

## CHANGING WATER-USE PATTERNS IN A WATER-POOR AREA: LESSONS FOR A TRACHOMA INTERVENTION PROJECT

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**Abstract**—An epidemiological survey carried out in the Dodoma region of Tanzania found that high rates of trachoma infection in pre-school children were associated with unwashed faces. Prior to a planned trachoma intervention project, a pilot study was done on household decisions about water use and perceptions about face washing and eye disease. The study found that mothers overestimated the amount of water necessary to wash a child's face. In addition, mothers would not change their water-use priorities without the consent of their husbands and the support of the community. Therefore a health education program was designed to address the perception that face washing required a great deal of water. The program also sought to involve and re-educate the whole community rather than focus only on the mothers who were most likely to wash the children's faces.

**Key words**—water use, eye disease, Tanzania, household health decisions

### INTRODUCTION

Many public health programs for the prevention of disease require improved sanitation practices, including changed personal habits. Designing such programs can be particularly difficult in arid areas where water for hygiene is scarce. The following discussion suggests an approach to health intervention in a water-poor area through a method which combines epidemiological data on the prevalence of disease with anthropological data on water-use patterns and the perception of water availability. The resulting health education program is sensitive to the local behavior and attitudes around water use which influence the possibility of change.

This report covers three aspects of the development of a trachoma intervention project among the Gogo people in the Dodoma region of central Tanzania. First, an epidemiological survey of risk factors for inflammatory trachoma was carried out to investigate the association with a number of risk factors including several measures of water availability. Secondly, a descriptive study using observations and structured interviews examined in more depth the issues of water-use patterns, peoples' perception of eye disease, and their behavior with regard to eye problems. Finally, we discuss the implications of the findings for a health education program targeted for specific hygiene behavior changes.

### EPIDEMIOLOGICAL SURVEY OF WATER AVAILABILITY AND TRACHOMA

The risk factor survey for trachoma was carried out in a random sample of 20 villages in Kongwa from July to September 1986. Data were collected on risk factors for over 3800 children in over 2000 house-

holds. There were three variables related to water use: the presence or absence of a constructed water supply, the distance to the usual water source, and the amount of water used by the household each day [1].

The survey indicated that 60% of all preschool children (aged 1-7) had active trachoma and that 10% had severe disease [2]. An important risk factor for these children was the presence of an unclean face (i.e. faces with nasal or ocular discharge, presence of food or caked mud). Because unclean faces appeared to be a major factor for trachoma, analyses were carried out to determine predictors of clean faces in these children [2]. The findings suggest that the distance to water was a factor in whether or not the children's faces were clean, with houses at a distance greater than 30 min one-way having more children with unwashed faces. However, clean faces were not associated with daily water supply both in the simple and multivariate analyses controlling for distance to water, so households at equal distances and with equal amounts of water might, or might not, use that water to wash the faces of the children. Logistical regression analysis suggested that distance to water was a factor in whether faces were clean but that distance did not correlate with water supply [1]. Moreover a constructed water supply in the village was not associated with either clean faces or trachoma, indicating that the availability of a water supply alone did not impact on the rates of infection.

The survey suggested that it was not the absolute amount of water in the household, or even the distance to a water source alone, which was most important to face washing. Instead the mother's priorities for water use and her perception of how much water she had available determined her willingness to use it on face washing. Therefore a study was

designed to examine the way in which women set priorities on water use. Such information was critical to designing a trachoma intervention strategy based on changing face washing practices.

An anthropologist trained Tanzanian women to observe the use of water at the village water source and in the homes, to administer a household questionnaire about water-use decisions and eye problems, and to lead discussions in focus groups of women around the problems of water use and face washing. Project personnel used participant observation to ensure the accuracy of interview and key informant data.

#### PRIORITIES ON WATER USE

##### *Water availability*

The pilot study of water use was carried out in the village of N'ghambi in the Kongwa district of Dodoma region. Rainfall in the area averages 200–600 mm annually, primarily between December and March and drought is common from August until December [3]. Seasonal variation is an important feature in water use and availability, as well as in food intake and disease patterns [4].

