the Amhara region, and Ethiopia as a whole.

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Appendix 1: Visual illustrations of the stages of blinding trachoma

 Normal tarsal conjunctiva. The dotted line shows the area to be examined.	**Normal Eyelid:** The eyelids and cornea are observed first for inturned eyelashes and any corneal opacity. The upper eyelid is then turned over (everted) to examine the conjunctiva over the stiffer part of the upper lid (tarsal conjunctiva). The normal conjunctiva is pink, smooth, thin and transparent. Over the whole area of the tarsal conjunctiva there are normally large deep-lying blood vessels that run vertically.
 Trachomatous inflammation-follicular (TF)	**Trachomatous Inflammation – Follicular (TF):** The presence of five or more follicles in the upper tarsal conjunctiva. Follicles are round swellings that are paler than the surrounding conjunctiva, appearing white, grey or yellow. Follicles must be at least 0.5mm in diameter.
 Trachomatous inflammation-follicular and intense (TI)	**Trachomatous Inflammation – Intense (TI):** Pronounced inflammatory thickening of the tarsal conjunctiva that obscures more than half of the normal deep tarsal vessels. The tarsal conjunctiva appears red, rough and thickened. There are usually numerous follicles, which may be partially or totally covered by the thickened conjunctiva.
 Trachomatous scarring (TS)	**Trachomatous Scarring (TS):** The presence of scarring in the tarsal conjunctiva. Scars are easily visible as white lines, bands, or sheets in the tarsal conjunctiva. They are glistening and fibrous in appearance. Scarring, especially diffuse fibrosis, may obscure the tarsal blood vessels.
 Trachomatous trichiasis (TT)	**Trachomatous Trichiasis (TT):** At least one eyelash rubs on the eyeball. Evidence of recent removal of inturned eyelashes should also be graded as trichiasis.
 Corneal Opacity (CO)	**Corneal Opacity (CO):** Easily visible corneal opacity over the pupil. The pupil margin is blurred viewed through the opacity. Such corneal opacities cause significant visual impairment (less than 6/18 or 0.3 vision), and therefore visual acuity should be measured if possible.

Figure 2. The WHO simplified grading scheme for assessment of trachoma. Reproduced from Thylefors, 1987 [18].
doi:10.1371/journal.pntd.0000197.g002

Appendix Two: FGD Guide for Teachers

GUIDE FOR FOCUS GROUP DISCUSSION WITH TEACHERS

Focus Group Discussion: Both Moderator and assistant welcome the group

Offer snacks/ beverage

Collect demographic information and go over informed consent

Role of Assistant Moderator:
- Tape recorder
- Takes notes
- Does not speak during the FGD
- Assists with consent forms
- Assists in collecting demographic information
- Help in time keeping

Moderator goes over the ground rules:
- You may stay with us for as long as you can or feel comfortable
- One person speaks at a time
- We want everyone to participate
- We want to hear a wide range of opinions
- Speak freely, there are no right or wrong answers
- You can speak in any order
- You do not have to agree with the views of others in the group but please be respectful of each other
- If you have a different or opposing opinion on the subject under discussion feel free to express it
- We will record the session but no names will be recorded. You will be kept anonymous
- This discussion will take on average 60 minutes

Introductions:
- Go around the group and have everyone introduce themselves. Name and position and favorite song or animal (not recorded)

Introductory Question:
- Take a moment to think about what you know about trachoma, is anyone willing to tell us some of the important trachoma health education messages?

Guiding Questions:
- Where did you learn these messages?
- What messages do you think are most important?
- What do you understand about the role flies play in spreading trachoma in the community?
- Are any of these messages included in the curriculum you teach to the students?
- What messages do you think are easiest for students to understand?
- What messages do you think are difficult for students to understand?
- Do you have any tools that you use to teach the students about trachoma?
- *Go over current tools and ask their thoughts:*
    - *Trachoma Curriculum*
    - *Flipcharts*
    - *Posters*
- *Explore what makes it easy or difficult for them to use certain tools.*
- Why do you think some children do not wash their face daily?

- What messages and tools do you think will work best for teaching students to wash their face daily?
- Why do you think some children do not use the latrine at home or wash their hands after using?
- What messages and tools do you think will work best for teaching students the importance of latrine usage and hand washing?
- If you wanted to hang a poster so everyone in the community would see it, where would you put it?
- What do you think about the possibility that school children will share the messages they learn back to their families and community?
- Which of the tools that we spoke about do you think would be easier for you as a teacher to implement in your classroom?

Concluding Question

- What would make it easy for you to teach the students health education messages about trachoma?

