Limits of health education

Barriers to oral rehydration use among Ghanaian mothers

Hanna Saltzman[1], Andrew Warren[2], Spencer Lloyd, MD, MPH[3], Easmon Otupiri, Ph.D[4], DeVon Hale, MD[5]
1. Williams College
2. University of Utah School of Medicine
3. University of Utah Department of Infectious Diseases
4. Kwame Nkrumah University of Science and Technology College of Health Sciences
5. University of Utah Department of Infectious Diseases

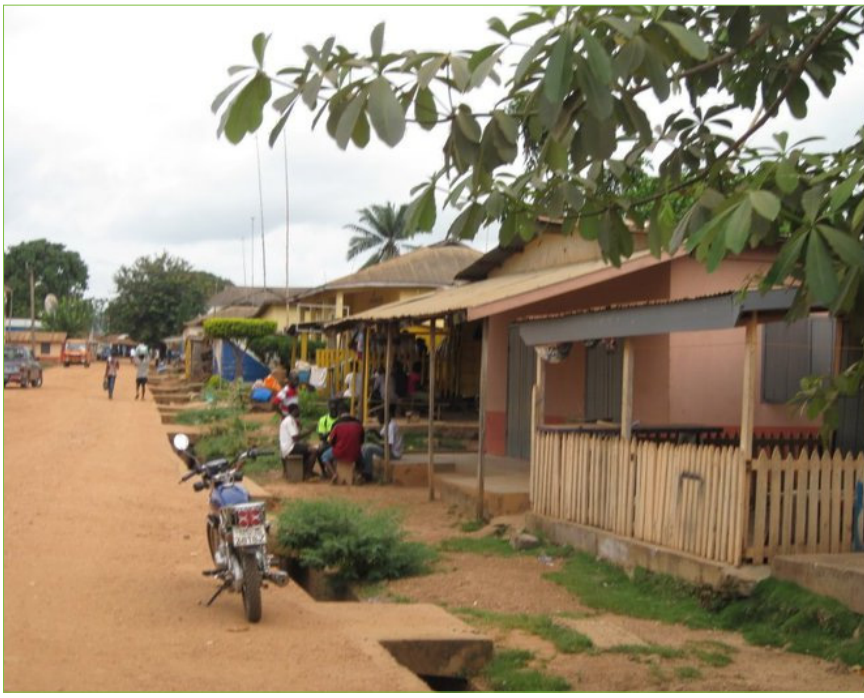
Abstract

Childhood diarrhea is one of the leading causes of childhood morbidity and mortality in West African communities. In the Ejisu-Juaben region of Ghana, oral rehydration solution (ORS) sachets are provided by the district hospital by nurses working in surrounding communities and by community drugstores to combat diarrhea and replenish electrolytes that have been depleted as a result of diarrhea. Previous research from the Ejisu-Juaben region, part of the Ashanti region, found that 92% of mothers had heard of ORS and 86.6% could describe its preparation, but only 28.4% had used ORS to treat their child's last episode of diarrhea (Kendell et al., 2009). The purpose of this study is to determine potential barriers to the use of ORS in these communities.

Qualitative interviews were conducted with 91 mothers, eight public health nurses, five community volunteers and five drugstore owners in the Ejisu-Juaben region. Additionally, focus groups were held with mothers.

Mothers knew where to obtain ORS, could correctly demonstrate its preparation and identify it as an effective treatment. The primary reasons given for not using ORS were its expense and use of alternative treatments. The latter includes herbs boiled in water, herbal enemas, sand enemas and innocuous foods; the primary reasons for choosing these treatments over ORS include availability of home remedies and adherence to tradition.

While public health education is vital to improving overall health in developing countries, education does not always predict compliance with medically proven health practices. This is particularly true when cost and tradition are barriers to behavioral change. A diarrhea treatment that bridges traditional and modern methods while mitigating cost barriers could potentially increase use, thereby decreasing the morbidity and mortality of diarrhea.



Leah Rothchild

Introduction

Diarrhea accounts for about 1.8 million deaths per year among children under five years of age, making it the second most common cause of child mortality worldwide, following acute respiratory infection and excluding perinatal diseases that occur within seven days of birth (Petri et al., 2008; WHO, 2002; UNICEF/WHO, 2009). In addition, recent evidence has documented the morbidity of recurrent episodes of diarrhea leading to long-term problems for these children (Guerrant et al., 1999; Dickson et al., 2000; Moore et al., 2001; Niehaus et al., 2002; Patrick et al., 2005; Lorntz et al., 2006).

Oral rehydration therapy (ORT) was officially introduced by the World Health Organization (WHO) in 1979 and rapidly became the cornerstone of programs for the control of diarrhea (Victoria et al., 2000). ORT consists of oral intake of a sugar and salt solution, providing an inexpensive and effective method of fluid and electrolyte replacement. Annual childhood diarrheal deaths have decreased from approximately 4.5 million in 1980 to fewer than two million today. Dehydration accounts for 60% of these deaths, and the impressive reduction in childhood diarrheal deaths has been ascribed to ORT, an overarching category that includes both recommended home fluids (RHFs) and oral rehydration solution (ORS) (Bull. World Health Organ., 1984). Despite this accomplishment, morbidity and mortality in West African communities due to childhood diarrhea remain crucial public health concerns.