During the rainy months the people of N'ghambi have three sources of water. The villagers prefer the taste of the water from a series of wells that have been built into the sandy soil over an underground river. These wells, known as Kinyasungi, are about 4 km from the center of the village. Due to the sandy soil, the edges of the wells are fragile and villagers must approach the wells carefully to prevent cave-ins. Water is collected by lowering a pitcher on a rope into the well repeatedly in order to fill a container which is carried back to the house. The water is muddy and villagers allow the dirt to settle before using the water. These wells dry up by September forcing villagers to rely on less desirable water sources.

The second water source is a pond which is formed by damming a hillside run-off about 10 km from the center of N'ghambi. This water is less popular because of the greater distance and because cattle herders water their animals at this pond [5]. The cattle walk in the water as they drink and villagers are aware that this water is less clean than well water. Water here is especially scarce and muddy in the months preceding the rainy season.

In 1988 a third source of water became available to the villagers of N'ghambi. A long-closed bore hole in the village was reactivated with a pump and windmill. The villagers dislike this water for drinking and cooking because it is 'salty' but they use it for washing, bathing, and preparing grain. This water source is not affected by seasonal changes. Hygiene practices and the cleanliness of the children's faces are not noticeably different in houses close to the well and those further away, again indicating that factors other than availability alone influenced water use.

##### *Household water use*

Thirty-seven households in N'ghambi participated in the household study which was done in visits which ranged in length from 10 min to 4 hr. Thirteen households were visited once, 15 were visited twice,

and the remaining 9 were visited three or four times.

In choosing households, a stratified random sample, based on clean faces and distance to water, was done on data from the 90 village households in the 1986 survey. The original households had been chosen as a random cluster sample of households with children between 1 and 7 years old. The survey found that 80% of the children had unclean faces and therefore this was matched in the 30 households interviewed in this descriptive study. Due to the construction of the well, distance to water had changed after the 1986 survey but households were chosen at varying distances to water sources. An early goal had been to include the four households with clean faces and absence of trachoma, but only the one which remained intact and in the community could be included. Therefore, 30 households were chosen based on facial cleanliness and distance to water, and an additional seven were added by the interviewers who felt they were particularly informative.

Although the interviewers had questions to ask about eye health and water use, they encouraged the household members to talk and they observed sanitation practices. Twenty-one of these houses were within a 30-min walk (one-way) of the windmill well (Table 1). The 16 others were farther from the windmill and had a precarious water supply during the rainy season. All houses within an hour walk (one-way) of the windmill well used it for part of their water supply. No houses at a distance greater than a one hour walk reported using the windmill well during the survey period of May to August.

Women brought water to their homes in either a 20-liter plastic bucket or a 15-liter gourd, neither of which was filled to the brim. Most women went to get water early in the morning and spent over an hour on this task. When they took along clothing to wash the job might take 3–5 hr. Teenaged daughters occasionally carried additional water into the household and some men hauled water for sale to other families. In seasons when water was scarce women spent at least 2 hr each day getting water. In the dry season some women went to the Kinyasungi wells at 2 a.m. because the wells were dry by daybreak, or the water had become too muddy to use.

Because women stated that they had no water to wash faces, the interviewers focused on how much water women estimated they needed for other household tasks in order to determine household priorities of water needs. Each woman's estimation was given in terms of the bowls, gourds, and buckets she herself used and so the interviewers measured the capacity of such utensils and converted the individual responses into liter measurements. Both family size and

Table 1. Distance to water sources in time necessary to walk one-way

Number of households	Windmill well	Drinking water
21	15–30 min	1 hr
2	30–45 min	45–60 min
1	30–45 min	30–45 min
3	30–45 min	1.5 hr
10	1.5 hr	30 min

seasonal changes in water availability can be expected to cause variation in the amount of water used in each household.