Conclusion of FGD

- Thank you for your participation, this has been a very informative and helpful discussion
- Your opinions are very valuable
- We hope that you have found this discussion interesting
- As a reminder, anything that you said in today's discussion will be anonymous and your name will not be used
- If you have any questions or comments please speak with myself or the principal investigator after the group has dismissed

Appendix Three: FGD Guide for students

GUIDE FOR FOCUS GROUP DISCUSSION WITH STUDENTS

Focus Group Discussion: Both moderator and assistant welcome the group

Offer snacks/ beverage

Collect demographic information and go over informed consent

Children sit in a circle on the floor

Role of Assistant Moderator:
- Tape recorder
- Takes notes
- Does not speak during the FGD
- Assists with consent forms
- Assists in collecting demographic information
- Help in time keeping

Moderator goes over the ground rules:
- You may stay with us for only as long as you can or feel comfortable
- One person speaks at a time
- We want everyone to participate
- We want to hear a wide range of opinions
- Speak freely, there are no right or wrong answers
- You can speak in any order
- You do not have to agree with the views of others in the group but please be respectful of each other
- If you have a different or opposing opinion on the subject under discussion feel free to express it
- We will record the session but no names will be recorded. You will be kept anonymous
- The discussion will take on average 60 minutes.

Introductions:
- Go around the group and have everyone introduce themselves. Name and favorite animal (Not recorded)

Introductory Question:
- Take a moment to think about what you know about trachoma, is anyone willing to tell us some of the ways that you get trachoma?

Guiding Questions:
- If they do not discuss face washing- Why is it important to wash you face?/If they do not mention trachoma, ask them if face washing helps with trachoma.
- If they do not discuss latrine usage- ask them if latrine usage helps prevent trachoma/how?
- If they do not discuss hand washing- ask them when and why they should wash their hands/ask if this is important to preventing trachoma?
- If they do not discuss flies, ask them if they know anything about the importance of flies in relation to trachoma?
- What problems trachoma causes in their community?
- **What are the tools/methods that your teachers use to teach you about trachoma?**
- *Go over tools and ask their thoughts: (see if they understand the message in the tools) Examples:*
    - *Flipcharts*
    - *Posters*
    - *School mini media*

    - *Radio messages*
- If you had to teach your family how they can prevent trachoma, what would you tell them?

Participatory Activity

- Have the children draw a picture that shows how they can teach about trachoma prevention and have them explain it picture to the group.

Concluding Question

- What will you tell your family and friends about trachoma so that they don't face the problems that we discussed today.

Conclusion of FGD

- Thank you for your participation, this has been a very informative and helpful discussion
- Your opinions are very valuable
- We hope that you have found this discussion interesting
- As a reminder, anything that you said in today's discussion will be anonymous and your name will not be used
- If you have any questions or comments please speak with myself or the principal investigator after the group has dismissed

Appendix Four: Demographic Form for FGDs

Demographic Form for FGDs

Date: _____

Zone: _____ Woreda: _____ Kebele: _____

Key Informant Group: _____ FGD Code: _____

Moderator: _____ Assistant Moderator: _____

Zonal Coordinator/Supervisor: _____

Participant Code	**Title/Occupation/Position**	**Age**	**Sex**	**Informed Consent/Assent Obtained?**

Appendix Five: Research Analysis Notes

Of the 10 zones where the study took place, 4 had increases in TF_{1-9} prevalence: North Shoa, Oromiya, South Gondar, and Waghemra; 6 zones had decreases from baseline: Awi, East Gojjam, North Gondar, North Wollo, South Wollo, and West Gojjam.

A Deviant Set of Discussions:

In the zones with increases from baseline, the most striking discussions came from the Oromiya zone on the eastern most edge of Amhara. Teachers were very concerned about students' migration out of the country. They cited the most distrust within their community of azithromycin in previous MDAs, and mentioned traditional practices for treating trachoma more than any other zone. Additionally, not all teachers believed in the health benefits of latrines.

The teachers' concerns, however, are not reflected in the students' discussion – instead different concerns and issues were brought to light. The students in Oromiya had the most misinformation and confusion between trachoma and HIV/AIDS. Unlike the teachers, the students agreed that latrines were good, but they could not explain why. This overall state of affairs in Oromiya may be explained by its location on the outskirts of Amhara, away from the regional bureau offices in Bahir Dar, Amhara's regional capital.

Looking at the participants' ages, job titles, and club participation for the teachers, and ages and grades for the students, there is no major difference between Oromiya and the other zones. Additionally, the rural to urban population and male to female ratio in the woreda are not majorly different from any of the other study sites.

Disease Confusion and Misgivings:

In two of the other three zones with higher prevalence than at baseline, students confused trachoma with other diseases. In South Gondar, the students had trouble distinguishing malaria from trachoma; in Waghemra, fistulas were identified as the effects of not washing, and "kert" was described as a trachoma-like eye disease. While confusion between diseases, or between causes and effects for diseases is not entirely unique to the zones with higher prevalence than at baseline, it is much more likely – only students in West Gojjam expressed confusion as to what diseases flies could spread of the zones with lower prevalence than baseline. The confusion of diseases is an area that can be improved upon in future programming for students and trainings for teachers.