ORS is a specifically measured solution of necessary electro-

lytes. This paper examines ORS usage in diarrheal treatment efforts in the Ejisu-Juaben region of Ghana. Nurses' campaigns in this region have focused on encouraging mothers to buy ORS sachets, which become functional ORS when mixed with water. Global health education programs aim to facilitate parental administration of ORS to their children (Coreil & Mull, 1988). However, these education campaigns do not always bring about behavioral changes; social, political and health-related cultural nuances often impede health interventions (Kaler, 2009; Briggs, 2003; Rutenberg & Watkins, 1997). Data from 68 UNICEF priority countries indicate a median use of ORS in only 38% of diarrhea episodes (Bryce et al., 2006).

Every year, an estimated nine million episodes of diarrhea and 84,000 diarrhea-related deaths occur among Ghanaian children under five years of age, at an estimated annual cost of 33 million USD (CWSA, 2002; Scott et al., 2007). A Multiple Indicator Cluster Survey (MICS) conducted in Ghana in 2006 found that of children under five years of age who experienced diarrhea in the previous two weeks, only about 29% received ORS and 9% received RHFs. The MICS showed similar data in the Ashanti Region, one of the ten administrative divisions of Ghana, with percentages of children who received ORS and RHFs, 26% and 7% respectively. In rural communities within the Ejisu-Juaben District, nurses from the district hospital have educated mothers in the surrounding communities about how, when and why to use ORS to treat their children's diarrhea. A study in the rural communities within the Ejisu-Juaben District in 2008 found that although 92% of these mothers had heard of ORS and 86.6% described the correct preparation of the solution, only 28.4% of mothers actually used ORS for their child's most recent episode of diarrhea (Kendell et al., 2009). This substantial gap indicates that awareness and education do not necessarily lead to improved health practices. The purpose of this study was to determine why ORS/ORT use is so low, even when it appears that mothers are adequately educated on the topic.

> Mothers value their villages' traditional remedies far more than they value an unfamiliar Western medicine, even though most understand how ORS works.

Methods

The communities involved in the study were: Juaben, Krofofrom, Nkyerepoaso, Odoyefe, Atia, Dumakwai, Apemso and Ofoase. Homes were chosen from different geographic areas within each community to provide accurate representation. Interviews were conducted with 91 mothers, each with at least one child under the age of five, in the Ejisu-Juaben District from July 9-22, 2009. The two authors of the study (Warren and Saltzman) conducted the interviews. Each community was visited twice, and different mothers were interviewed during each visit. Names of mothers interviewed in each location were recorded. Interviews were based on an oral questionnaire developed by the authors with input from medical staff from the University of Utah, USA, and Kwame Nkrumah University of Science and Technology in Kumasi, Ghana. A pilot survey was administered to three mothers in Dumakwai prior to beginning the research, but the data from those mothers' answers were not included in the final study results.

Open-ended questions investigated beliefs about the objective definition of diarrhea, treatment of diarrhea, knowledge of ORS and personal use of ORS. Some questions more directly investigated potential barriers to ORS including availability, cost, substitution with other treatments, unequal distribution and misunderstandings about the benefits of ORS and its correct usage. During interviews, responses were recorded directly on the survey tool or in a notebook and were later compiled in aggregate.

Translation was provided by community health workers (CHWs). CHWs are residents of each community selected by their peers and the nursing staff to mediate affairs between the hospital and community members. Well-trusted by fellow community members, CHWs proved necessary in the translation of the English questions into the local Twi language, as well as in assuaging community members' uneasiness about being interviewed by strangers. CHWs provided insight on the dynamics underlying the mothers' responses. While this provided cultural context for the researchers, CHWs' comments were not included in the mothers' interview data. One CHW accompanied each interviewer to the homes of interviewees to serve as a translator. As CHWs are trusted and familiar within the communities we studied, they also selected the mothers that were interviewed. CHWs were instructed to select mothers randomly in order to minimize selection bias. Randomness was also increased by visiting each community on two separate days and by selecting mothers from randomly chosen geographic areas. True random selection was not possible in this context, as CHWs are familiar with the communities. Using non-affiliated translators could have enhanced randomness; however, the mothers' trusting relationships with CHWs seemed more important for the accuracy of the study than did random distribution, given the short time frame and the qualitative emphasis of our study.

CHW-selected mothers were invited to participate in an interview about how they treat their children's diarrhea. Before beginning each interview, translators emphasized to the interviewee that interviewers wanted to learn about how they treat diarrhea, that no answer would be deemed as incorrect or inappropriate, that interviewees would not be identified by name and that interviewers wanted to hear answers only from the interviewee. No mother rejected the opportunity to participate. Interviews were conducted either in courtyards outside of the homes of interviewees or at common meeting places in the communities. A member of the research team also visited the drugstores in each of the communities that had one (five of the eight communities) to record whether the drugstore had ORS on hand and, if so, the advertised cost of the ORS. Interviews concerning the availability and distribution practices of ORS were conducted with drugstore owners, who were not forewarned of the research team's visit.