Although the interviewers were focused on the women's perceptions about how much water they used, the interviewers checked their estimates against actual water use for the chores mentioned and found them accurate. Interviewers asked women to recall how they had used water the previous day and to estimate the amount of water used for each purpose. The most common use of water was for food preparation and drinking. Women used water at various stages in preparing grain for use, a process which was done in stages over several days. They estimated that a family of five used approximately one *debe* (20 liters) of millet or maize each week and needed 40 liters of water to prepare the grain before cooking. To prepare enough maize for a week, the grain was first hulled in a liter of water and then left to soak in 15-25 liters of water. Ideally it was then rinsed in an additional 20 liters of water, although the soaking water could be used when water was scarce. Then the maize was dried and machine milled. Three liters of water were needed to cook one meal of maize. Millet was hulled in 2 liters of water and soaked in 15-25 liters, but only 5 liters were needed for rinsing. After drying and grinding, about 3.5 liters of water were necessary to cook a meal. The size of the available utensils and the danger of spoilage led to the practice of preparing grain in small amounts three to five times a week rather than all at one time.

Women estimated that they used 7 liters of water each day to cook two meals of porridge (*ugali*) and boiled vegetables and an additional 3 liters a day for drinking water. They needed 3 liters to wash the dishes and 1 more for handwashing before meals. Therefore most women who carried 15-17 liters of water each morning used 14 liters for four activities. To allow for grain preparation women had to make additional trips for water or store some water from each trip to accumulate the necessary amount. For them, water stored in the house was not seen as extra, but as reserved for a specific use.

Water was also used for beer brewing, an activity highly valued by women because it was one of their few ways of earning money. Women worked in groups of two or three to gather the extra water, grain, and firewood necessary to brew beer. Then each week one woman used the supplies to brew beer which she sold to village men. Only energetic women were able to accumulate the surplus 150 liters necessary to brew beer and they saved the best water, not that from the windmill well, for this use. In many houses there was stored water for beer brewing which could not be used for any other purpose.

Ideally bathing could be done at the water source but there were several limiting factors. Women might wash their hands and face at the well, often scooping water from the cattle drinking troughs, but it was usually too cold to bathe in the early morning. Because of the cold they did not bathe the infant they carried on their back to the well, nor did they bathe the small children at home before they left to get the water. Most mothers did not have towels to dry the children and they feared that wet, cold children would become ill. Even when mothers went to get

water in the warmer afternoon hours they were unable to bring along their small children. The dam and the Kinyasungi wells were dangerous for toddlers and the mother with a full water container on her head could not manage the long walk back with a small child to mind. There was a constructed bathing place at the new windmill well and adults who lived nearby bathed there on warm afternoons but women who were carrying water still could not bring along their pre-school children because they could not care for them while walking home with a full container on their head.

Women estimated that they used about 2 liters to bathe a child and slightly more (2.5 liters) to bathe an adult. Washing clothes was rarely done at home, but women estimated that it would take about 10 liters of fresh water or 20 of salty water (which is harder to get sudsy) for a load of clothes.

#### *Practices and perceptions about face washing and eye disease*

In both household interviews and focus groups women were asked to estimate how much water they needed to wash a child's face. The estimates averaged 1 liter for each child although usually the women mentioned washing several children at the same time. Their method was to pour the water into a bowl, scoop water from the bowl onto the child's face, and allow the used water to fall to the ground. Any leftover water was used to water nearby trees and, when questioned, women said that water used for face washing could not be used for other purposes. Mothers said that the best time for washing faces would have been just as the children woke up in the morning, because they had discharge around their eyes then. However, often there was no water early in the morning, it was too cold, or the woman left to get water before the children woke up.

At various times the children were cared for by the father, sister or grandmother but these caregivers did not wash the children's faces. In a project planning meeting with male village leaders, the men claimed that the cleanliness of both the children and the household was the woman's responsibility. Women confirmed this belief in focus groups when they said that, although men could wash children, this was not really their job. During the day, the pre-school children were watched by an older sister (usually 7-14 year old) or a grandmother and although they could have washed the child's face they did not use water that they did not haul themselves without specific instructions from the woman who had carried it. Each woman carried water for her own husband and the children living in her house and so even grandmothers, who carried water to their own home, had no claim on the water in their daughter-in-law's house.

