Water, Sanitation, and Hygiene

Titara Region
Aleta Wondo, Ethiopia

Report Prepared By:

Kelsey Bryant
John Anhalt
Bilal Dar
Courtney Wiener
John Doehring

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Abstract

Ethiopia Outreach sends 8 MS1s to Aleta Wondo, Ethiopia each summer in partnership with Common River, an NGO that provides schooling and support for Aleta Wondo's most impoverished. Most community members do not have access to clean water and cannot afford basic health care services. Nationally, only 19% of children under 5 with suspected pneumonia were seen by an appropriate health care provider–of those, 5% were treated with antibiotics. Among children with diarrheal illness, 15% were treated with Oral Rehydration Therapy.[1]

Objectives:
• Screen all Common River students and many community members for several treatable diseases.
• Conduct a survey on knowledge, attitudes, and practices concerning water, sanitation, and hygiene (WASH).

Methods:
8 students and 2 physicians traveled to Common River in May 2012 to conduct a 1.5-week clinic in the school library. Students and staff supported by Common River were given priority, followed by locals seen at a nearby clinic. In addition, a household WASH survey was conducted in a random sample of 52 households to begin characterizing local determinants of health.

Results:
Over 300 patients were treated during clinic. All were screened for trachoma and received treatment for intestinal worms. Bacterial and fungal infections were treated, and several minor procedures were performed. The WASH survey found that 37% of the sample does not treat their water. Respondents provided a mean of 2 correct times one should wash their hands (of 5 possible answers), and just over half had soap available for hand washing. Six additional questions were asked to characterize WASH knowledge and a composite knowledge score was summed. The mean score was 10.17 of a possible 33 correct responses. It was determined that those who kept their latrines sealed, did not keep animals in their homes, and had attended a community meeting within the last year had significantly higher knowledge scores. To quantify sanitation, the hygiene index was created. It consisted of several observations to help determine the level of sanitation among households. Statistically significant associations were not discovered, however, the mean Hygiene Index among households was only 5.8 of a possible 15.

Conclusions:
WASH data indicates a lack of hygiene knowledge may contribute to the illnesses encountered during the clinic. Challenges included: inconsistencies with translations, limited medications, and an inability to treat chronic conditions. Future groups should modify their pharmacy to include more antifungal drugs and mild painkillers and most importantly, dedicate more time to research activities.

Background

The Ethiopia Outreach program is a partnership between medical students of the University of Texas Health Science Center at San Antonio and Common River, a non-governmental organization with a goal "to create balanced, productive, and self-sustaining communities for others to witness and replicate" in Aleta Wondo, Ethiopia. Each year, a group of medical students from the Health Science Center travels to the village of Aleta Wondo to provide basic healthcare to people of the village and surrounding areas. In recent years, a research component has been added to the trip.

This particular underdeveloped area of Ethiopia struggles with several specific health problems. One of the most common transmittable afflictions endemic to the region is *Chlamydia trachomatis*, causing infection of the eyes.[2] It is the world's leading preventable cause of blindness. Simple improvements in hygiene could drastically reduce the spread, and a one time antibiotic treatment provides a cure. However, this "cure" only acts as such if the patient is not re-infected. Currently 66% of the nation's population lives on less than $2 per day, which adds financial hurdles to healthcare. [8]Therefore, access to simple, effective treatment is limited due to poverty. Furthermore, a poor understanding of hygienic practices may contribute to the continued spread of many transmittable diseases. Diarrhea of various causes also remains a constant impediment. Diarrheal illness kills more children worldwide annually than HIV, tuberculosis, and malaria combined. With simple practice of adequate hygiene and reliable potable water, approximately 24 million deaths could be prevented around the world each year.[4] Infection with intestinal worms, a common cause of diarrhea in Aleta Wondo, has been shown to stunt longitudinal growth, limit educational attainment, and affect physical strength. Access to treatment with albendazole, a drug that treats various parasitic infections, is also limited in this population. [3]

In addition to running a clinic to provide the community with some needed medical treatment, we conducted a baseline survey of Water, Sanitation and Hygiene (WASH) knowledge, attitudes and practices in the Aleta Wondo community to better understand the factors that lead to residents continually experiencing preventable disease. This report presents and discusses the findings of the baseline data collected in May 2012. Our hope for future projects with Common River and the Aleta Wondo community is to spread knowledge of healthy hygiene practices in order to decrease the clinical trends we encountered.