Interviews regarding diarrhea and its treatment were also conducted with the head nurse at the district hospital (called the Juaben Government Hospital), seven public health nurses and six CHWs. Nurse interviews were held in the local hospital and CHW interviews were conducted in the communities.

After completion of the interviews, responses were evaluated for trends. Mothers' responses were compared according to the "Child Health Records," a small booklet that contains recommendations for treating various diseases and a means of recording immunizations and the child's health status. This booklet is printed by the Ghana Ministry of Health and is distributed at "Child Health Clinics," where mothers come voluntarily to obtain immunizations and check-ups for their children. Mothers are given a copy during their first visit and are expected to bring it with them on each subsequent visit for the nurses to record the child's health status. We define "treatments recommended by nursing staff" as those printed in "Child Health Records."

There has been an ongoing collaboration between the University of Utah School of Medicine in Utah, USA, and Kwame Nkrumah University of Science and Technology in Kumasi, Ghana, for approximately ten years. As part of this collaboration, there was Institutional Review Board (IRB) approval for public health surveillance studies in rural communities near Kumasi, of which the Ejisu-Juaben region is part. This study received IRB approval as part of that pre-existing IRB approval.

Results

Interviews from 89 mothers, eight nurses and six CHWs were used for data analysis. A few additional mothers were interviewed, but the interviews were either incomplete or clearly biased (explained later

in this paper) and thus were omitted from data analysis.

Data from Mothers

Top Health Concerns

When asked the open-ended question, "What are the top five health concerns for your children?" mothers' most common responses included proper nutrition, malaria, hygiene, breastfeeding, clothing, diarrhea, attending child welfare clinics and polio (Figure 1). At least 15% of mothers listed each of these as one of their top five concerns. Mothers listed an additional 13 health concerns, but because fewer than 15% of mothers mentioned each, they are omitted from the following table. Only eighteen mothers (19.8%) said that diarrhea was one of their top five health concerns for their children.

Health Concern	Mothers who reported this concern (N=89)	Percentage of mothers interviewed who reported this concern (%)
Proper Nutrition	43	47.2
Malaria	38	41.8
Hygiene	30	33.0
Breastfeeding	26	28.6
Clothing	19	20.9
Diarrhea	18	19.8
Attending Child Welfare Clinics	17	18.9
Polio	14	15.4

Prevalence of Diarrhea

Sixty-three mothers (70.8%) had at least one child suffer from diarrhea in the past year. Mothers reported different incidences of diarrhea, ranging from a five-year-old child who had diarrhea only once ever, to a child who had diarrhea 12 times in one year. Of these 63 mothers, 57 (90.5%) reported a frequency of a child's diarrhea between one and four times per year. Diarrhea was reported to last from one to ten days, with 57 mothers reporting it lasting one to four days. Mothers all defined diarrhea similarly, as the condition of having runny or loose stools at least four times in one day; this criteria is how the nurses define diarrhea in their education campaign.

Significance of Diarrhea/ORS Use

When asked what their primary health concerns were for their children, only 18 mothers (19.8%) reported diarrhea as one of their top five concerns. Eighty-five mothers (95.5%) stated that ORS should be used anytime a child has diarrhea, but only 17 mothers (19.1%) listed ORS as their most frequently used medical treatment for diarrhea. Of the 63 mothers with a child under age five who had diarrhea within the past year, 24 said they used ORS to treat the most recent episode, while seven said they had used a home-prepared "salt and sugar" solution for the most recent episode. (Although the previously mentioned "salt and sugar" solution is not in the "Child Health Records," the nurses sometimes suggest it to mothers as a substitute for ORS). The rest either listed no treatment or traditional remedies, which will be described shortly.

ORS Availability

Eighty women (89.8%) identified a correct location when asked where they could go to obtain ORS. These locations include the district hospital, drugstores, CHWs and Child Welfare Clinics (CWC), small morning clinics held weekly by the nurses in each community. Women who did not identify one of these four locations noted they did not know where to go to obtain ORS. Out of 80 mothers, 62 (77.5%) reported they would/did obtain ORS at a drugstore, 43 (53.8%) said they would go to the district hospital, nine (11.3%) would ask the CHW and two (2.5%) mothers stated they would obtain ORS from the Child Welfare Clinic. These responses were not mutually exclusive.

Nine respondents (10.1%) reported not being able to obtain ORS when they wished. This was due to the drugstore being closed (three responses) or a lack of availability in the store (six responses). Of the six who stated the drugstore did not have ORS available, five noted it was not the first time they were out of stock, and one noted that the store ran out three times in the past year. Of the nine mothers who could not obtain ORS when they wished, six reported they were able to obtain it from another location that day or the next day, and only three were unable to obtain ORS for that incident. Seven mothers (7.9%) reported having ORS in their homes.