Eye problems were consistently listed by the villagers as one of their major health concerns along with malaria, headaches and stomach disorders. When women were asked to name the cause of eye disease, they said that dust, dirt, flies and unwashed faces led to eye problems, indicating that they had some knowledge of the role of contagion in the spread of disease. However, as the discussion went on

they mentioned that eye problems could also be caused by headaches, bewitching, measles, and flies which entered the nose. The women did not distinguish between trachoma and other eye problems and said that in the past washing had not cured all eye problems.

In meetings, village women protested that they did not have time to carry extra face-washing water, nor did they have time to chase unwilling children who did not like to be washed. They claimed that their important work was preparing food for the family. Both men and women said that adults themselves were not accustomed to washing their own faces and therefore didn't wash the children's faces. They suggested that children would be more compliant if they were used to having their faces washed but that in most cases the children were uncooperative with the new practice.

In addition, both women and men said that it was useless to wash the faces of young children. If you washed children before a meal, they said, they would be just as dirty afterwards. If you washed them after they ate, they would be dirty again within an hour. And even if you washed your own child's face they could get an eye infection from the neighbour's child who had a dirty face and touched your child while playing. Women stated that they could not comment on the way their neighbor was raising her children, but without her cooperation there was no point in keeping your children clean.

Project personnel observed that a child's clean face might be dirty again, but usually after several hours, and that children played together quite often. The interviewers estimated that toddler's faces were probably washed every third day.

#### DISCUSSION

This study focused on the attitudes and practices which influence face washing in a Tanzanian village with the goal of designing an intervention to increase the washing of the faces of pre-school children as a means of preventing trachoma. Interviews with villagers indicated that face washing was not a high priority for them because they felt they did not have enough water, and that the time spent washing faces reduced the amount of time they had for more important work. Additionally, they thought it useless to wash their own child's face if the neighbor's children had dirty faces.

Mothers stated that lack of water was a major reason for not washing their children's faces and the average woman with three children estimated that she needed 3 liters each time she washed her children's faces. Interviewers, however, noted that less water could be used and that houses often had stored water for beer brewing and grain preparation. Therefore it was not the absolute absence of water that prevented face washing but the perception that such washing took a liter of water and that it was less important than other water uses.

A health education intervention was designed to demonstrate how little water was necessary to wash eyes. A liter-can of water with a plug at the bottom was held up and the women and men, in separate groups, were asked to guess how many people's faces

could be washed with that amount of water. Then each group was asked to see how many people's faces they could wash with the can of water. The men's group thought they could wash one or two but they were able to wash 12 men's faces with their liter of water. The women thought they could wash five or six but they washed between 30 and 35. This demonstration was well received although in the subsequent discussion some said that in real life one might use more water. When women learned that the men had been able to wash fewer faces they commented that men are always less careful with water than the women who have to carry it.

Women also claimed that they did not have the time to take on the added responsibility of face washing, a comment which had two aspects covered in the study. First, women assumed that they needed to be able to bring additional water into their homes so that they would have enough to wash the children's faces. However, they could not carry larger containers of water and so to increase household water supply they would have had to make repeated trips to the well to carry additional supplies for water. Most rural women did not have the time.

Secondly, they said they were too busy with more important duties to spend time washing children. To determine the priorities women set on time and activities, they were asked in the household interviews what their most important duties were. Without exception they replied that feeding their families was their most crucial activity, not an easy task in this area where severe food shortages occur once in about every 5 years. The village women of N'ghambi, like many rural African women, bear the responsibility for feeding their families [6, 7]. Each woman, whether first or subsequent wife, had her own garden plot (*shamba*) on which she grew grains and vegetables for her family. Because of poor rainfall only one crop could be planted each year and the harvest had to last for months. Women were responsible for preparing the fields, planting, weeding, harvesting, pounding the grain, preparing the food, and gathering the firewood to cook. Men sometimes helped their wives with planting and harvesting, but the responsibility remained with the women. As fields yielded less, women moved to gardens farther from their homes and spent more time walking to tend gardens sometimes so distant that they slept there during crucial agricultural times. During these periods the children were left at home to be cared for by their siblings, grandmothers, or fathers.