Methods

We conducted a cross-sectional household survey of 52 homes in the Titara region of Aleta Wondo, Ethiopia. Our protocol was submitted to the UTHSCSA IRB and approval was granted May 16, 2012.

Two days were spent training the 3 translators. After reviewing the survey amongst the research team to ensure understanding of the purpose and measurement of each question, we went through the survey line by line with our translators. Each question was read aloud, and its purpose specifically explained. The interpretors then repeated the question in Sidama, a local language, and Amharic, the National Ethiopian language to ensure each household would be asked the same question regardless of preferred language. Two groups were sent to test the survey to ensure the questions were culturally appropriate, well understood, and took a reasonable amount of time to complete.

Two to three students were assigned to each interpretor, and each group was assigned a random number via "the dollar method". A dollar bill for each group was selected from one wallet. The last digit of the serial number was that groups' random number for the duration of data collection. For example, one group was assigned the number 4. They were to visit every fourth house on their specified route for the day. In the event that a selected home did not qualify to participate in our survey (away from the house, under 18, unwilling to participate), the immediate neighbor became the next house.

Because maps were not available we relied heavily on our interpretors, lifetime residents of the region, to help in selecting routes. Data was collected for five consecutive days. Each group consisted of both men and women and used the same randomly assigned number for the duration of the data collection. Upon arrival at a home, the interpretor would greet the household members and ask for the head of household. The group was then introduced and the informed consent was read. If the head of household was unavailable, was under the age of 18, or unwilling to participate, we thanked them and moved to the next house. Upon determining a suitable and willing participant, it was explained that they were to be the only person providing answers to the survey. This helped us to maintain consistency in answers for each survey.

The survey began with basic demographic questions like age, level of education, occupation, number of children, followed questions about community involvement, water source, cleaning practices, latrine use, garbage disposal, rodent problems, and sanitation related to their animals, if they owned any. Finally, we asked questions about their knowledge of water, sanitation, and hygiene. These included questions like "Can you name the ingredients to a homemade sugar-salt solution to treat dehydration?", and "Can you name five times you should wash your hands?", among others. Finally, we thanked the participants and requested to make observations of their property. Upon agreement, a list of 32 observations was

completed. Some observations included: latrine type, latrine cleanliness, animals inside the home, animal or human feces on the property, standing water, kitchen cleanliness, kitchen ventilation, use of mosquito nets, standing water, and finally, we asked if we could wash our hands. This allowed us to directly observe the hand washing practice in each household.

Data Management

The data was recorded by hand during each interview, then double-entered into Excel. Finally, it was checked for accuracy using the program Differencia. All mismatches in the data set were corrected by referencing the data hard copy. One accurate database was converted into the proper format for analysis, and all further tests were run in STATA 11. All commands were saved in a STATA DO file for organization and quick reference when necessary.

First, descriptive statistics were run and the data were examined for outliers. Next, we began a more in depth analysis began looking for associations between various variables. The remainder of this report describes and discusses our findings.

Index Descriptions

Knowledge Score

To assess WASH knowledge, we asked a series of seven questions each of which had three to five correct answers. For example, one question read "Please give five times/ways your drinking water can become contaminated." Acceptable answers included: at the source/while collecting, while transporting/carrying home, when storing water, when taking water to drink, and when sharing cups. We counted the number of correct responses for each participant. The knowledge score is a composite of all the correct responses for each of the seven knowledge questions. The total number of correct responses possible was 33.

Hygiene Index

The Hygiene Index (HI), a parameter developed by Jason Rosenfeld, MPH, is a measure we used to assess hygiene and sanitation practices. The HI does not involve participants' knowledge concerning WASH practices, but rather observations of their household practices and environment. The HI was created using the following subcategories: environment, kitchen hygiene, hand washing, drinking water, and sanitation/defecation. See below for a detailed description of the HI components.