Cost of ORS

When given an open-ended question that asked them to identify barriers to ORS use, 26 mothers (29.2%) said cost, 60 mothers (67.5%) said there were no significant barriers and three mothers (3.3%) had other responses. Each ORS satchet costs between 20-50 peswas (US $0.13-$0.33).

Use of Traditional Remedies

Fifty-eight mothers (65.1%) reported the regular use of alternate remedies not recommended by nursing staff to treat diarrhea as outlined in the "Child Health Records" booklet. Of these, ten (11.2%) used syrups and other medications obtained from drugstores or the district hospital. Importantly, 48 mothers (53.9%) treated their children with traditional remedies, defined in this study as treatments not supported by the district hospital or the nursing staff and using substances not provided by either. These remedies include various herbs boiled and given to children to drink, as well as sand and clay enemas. To our knowledge, the effectiveness of herbs grown naturally in Ghana as a diarrhea treatment has not been evaluated. Enemas can be innocuous to some children and dangerous for others, depending on preexisting health conditions (Moore & Moore, 1998; Dunn et al., 1991).

Reasons given for using these traditional treatments were cost (though herbs may actually cost more than ORS), availability and convenience ("I can use herbs from my farm"), tradition ("the herbal methods were taught to me by a family member or friend") and functionality ("clay enemas immediately halt the diarrhea, but ORS does not"); these are direct quotes from mothers during interviews. In an interview, a woman in Dumakwai who sells boiled herbs to community members for the treatment of diarrhea reported that ten patients per day use her services, which cost one cedi or 100 peswas ($0.67) (recall that each ORS costs between 20-50 peswas). Both mothers and nurses reported the presence of other individuals who sell or give herbal treatments in other communities.

Data from Nurses

Barriers to ORS Use

Nurses reported the following as barriers to ORS use: cost, use of traditional medicine, inconvenience (having to walk to obtain ORS), lack of concern (the belief that diarrhea is not a severe condition) and inaction (waiting to see if a child improves). Most nurses said that the cost of ORS and the use of herbal remedies are the most important barriers. The nurses generally believed that the herbal remedies are not effective treatments, and many expressed frustration that the mothers continued to use herbs instead of ORS. Two out of the seven nurses reported inconvenience and waiting to see if a child improves as one of the most important barriers. One out of seven nurses reported lack of concern as a major barrier.

ORS Availability and Alternative Therapies

Two nurses reported that CHWs can provide ORS, while two reported that they cannot; it was clear from the CHWs that they only have ORS sporadically. Four nurses reported that "home fluids," as outlined in the "Child Health Records," could be used as a substitute treatment for diarrhea. The "Child Health Records" lists ORS, home fluids (rice water, porridge, coconut juice, etc.) and continued breast feeding as treatments for diarrhea, listed in order of importance. It appears the nursing staff interprets this to mean three different treatments as opposed to three steps in treatment. The nurses believe that ORS is the most important treatment and that the other two are less effective. Thus, nurses instruct mothers to use "home fluids" if they do not have ORS or cannot obtain it, and they teach the CHWs to provide the same instructions. Two nurses reported that ORS is not needed if home fluids are effective, while two other nurses suggested that ORS should not be replaced by any other treatment. One nurse said that mothers are instructed to have ORS in their homes to avoid a trip to the hospital if a child were to get diarrhea in the future, three nurses recommended mothers wait 24 hours before giving ORS, and two nurses suggested ORS be given immediately. The "Child Health

Records" is unclear about when ORS should be given, but it states that a mother should "report to the nearest clinic if a child's diarrhea does not stop in 24 hours." In addition, five out of the seven nurses said that a solution of salt and sugar (one tbsp. each) could be substituted for ORS if necessary, although this is not outlined in the "Child Health Records."

Data from CHWs

All CHWs reported having ORS provided to them at various times, and the head nurse at the district hospital confirmed that the CHWs receive ORS from various outside sources at irregular times. One CHW reported having ORS in stock two years ago, two CHWs mentioned ORS satchels were available within recent months (two to four months), and one currently had and distributed ORS, which were given to him by the district hospital. One CHW reported that he thought the use of herbs was the preeminent barrier to ORS use, and another stated that all mothers use ORS; he could not think of a reason why they would not. All CHWs stated that the drugstores never run out of ORS satchels, which diverges from the mothers' data about ORS availability in drugstores.

Data from Drugstore Owners

All drugstores had ORS on hand when visited by the interviewers. Each had between a three-week and a two-month supply of ORS. One drugstore owner reported running out of ORS satchels two to three years ago, and one reported rarely running out, perhaps a few times a year. All other owners stated they never ran out. These responses diverge from the mothers' appraisals of ORS availability in drugstores.