Current School Practices:

All schools reported having some sort of hygiene check once per week. The practice of hygiene checks every Monday at the schools' flag ceremony is well established across the region. Both students and teachers alike cited that it was common practice for the school to be reminded on Fridays to wash and to be checked on Monday for compliance.

Additionally, many schools observe "Handwashing Day" where they provide demonstrations on how to properly wash. However, as stated by a student in North Shoa, students cannot carry these practices to their household level if they do not have soap at home. Given teacher statements about lack of water and latrines on several school compounds, it is reasonable to extrapolate that latrine and handwashing station presence at the school level is far from universal in Amhara.

The absence of trachoma education in the formal curriculum accounts for most teachers' failure to bring trachoma education into the individual classroom. Reports of HEW

supplementing health education can begin to fill the gap, but more direct and consistent approaches to behavior change education are needed.

Encouraging Latrine Usage:

Both teachers and students expressed trepidation around universal coverage and usage of latrines both at schools and in households. The most common issues raised regarding resistance to latrine usage included smell, cleanliness, fear, laziness, and lack of availability.

Taking the issue of smell into account, we can learn from select students and teachers in zones where $TF_{1\text{-}9}$ prevalence has decreased from baseline. Teaching students about chemicals and ash as ways to control smell as demonstrated in East Gojjam could be one way to increase and encourage both students and families to utilize latrines. The Community-Led Total Sanitation approach talked about by students in North Wollo, specifically the aspect of "embarrassment journeys" where communities come together to patrol and castigate open defecators may be another way to incorporate better sanitation and hygiene behaviors into schools and the broader communities.

Among the zones with lower prevalence than baseline, there was a trend of students mentioning monetary fines for households without and not using latrines. Students in North Wollo and North Gondar identified a 500 birr (approx. $22 USD) penalty for people found to not have latrines. Students in South Wollo also mentioned a fine, but did not know the exact amount. These discussions cannot provide a definitive answer as to whether or not fines do actually incentivize latrine usage, nor can it confirm the validity of student's claims regarding fines. However, the idea of a tangible consequence for not using latrines may be possible to implement at the school level through some sort of demerit or honor code, if not throughout the broader community.

Teachers in Waghemra noted that children may be afraid of the latrine pit, and thus do not like to use latrines. Interestingly, teachers in Waghemra and South Gondar had some plan of how to make latrine usage and face washing more frequent: Waghemra teachers said simple encouragement and motivation for students would increase the desired behaviors, while teachers in South Gondar noted that they had built a "model health village" with aid from the HEW to teach students and the community about health and sanitation.

Hygiene Behaviors:

All students reported washing their faces in the morning. Whole body bathing happens over the weekend. While morning face washing is important, studies have shown that "clean faces," the measurement for facial cleanliness, varies greatly by time of day children are observed (citation). This implies that morning face washing keeps children's faces clean for at least some part of the day, but as the day continues and faces get dirty, there is not a culture or set of instilled behaviors that would remedy afternoon and evening accumulation of dirt, grime, and bacteria.

Appendix Six: Information Sheet

INFORMED CONSENT FORM

Title of research:
Barriers to Uptake of Facial Cleanliness and Environmental Improvement in Amhara Regional State, Ethiopia: Where do Opportunities for Behavioral Change Communication Exist?

Purpose of research:
To assess health education activities and messages currently used on the Face Washing (F) and Environmental Improvement (E) pillars of the trachoma SAFE strategy in order to develop additional messages and tools which are more efficient and effective in changing behaviour in trachoma endemic areas.

P**rocedure of the research:**
The researcher will organize a sensitization rally in your community and meet with you to discuss the purpose of the study. Individuals will be asked to participate in the study in your community and at their households where the researchers will administer the questionnaire and ask them to participate in the barrier analysis survey or focus group discussions.

Expected duration of the study:
The duration of the study across all the study sites will be for six months. However, we anticipate that the researchers will only visit your community for a few days over one to two weeks.

Risks:
This procedure will not cause the participant any harm.

Costs to the participants in joining the research:
Your participation in this research will not cost you anything.

Benefit:
The results will identify barriers to trachoma preventing behaviors and aid in the development of new health education messages and tools which will then be disseminated among trachoma endemic communities.

Confidentiality:
All information collected in this study will be given code numbers with no name. This cannot be linked to you in anyway and only the researchers and study teams will know any detailed information.

Voluntariness:
Your participation in this research is entirely voluntary. If you choose not to participate, this will not affect your health delivery in any way.

After the research:
The researchers will inform you of the overall outcome of the research through a news bulletin provided to the community leaders and local health workers. During the course of this research, you will be informed about any information that may affect your continued participation or your health. The results will be reported to the Ministry of Health, and published in the scientific literature.

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