Hygiene Index Components

Category	Indicator	Point Value
Environment	No, Garbage	1
	No, Animal Feces	1
	No, Standing Water	1
	Yes, Garbage Pit	1
Kitchen Hygiene	Yes, Clean Surfaces	1
	Yes, Clean Dishes	1
	No, Flies	1
	Yes, Food Covered	1
Hand Washing	Yes, Hand Wash Facility	1
	Yes, Use Hand Washing Facility	1
	Yes, Soap	1
Drinking Water	Yes, Water Cover	1
Sanitation/Defecation	No, Open Defecation	1
	Yes, Access to Latrine	1
	Yes, Clean Latrine	0.5
	Yes, Sealed Latrine	0.5
Hygiene Index = Sum Score		**Max = 15**

Results

Demographics

Table 1 shows that the majority of respondents were married (88.5%) females (69.2%) of a mean age of 38.3 years. Most were literate (read and write: 71.2%) with an average of six years of education (SD=5 years) and primarily spoke Sidama (76.9%). On average, households consisted of six members including two male and two female children.

Table 1. Demographic Information	**N (%)**
Sample size	52
Gender	
Male	16 (30.8)
Female	36 (69.2)
Age	
Mean ± σ	38.3 ± 16.7
Min	18
Max	80
Marital Status	
Married, living with spouse	46 (88.5)
Single	1 (1.92)
Widowed	5 (9.62)
Number in household	
Mean ± σ	6 ± 3
Min	1
Max	12
Number of male children	
Mean ± σ	2 ± 1
Min	0
Max	3
Number of female children	
Mean ± σ	2 ± 1
Min	0
Max	6
Literacy	
Read & Write	37 (71.2)
Read Only	3 (5.8)
Neither	12 (23.1)
Years of Education	
Mean ± σ	6 ± 5
Min	0
Max	16
Language	
Sidama	40 (76.9)
Amharic	9 (17.3)
Guaragigna	1 (1.9)
Oromigna	1 (1.9)
Siltinia	1 (1.9)

Table 2. Employment and Community	N (%)
Sample size	52 (%)
Full-time employment	
Yes	21(40.38)
No	31 (59.62)
Type of full-time employment	
Unskilled manual labor	0
Skilled trade	1 (1.92)
Agriculture	10 (19.23)
Trade (buying/selling)	5 (9.62)
Crafts	0
Community worker	0
Office work	3 (5.77)
Professional w/ diploma (nurse, doctor)	2 (3.85)
Professional w/ degree (teacher)	6 (11.54)
Other	5 (9.62)
Means of maintaining home	
Unskilled manual labor	0
Skilled trade	2 (3.85)
Agriculture	17 (32.69)
Trade (buying/selling)	5 (9.62)
Crafts	1 (1.92)
Domestic Worker	0
Community Worker	1 (1.92)
Office Worker	0
Professional w/ degree (teacher)	0
Other (family assistance)	3 (5.77)
Social welfare grants	
Yes	7 (13.46)
No	45 (86.54)
Community collaboration for problems	
Yes	46 (88.46)
No	6 (11.54)
Participated in community meeting	
Yes	48 (92.31)
No	4 (7.69)
Spoken with community leaders for problem	
Yes	42 (80.77)
No	10 (19.23)

Table 2 displays the breakdown of employment and means of maintaining the household. Participants were first asked what type of full-time, formal employment household members held. Next, we asked what kind of informal employment was used to maintain the household. We found that more participants maintained their household through informal means of employment (59.62%), as opposed to full-time, formal employment (40.38%). Of those who held full-time jobs, agriculture was the most frequently represented profession. Among those with informal employment, agriculture was again the most frequently represented profession. Only seven (13.46%) respondents reported receiving social welfare grants. Several questions were asked to determine the level of household involvement in community activities. It was found that 88.46% of respondents had collaborated with their community to solve a problem. An even greater number (92.31%) had attended a community meeting in the last year. Lastly, 80.77% of respondents had approached a community leader concerning a problem in the last year.