Discussion

Almost all mothers interviewed knew what ORS is, how to obtain it and how to use it, yet most mothers did not use ORS to treat their child's most recent episode of diarrhea. Instead, many mothers chose to use traditional remedies, including oral herbs and enemas. The sharp disparity between mothers' awareness of ORS and their choice to use it as a primary treatment for diarrhea indicates that although the nurses' education campaign has successfully reached an extensive number of people and communities, simply explaining how, when and why to use ORS is not enough to increase usage.

Limitations

One major limitation of the study is that different CHWs and nurses served as translators in different communities and had varying levels of English proficiency, as well as varied tones and thoroughness when translating questions to the mothers. Some translators understood the survey and the need for objectivity, but some had difficulty understanding the English questions, and others seemed to change the questions when translating them, potentially hindering attempts to avoid bias. Furthermore, both the nurses and the CHWs were invested in their ORS educational campaign, adding potential bias to the data collected from their responses about the effectiveness of the education program. Using these healthcare workers as translators was necessary because of their understanding of the issue and knowledge of the community, but these connections may have compromised objectivity. In a few instances, translators mentioned ORS before instructed to do so, and this mention heavily shaped mothers responses (these mothers named ORS as their first choice for diarrhea treatment, presumably because the translator mentioned it). These interviews were omitted prior to analyzing the data but similar situations possibly occurred in other interviews without researchers' cognizance.

The benefits of using the CHWs and nurses as translators were believed to outweigh this potential bias. The selection of more "objective" translators (i.e. people who spoke Twi but were uninvolved with the communities) would have sacrificed the trust that came with using insiders as translators. It was decided that for short-term public health research projects that utilize qualitative methods, establishing trust with study participants is the most important factor to consider. Trust is key in collecting data that is as thorough and accurate as possible, as well as in conducting an ethical study that avoids making study participants feel uncomfortable, confused or vulnerable. However, researchers aiming to conduct a study similar to ours could mitigate some of this bias by working with translators who are members of the community but who are not involved in the particular health campaign on which the study focuses. Yet this too could cause problems, as the translators would not have a thorough understanding of the research project and might be less able to translate health-related phrases or concepts.

The interview questions themselves created another study limitation. Open-ended questions seemed like the most objective way to approach mothers. As there was not enough preexisting data to identify the most likely reasons that mothers chose not to use ORS, a survey composed of "yes" or "no" questions would likely overlook important factors. For instance, if the interviews were conducted with "yes" or "no" questions, the role of herbs and enemas might not have emerged as clearly. However, the open-ended interview method presented some unforeseen limitations. Many mothers interviewed were illiterate, and open-ended questions were often difficult for them to answer, even though the questions were asked orally. A CHW explained the nature of this problem: illiterate women who did not receive an education have never answered open-ended questions similar to those in the interviews, and some women were unsure how to respond. For example, when asked, "What are the top five health concerns for your children?" one mother replied, "Pineapple," because she had overheard a previous mother using that word at a completely different point in the survey. The fact that mothers sometimes overheard previous interviews before their own interview is a limitation; however, this was avoided as much as possible.

Reasons Underlying Low ORS Usage

The role that cost plays in explaining lack of ORS use brings critical complexities to this study. Although mothers repeatedly mentioned cost as a barrier to ORS use, this issue is more nuanced. In many instances, mothers said the ORS satchels (20 peswas/0.13 USD) were too expensive but that herbs from the medicine woman (100 peswas/0.67 USD) were affordable; for some mothers, the herbs grew in their own yards and were free, but most mothers who used herbs paid around 100 peswas for them.

Furthermore, it is important to note that agriculture accounts for one-third of the Ghanaian economy and 55% of formal employment (Bureau of African Affairs, 2010). Most Ghanaian agriculture is small-scale subsistence farming (McNeill & O'Neil, 1998; Africa Rural Connect, 2009), in which many of the members of the villages surrounding Juaben participate. Thus, 20 peswas might hold different meaning for a family whose farming brings them adequate food and shelter without formal income, as it would for a family who works for money in order to buy food and shelter. There is insufficient information to discern exactly how interviewees' engagement in subsistence agriculture affects the ways in which they value money. Yet acknowledgment of this possible association, suggests that the meaning of money is culturally contingent rather than a neutral value, and that the accuracy and efficacy of public health research may improve when researchers look beyond a survey response to consider the culturally situated human being producing that response.

Some mothers did seem to accurately choose herbs because of cost. One mother interviewed said, for instance:

"First we use herbs…we wait three to four days. If the diarrhea hasn't resolved then we take them to the hospital. At the hospital you will be charged; here you can get herbs for free."

This mother recognizes that ORS, received at the hospital, is more effective than herbs, and she obtains ORS if other methods do not work. However, she first chooses herbs because they are free where she lives, whereas ORS costs money.

Interestingly, many mothers chose to buy herbs to treat diarrhea that actually cost more than ORS. One mother explained:

"I grind the leaves, mix them with water and give them to the child to stop diarrhea. I get herbs from the herbalist that I pay one cedi [100 peswas] for."