The comments of other people in the community reinforced the idea that a woman's major duty was to feed her family. Older women commented that a woman was only justified in spending time on keeping her home and children clean if it didn't interfere with her work in food production and preparation. However, women were also considered to be responsible for their children's health and the demands on their time were not acknowledged. In a group of village leaders, the men stated that the children's faces were not clean because the women were lazy. Although the women spent long hours working in the gardens or the home, the fathers, sisters, or grandmothers who cared for the children assumed no responsibility for the children's cleanliness.

Project personnel at first thought that a health intervention education program to work with mothers on increasing face washing to prevent trachoma should involve only the mother and her children. They hoped to work through, or form, women's groups as has been done successfully in other places [8]. Soon, however, it became evident that if women were to be persuaded to re-prioritize the use of their time and household water it would be necessary to have broad-based social support for these changes. Women needed the support of their neighbors because they thought it useless to wash their children if the neighbor didn't and because they feared being criticized for neglecting the work that was perceived as more important if they spent time on hygiene and sanitation. Also, other child care givers needed to be convinced that they should wash the children's faces.

Even more importantly, change in the priorities of the women had to be supported by their husbands who made the decisions about the use of household resources [9]. Village leaders and the trachoma project's experience suggested that men and women both be invited to the meetings but then divided into separate discussion groups [10].

The purpose of the health education meetings was to have villagers recognize the connection between unclean faces and eye diseases and then to devise practical plans for increasing face washing. Clearly an effective intervention would require the agreement and support of the whole community, not just the mothers alone. Therefore in the men's and women's groups, each individual was asked to make a concrete plan for washing the faces in his or her own household. When the men and women came together again at the end of the meeting, each person in turn was asked to describe their plan including the time, location, and water vessel to be used in washing. It was hoped that the public announcement would reinforce the commitment to whatever plan was worked out. Local leaders also endorsed this method saying that if wives, and especially husbands, publicly came up with a plan there would be less cause for private disagreement.

#### CONCLUSION

An epidemiological study on the prevalence of trachoma in the Kongwa area of Tanzania suggested that the unclean faces of pre-school children were a risk factor for infection. Therefore a study was designed to examine the behavior around face washing in a pilot village with the aim of designing an intervention which would increase face washing.

Project personnel used household interviews and observations, key informant data, focus groups, and participant observation to determine why children's faces were not being washed. The study indicates that villagers put face washing as a low priority because they perceived that an increase in washing would require an unacceptable increased output of household water and time.

In addition, the study found that it was not possible to change the mother's use of water and time without educating the whole community so that they would support her in her actions. There were three

major reasons that women said they could not, or would not, initiate changes in water use on their own. First, they stated that it was useless to wash children unless all their playmates were also washed. Secondly, women and other community members emphasized the perception that a woman's primary responsibility was to feed her family and that a woman could spend time on hygiene only if she did not jeopardize her important duties. Third, and most importantly, women could not change without the support of their husbands. Village men had authority over their wives' activities and household decisions and therefore any change in women's behavior had to have the approval of the men.

This information has been used in the design of a trachoma prevention project. The program will be targeted at changing the attitudes and practices of the whole community. Also, the perception that face washing requires a great increase in water use, and implicitly the time needed to get additional water, will be addressed directly with demonstrations of how little water is really necessary to wash a child's eyes.

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9. In the past women grew household food in garden plots and men cared for cattle, the prestigious property of the family. Men controlled household surpluses and invested capital in cattle in the hope that growing herds would increase the family's wealth.
10. For a detailed analysis of decision-making in this village see McCauley A., Lynch M., Pounds M. and West S. Household health decisions in Tanzania: determining the roles of men, women and the community in implementing change. Unpublished manuscript.