Figure 1. Full-Time Employment

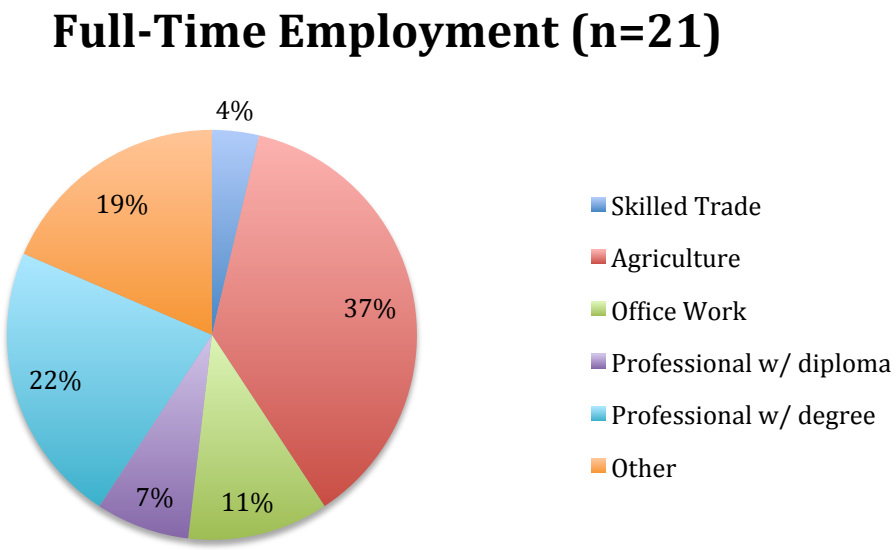
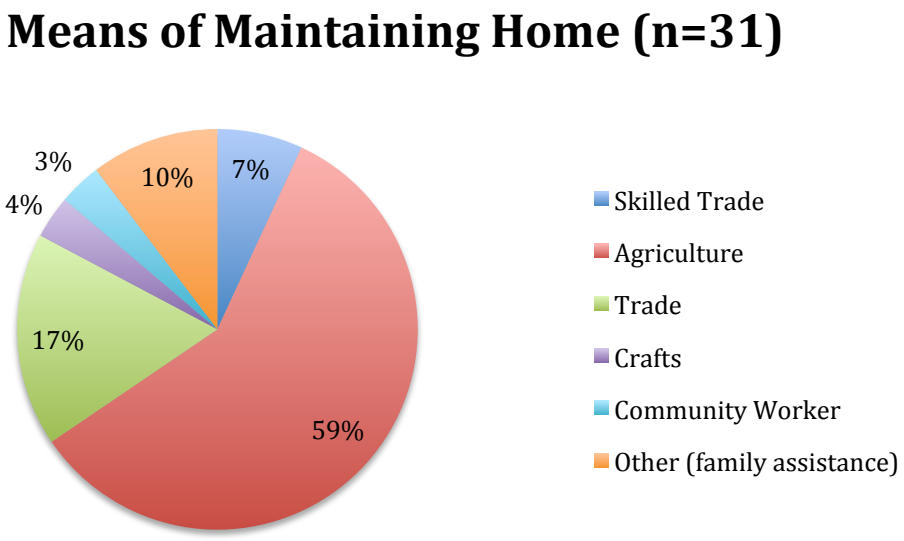


Figure 1 displays the breakdown of employment among the 21 respondants that held full-time jobs. Among this group, most full-time jobs were in agriculture. Figure 2 displays the breakdown of means of maintaining the household among the 31 respondents who did not hold full-time jobs. Like the full-time group, agriculture was the most represented means of providing financial support with 59% reporting this type of work.

Figure 2. Means of Maintaining Home



Drinking Water

Table 3. Drinking Water Habits	Frequency (%)
Source	
Pipe in Town	21 (40.4)
Stream	9 (17.3)
Spring	9 (17.3)
Protected Spring	1 (1.9)
Protected Well	3 (5.8)
Hand Pump/Borehole	9 (17.3)
Think Water Needs Treatment?	
Yes	47 (90.4)
No	5 (9.6)
Treatment Method	
Purifying Tablets	20 (38.5)
Nothing	17 (32.7)
Boil	8 (15.4)
Chlorine	7 (13.5)
Travel Time to Source in minutes	
Mean ± σ	11.5 ± 9.6
Min	1
Max	50
Times Collected Daily	
Mean ± σ	3.2 ± 2.1
Min	1
Max	10
Number of Buckets Collected	
Mean ± σ	2.7 ± 1.9
Min	1
Max	12

Table 3 shows that households collected an average of 2.7 buckets of water on average three times daily through a pipe in town (40.4%). Most respondents think that their drinking water needs treatment (90.4%), however, 32.7% reported using no treatment at all. Among those who treat their drinking water, the most common method is purifying tablets (38.5%).