According to the nurses, even in the poorest communities, 20 peswas (the cost of ORS) is considered extremely inexpensive. This seeming incongruence suggests that some mothers do not value ORS nearly as much as they value herbs; they choose herbs even when the difference in cost is minimal. As one mother said:

"For diarrhea, first I use herbs from the farm. If that doesn't work I go to the hospital. I have a strong belief in the herbs, which is why I use them instead of ORS."

Therefore, the two main barriers to ORS use identified in this study—cost and tradition—are closely associated with one another.

Distinguishing between cost and value can help illuminate the nature of this cost-tradition relationship. Mothers value their villages' traditional remedies far more than they value an unfamiliar Western medicine, even though most of these mothers understand how ORS works. Thus, it is not always the numerical figure of cost that matters when predicting the effectiveness of a health education campaign, but, rather, it is the relationship between value and cost for a particular product. Value encompasses much more than just money: a mother may value herbs more than she values ORS that she is willing to pay 100 peswas for herbs, but is not willing to pay 20 peswas for ORS, because she perceives ORS as too expensive for its value.

Furthermore, to analyze the reasons inhibiting ORS use, it is important to remember that although diarrhea is the second leading cause of death in children under five years of age, the case fatality rate for any one small community remains relatively small, likely contributing to why mothers do not view diarrhea as a major health concern. Thus, traditional methods may appear effective when diarrhea subsides, regardless of their mechanistic efficacy, which, to our knowledge, has not been evaluated for the specific herbs in question. As a nurse explained:

"They think diarrhea is not [as important as] fever or malaria… they prefer to sit in their house and treat it."

This quote suggests that one reason for lack of ORS use could be that mothers do not perceive diarrhea as a major health concern. Although they know how to obtain and use ORS, they find that their children's diarrhea generally clears up without this treatment and that diarrhea does not seem to cause significant health problems when compared to illnesses such as malaria. From this perspective, using the most effective treatment may not be a high priority. Worldwide, diarrhea accounts for more child deaths than malaria (Black et al., 2003). Case-by-case, though, untreated malaria can be quite lethal; for example, one untreated malaria epidemic in Ethiopia had case fatality rates of 5-20% (Alles et al., 1998). It makes sense, then, that from a mother's point of view, malaria is more serious than diarrhea.

Apart from the fact that mothers value traditional, seemingly effective remedies more than foreign remedies like ORS, other nuances likely influenced their responses to survey questions. Mothers seemed very hesitant to admit use of traditional herbs and did not discuss it until the interview was underway for an hour or more, until they felt more comfortable with the interviewers and with the translators. Even though we emphasized that no answer was incorrect, mothers clearly knew that the district hospital nurses advocate ORS and likely assumed that as foreign researchers, we valued ORS more than traditional remedies. This clear trend suggests that it is likely that even more mothers use traditional herbs instead of ORS than our results indicate. Furthermore, the relationships between the nurses and the mothers have influenced both the educational campaign and the results of our survey. Information was insufficient to gauge the level of trust in these relationships or to determine how Western medicine is viewed throughout these communities. Nonetheless, the data collected demonstrate that mothers know how to use ORS, how to obtain it and are financially capable to purchase it, but they often choose to buy herbs instead.

A possible additional explanation for the relatively low use of ORS reflects a challenge that diverse public health campaigns face: cultural nuances. Even those that from a health researcher's perspective may seem unrelated to health, can limit the effectiveness of health education campaigns. In several other health interventions in sub-Saharan Africa, local symbolism, perceived power imbalance, mistrust of authority or of Westerners and other cultural complexities impeded the success of a health education campaign (Kaler, 2009; Briggs, 2003; Rutenberg & Watkins, 1997).

Specifically pertaining to ORS usage, research in developing countries has demonstrated that socio-cultural contexts are critically important to how a particular population perceives and treats diarrhea (Weiss, 1988; Kendall, 1984). For example, an anthropological study in rural Pakistan attempted to further understand mothers' concepts of childhood diarrhea (Mull & Mull, 1988). The purpose was to highlight culturally relevant information that might be missed by broader epidemiological surveys. Two findings with important implications for ORS use were:

1. Certain types of diarrhea were classified as signs of folk illnesses requiring traditional folk treatment rather than fluid replacement or other biomedical therapy.

2. Certain types of diarrhea were regarded as 'natural' and that these diarrheas should simply be tolerated rather than treated with therapies such as ORS.

While this study's interview questions pertaining to types of diarrhea were not specific enough to evoke reasons such as these, research sheds light on the possibility that additional causes contribute to the use of ORS among the study population (Mull & Mull, 1988). For any public health research project, and particularly for shorter-term projects, it is important to keep in mind that additional cultural perceptions about illness that were not identified in the scope of the research may still play a role in answering the research question. This study could be improved by increasing the focus on cultural perceptions of health; methodologies have been developed to elicit culturally relevant information, and these methodologies should be utilized in future studies. Hill et al. used a Rapid Anthropological Assessment (RAA) to explore childhood illness and traditional explanations with respect to care-seeking behavior in rural Ghana (2003). A similar study in the Ejisu-Juaben District would provide invaluable information for successful program implementation.