Table 4. Sanitation

	Frequency (%)
Is Garbage a Problem?	
Yes, big problem	5 (9.6)
Yes, a bit of a problem	10 (19.2)
No, not at all	32(71.15)
Garbage Observed Around Home?	
Yes	19(38)
No	31 (62)
Rodent Problem?	
Yes, big problem	22 (42.3)
Yes, a bit of a problem	18 (34.6)
No, not at all	12 (23.0)
What do you do for rodent problem?	
Nothing	12 (23.0)
Traps	13 (25.0)
Poison	26 (50.0)
Cat	5 (9.6)
Clean Kitchen?	
Very Clean	18 (36)
Quite Clean	22 (44)
Dirty	10 (20)
Flies in Kitchen	
None Visible	16 (32.0)
A Few Visible (1-5)	28 (56.0)
Many Flies	6 (12.0)

Table 4 displays findings related to sanitation. Most (71.15%) participants felt their community did not have a garbage problem. However, garbage was observed on the property of 38% of households. Rodents were considered a problem among 77% of respondants with the most common method of removal being poison (50%). Only 20% of kitchens were found to be dirty. A kitchen was labeled as “dirty” when food was left out uncovered, dishes were left unclean, or animal waste was observed in the kitchen. Most households (56%) had some flies in their kitchen, however, 32% were found to be without any flies.

Table 5 displays the mean scores of each of the knowledge questions, the mean composite Knowledge Score and the mean Hygiene Index. The lowest mean number of correct responses in a single category (0.23) asked participants to name the ingredients in an ORS solution. Many respondants were unable to name the correct proportions of ingredients and indicated they were aware of its availability for purchase at the local pharmacy. The highest mean number of correct responses in a single category (2.44) asked participants to name five times one should was their hands. The mean composite Knowledge Score was 10.17 of a possible 33, and the mean Hygiene Index was 5.81 of a possible 15. Table 6 shows that there was a difference in the mean Knowledge Score among men and women, however, it was not statistically significant.

Table 5. Knowledge Score and Hygiene Index

Variable	Mean ± σ	Min	Max
Oral Rehydration Solution	0.23*± 0.51	0	2
When to wash hands	2.44 ± 0.85	1	4
Diarrhea Transmission	2.13 ± 1	0	4
Skin Disease Transmission	1.56 ± 0.96	0	4
Worm Transmission	0.87 ± 0.89	0	3
Ways water becomes contaminated	1.35 ± 0.88	0	4
Safe water sources	1.60 ± 0.57	1	3
Knowledge Score	10.17 ± 3.16	4	19
Hygiene Index	5.81 ± 2.35	1	10

Table 6. Gender and Knowledge Score

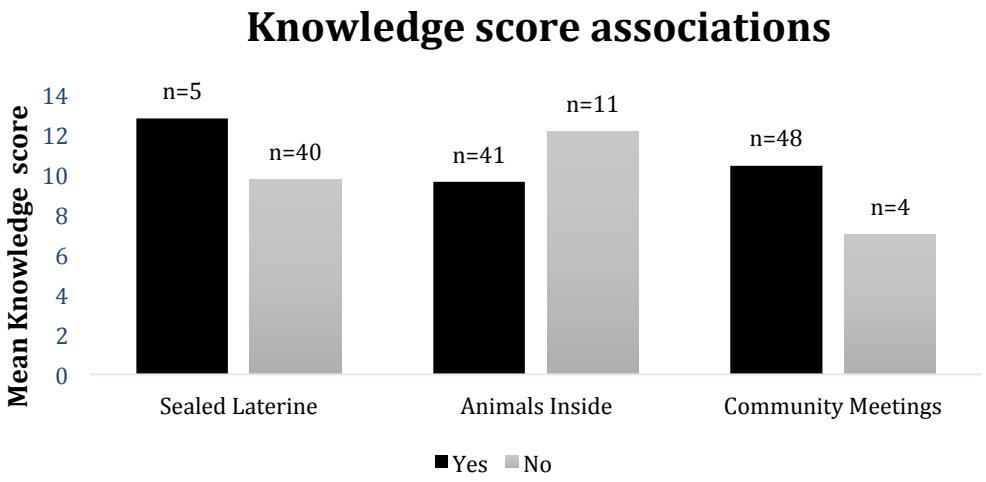
	Male			Female			Diff		
	n	Mean	SD	n	Mean	SD	Mean	SE	p
Gender	16	11.19	1.3	36	9.72	2.97	1.46	0.94	0.12

Table 7 describes associations between the Knowledge Score or Hygiene Index and various parameters from the survey. It was determined that those who kept a sealed latrine had a significantly higher knowledge score (mean difference= 3.05, p=0.04) than those who kept an open latrine. A higher knowledge score was noted among those who keep their animals outdoors as opposed to indoors (mean difference= 2.55, p=0.02). Additionally, the Knowledge Score was higher among those who used a cell phone (mean difference= 2.88, p=0.008). There was no significant difference in Knowledge Score with respect to soap use, full-time employment, or animal feces in or surrounding the home. Statistically significant associations between the Hygiene Index and other parameters were not noted.

Table 7. Knowledge Score Associations

	yes			no			Diff		
	n	Mean	SD	n	Mean	SD	Mean	SE	p
Sealed Latrine	5	12.80	1.30	40	9.75	0.5	3.05	1.44	**0.04**
Animals Inside	41	9.63	2.67	11	12.18	4.09	2.55	1.02	**0.02**
Community Meetings	48	10.44	3.05	4	7	3.16	3.44	1.59	**0.04**
Cell Phone Use	10	12.5	2.86	42	9.62	2.86	2.88	1.04	**0.008**
Uses Soap	27	9.92	3.77	23	10.21	2.17	0.29	0.89	0.75
Full-time Employment	21	9.76	3.76	31	10.45	2.70	0.68	0.89	0.45
Animal Feces Present	21	10.14	2.43	29	10.14	3.56	0.19	.9008	0.84

Figure 3. Knowledge Score Associations



Finally, Figure 3 depicts the findings described in Table 7. The mean knowledge score was greater among households that sealed their latrines, those that attended community meetings, and did not keep animals inside their homes.

Discussion

WASH Knowledge Score

The purpose of calculating a Knowledge Score was to evaluate which sanitation/hygiene concepts were widely understood amongst the community and to provide a composite baseline score. The average composite score was 10 out of a possible 33 correct responses. The low score is reflective of significant deficits in the understanding of how disease is spread. Of the subcategories comprising the composite score, knowledge regarding the proper preparation of Oral Rehydration Solution (ORS) was the lowest scoring. In order to receive credit for a correct response regarding ORS preparation, households had to name the ingredients and the appropriate proportions of the mixture according to the WHO guidelines. Typically, households succeeded in listing some ingredients, however they were unable to describe the correct proportions. This is alarming considering how widespread diarrheal illness is in the region. It should be noted that ORS was available at the local pharmacy and many of the households interviewed were aware of it's availability. However, it was not determined if these families could afford the solution from the pharmacy or if they were aware when it was necessary. According to data from UNICEF, only 24% of those with diarrheal illness at a given time receive treatment with ORS in rural settings. That number increases to 45% in urban areas.[7]

Several noteworthy correlations emerged between the composite Knowledge Score and elements of hygiene independent of the index. The composite knowledge score was greater among households that sealed their latrines, those that did not keep animals inside their homes and those that frequently attended community meetings. This correlation may be explained by financial status if it is assumed that households with sealed latrines and those with no need to keep animals inside were wealthier. Testing this hypothesis against other metrics that presumably measured wealth (i.e. housing type, years of education, employment type) however, found no such correlation. Perhaps we need to explore better ways to measure wealth, or we can reason that financial situation and education level has little effect on knowledge concerning hygiene and sanitation. Households that regularly attended community meetings had the strongest correlation to the Knowledge Index with the difference between "those who attended" and "those who did not" outweighing any other correlation. This may be indicative of a lasting impression made by previous attempts that used