Cultural nuances, even those that from a health researcher's perspective may seem unrelated to health, can limit the effectiveness of health education campaigns.

Certain aspects of the Ejisu-Juaben District Hospital's education initiative can be improved, such as greater emphasis on the fact that ORS does not halt diarrhea but rather treats the effects of dehydration and electrolyte imbalances. This misunderstanding was a major barrier to ORS use in rural North India (Bentley, 1988), and although many mothers in the Juaben communities seemed to understand that ORS alleviates dehydration, a clearer focus on this rationale could both increase the use of ORS and decrease the use of clay enemas (a treatment seen as a method of halting diarrhea). Although enemas can be innocuous for some children, they can be harmful to others, particularly to children suffering from an underlying illness. Both traditional and chemical enemas administered to children can cause respiratory distress, hypertonia, loss of consciousness, colonic and renal complications and even death (Moore & Moore, 1998; Dunn et al., 1991).

In addition, there were noticeable inconsistencies in the nurses' health education campaigns. As noted, individual nurses provided mothers with different information about the proper timing and amount of ORS usage. Some nurses told mothers to use ORS immediately after the child's diarrhea began, and others recommended waiting for a period of time before beginning ORS use. According to the Centers for Disease Control and Prevention (CDC), for acute diarrhea management, ORS should be used for rehydration after each diarrheal stool, as long as there are signs of dehydration (King et al., 2003). Although the variability in nurses' information indicates that the health education campaign was not streamlined as much as it could be and likely suggests that the nurses' own education about proper ORS usage varied, it does not appear to be a primary barrier to ORS use. Despite these inconsistencies, approximately 96% of mothers stated that ORS should be used anytime a child has diarrhea. Thus the mothers clearly understand the overarching aim of the education campaign: that ORS is the recommended treatment for diar-

rhea. Their reasons for refraining from ORS use cannot be attributed solely to inconsistent information about specific details of ORS use. It is certainly possible that the nurses' conflicting information decreased either confidence in the nurses' program or confidence in ORS itself, and this inconsistency could contribute to why mothers often chose to use traditional remedies instead of ORS. However, it definitely did not seem to impede mothers' understanding that the nurses uniformly recommend ORS as the treatment of choice.

The limited extent to which mothers value ORS, in spite of the nurses' education campaign, suggests that a new focus of education may be necessary. In a participatory research project in rural Sri Lanka investigating low usage of ORS, Nichter et al. found that, as in this study, diarrhea was not considered a major health concern (1988). To address this perception, he worked with villagers to keep a "village health diary," in which parents recorded their children's diarrheal episodes. He found that even after one to two months, villagers recognized that diarrhea actually appeared to be a serious community health problem. This sparked community-wide motivation for improvement, and perhaps a similar program could work well in Ghana. Yet Nichter emphasized that the translation of community motivation into effective change requires "a form of health education which begins with popular health culture and social values… [that involves] a learning process wherein the community takes increased ownership of health problems… At issue is not the worth of ORS, but the manner in which it is employed in the context of development. Technical fixes are resources, not solutions" (Nichter et al., 1988). While helping communities to take diarrhea seriously as a health problem would be a step in the right direction, it alone would probably not change fundamental attitudes toward ORS. Cultural perceptions of proper diarrheal treatment should be considered crucial, not peripheral, to health education campaigns.

Moreover, it is possible that ORS is not the best solution in these Ghanaian communities at this time. The most recent definition of ORT involves continued breast feeding alongside increased fluids, which can be either ORS or RHFs but should include salt, carbohydrates and water (Victora et al., 2000). Nurses could teach mothers how to mix the proper ratio of sugar and salt into their boiled herb water; oral rehydration and innocuous herbs do not have to be mutually exclusive. An effective solution in rural areas of Brazil was simply to add salt and sugar to a well-established traditional treatment (Nations & Rebhun, 1988), and a similar strategy could work well in the communities surrounding Ejisu-Juaben. However, there is a notable lack of information evaluating the effectiveness of RHFs (Munos et al., 2010), and a clinical trial to determine the efficacy of RHFs the efficacy of home-prepared sugar-salt solutions at different ratios, and the outcomes of these home treatments as compared to ORS would benefit communities worldwide.

Another potential solution is to work with local healers to reach an integrated plan for treating diarrhea in their communities. In Brazil, ORS interventions were most effective when patients and healers came from the same social class and sub-culture and local healers were open to combining traditional rituals and modern medicines (Nations & Rebhun, 1988). Although the nurses from the district hospital in Ejisu-Juaben understood the benefits of ORS and enthusiastically taught it to mothers in the surrounding communities, perhaps the mothers would better receive the same information from healers within their own communities. Despite the fact that both the nurses and the healers live in approximately the same area in Ghana, the relationships that the mothers have with the nurses are quite different from those that they have with people who actually live in their particular communities. As Kendall found in Honduras, successful ORS health interventions require detailed attention to local contexts and a willingness to work within the existing health system (1988). This study in Ejisu-Juaben exemplifies how in rural areas of other countries, integrating Western and traditional methods of healing could help overcome barriers to ORS usage, effectively lowering the morbidity and mortality associated with diarrhea.