WASH Hygiene Index

The WASH hygiene Index served as way to quantify overall hygiene practices. As a composite score, it tabulated various hygiene parameters such as whether households had access to a latrine or designated hand-washing facilities. The average composite score for 52 households interviewed in Aleta Wondo was 5.81 out of a possible 15. Of the subcategories examined, the community scored highest on parameters that measured environmental hygiene (exposed garbage, animal feces etc…) and lowest on those that measured hand washing (use of soap, designated washing facility etc…). In preparation for a sanitation/hygiene education program, a targeted approach towards hand washing behaviors would be most efficacious considering limited time and resources.
It is interesting to note that a linear correlation between the Knowledge and Hygiene Indices was not statistically evident. This, of course, makes us wonder if knowledge alone influences behavior. Would an education program produce beneficial changes in behavior or would it simply be better to donate resources and hope for the best? Opinions vary depending on the aid-organization and their mission platform but it is likely a combination of the two. Finding ways to not only teach the proper sanitation methods but also *why* they are important is paramount. This approach can be supplemented with the donation of resources that are deemed economically sensible. This of course does not address the knowledge-behavior gap, but resources can certainly help see such a goal to an end. One possible outlet for intervention that we could feasibly implement would be a multi-faceted approach in the role of zinc in treating childhood diarrhea. The WHO and UNICEF recognize its importance and they consider it an essential component of ORS. It has been shown that 20 mg zinc supplements for 10-14 days during an acute diarrheal episode can reduce the severity of the episode and prevent further occurrences in the following months.[6] This lasting effect lowers yearly morbidity and reduces absenteeism from school and burden for caregivers. A program that offers zinc supplements along with education regarding both its use

and importance to caregivers of children with diarrhea would be both efficacious and inexpensive.
community meetings as forum for sanitation/hygiene education. This understanding will be helpful in the implementation of a prospective education program that targeted the most actively involved members of the community.

Part of the WASH survey was to collect information about community demographics. Of particular interest were the literacy rate and the level of education of the interviewees. Of the 52 households examined, 70% of the interviewees were literate and most of them (70%) were female. On average, interviewees had completed 6 years of education. The literacy rate is indicative of access to education, and while 70% shows that there is room for improvement, it also shows that schools are accessible to many across Aleta Wondo. Schools may serve as a vehicle to reach a large portion of the population in the implementation of a sanitation/hygiene education project.

Limitations

This study had several limitations, most of which can be addressed and modified in future research. First, the sample size of 52 was relatively small. This was a result of limited time in country, length of interviews, and limited translators. In future research, dedicating more time to data collection, shortening the interview, and finding more translators can reverse this issue. Our survey was limited to the Titara region of Aleta Wondo directly surrounding the Common River grounds. As we were traveling solely on foot, it was not possible to venture outside of this region and return before dark. This limits the generalizability of our findings to regions beyond Titara. Future groups may consider splitting groups by region and sending one group out by bus. Finally, we were limited by the language barrier. Despite our skilled translators and the time spent training them, there was surely some limitation in communication with respect to language. This particular issue is very difficult to improve upon as it is unlikely that visiting researchers will become proficient enough in Amharic or another local dialect to conduct a thorough interview. However, if we continue to use the same translators each year, it is unreasonable to assume their skills will improve and help reduce some, though not all, bias.

Conclusions

The findings of this baseline survey clearly indicate the need for intervention. While it is difficult to say exactly what that intervention should be at this point, we are certainly not limited in terms of ideas for the future . Perhaps a Community Health Club (CHC) that focuses on teaching community members to take ownership of their own sanitation and hygiene would be beneficial. Such endevors have proven successful in other regions, as described by Waterkyn & Cairncross (2005). Their CHC's in Zimbabwe focused on creating a "culture of health" in order to change the social norms related to sanitation and hygeine within a particular community These

clubs were found to be a very cost effective, long-term strategy for improving hygiene behaviors.[5] As such a large proportion of our sample in Aleta Wondo had participated in community meetings, it is reasonable to consider this community as possible fit for a community-based intervention. As discussed above, improving access to zinc supplements has the potential to impact the outcome of acute diarrheal illness greatly. Improved access to potable water is key to long term improvement. However, teaching residents of Aleta Wondo how to live safely in the current environment is the first step.

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