An investigation conducted for the Bellagio Conference on Child Survival in 2003 concluded that two-thirds of deaths in children under five years of age could be prevented by interventions currently available and feasible for implementation in developing countries, but current systems for delivering these technologies are seriously deficient and their utilization is inadequate (Jones et al., 2003). According to the Department of Child and Adolescent Health and Development of the WHO, understanding the barriers blocking implementation, effectiveness and optimization of available interventions is a priority for research in the major causes of child mortality (Fontaine et al., 2009). A paper by Leroy et al. emphasizes the bias in the current research funding policy—ninety-seven percent of grants are for developing new technologies, which could reduce child mortality by only 22%—but this reduction is one third of what could be achieved if existing technologies were fully utilized (Leroy et al., 2007; Mohammed, 2009).

In his review of anthropologic research relating to diarrhea, Weiss proposes several questions that could be useful in determining further research to carry out in Ejisu-Juaben, including: "What factors determine a response to diarrheal illness that results in childhood malnutrition? In what ways might the culture of health professionals and planners be at odds with their stated objectives? What are the implications of health seeking in the context of political, economic and other macro-social forces? What criteria should identify those [traditional healers] with whom cooperation is appropriate?" (Weiss, 1998).

Conclusion

As demonstrated through interviews with Ghanaian mothers, Western-style educational campaigns may increase knowledge concerning ORS but do not ensure its widespread usage. Furthermore, public health campaigns in developing countries often focus on limiting the cost of a treatment. While this is important, the data collected indicate that cost and value are not necessarily synonymous. Rather than focusing on cost as a numerical value, public health campaigns might be more effective if they were to focus on the relationship between cost and value for a particular product. Current and future research must aim to understand the best ways to promote ORS use in poor communities around the globe, specifically in African communities, which bear a disproportionate burden of diarrheal disease. Health education campaigns should work within traditional treatment systems to promote solutions that effectively mitigate diarrhea within specific cultures.

References

Alles, H.K., Mendis, K.N. & Carter, R. (1998). Malaria mortality rates in South Asia and in Africa: Implications for malaria control. Parasitology Today. 14 (9), 369-375.

Background Note: Ghana. (2010). Bureau of African Affairs. Retrieved September 10, 2010. http://www.state.gov/r/pa/ei/bgn/2860.htm.

Bentley, M.E. (1988). The household management of childhood diarrhea in rural North India. Social Science and Medicine. (27), 75-86.

Black, R.E., Morris, S.S. & Bryce, J. (2003). Where and why are 10 million children dying every year? The Lancet. 361 (9376), 2226-2234.

Briggs, C.L. (2003). Why nation-states and journalists can't teach people to be healthy: Power and pragmatic miscalculation in public discourses on health. Medical Anthropology Quarterly. 17 (3), 287-321.

Bryce, J., Terreri, N., Victora, C.G. et al. (2006). Countdown to 2015: tracking intervention coverage for child survival. The Lancet. 368,(9541), 1067-1076.

Bulletin of the World Health Organization. (1984). The magnitude of the global problem of acute diarrhoeal disease: a review of active surveillance data. 60, 605-613.

Coreil, J. & Mull, D. (1988). Anthropological studies of diarrheal disease. Social Science and Medicine. (27), 1-3.

CWSA. (2002). Clean Hands, Healthy Life. Ghana washes her hands: a Public-Private Partnership to save lives. Business plan, September 2002. Accra: Community Water and Sanitation Agency, Ministry of Works and Housing. Government of Ghana. Online at: [http://www.globalhandwashing.org/country%20act/Attachments/GhanaProgMaster.doc].

Dickson, R., Awasthi, S., Williamson, P., Demellweek, C. & Garner, P. (2000). Effects of treatment for intestinal helminth infection on growth and cognitive performance in children: systematic review of randomized trials. British Medical Journal. (320), 1697-1701.

Dunn J.P., Krige, J.E., Wood, R., Bornman, P.C. & Terblanche, J. (1991). Colonic complications after toxic tribal enemas. British Journal of Surgery. 78(5), 545-8.

Editorial board. (1978). Water with sugar and salt. The Lancet. 2 (8084), 300-301.

Fontaine, O., Kosek, M., Bhatnagar, S., Boschl-Pinto, C., Chan, K.Y., Duggan, C., Martinez, H., Ribeiro, H., Rollins, N.C., Salam, M.A., Santosham, M., Snyder, J.D., Tsai, A.C., Vargas, B. & Rudan, I. (2009). Setting research priorities to reduce global mortality from childhood diarrhea by 2015. PLoS Medicine. 6 (3), 0001-0006.

Guerrant, D.L., Moore, S.R., Lima, A.A.M., Patrick, P.D., Schorling, J.B., and Guerrant, D.I. (1999). Association of early childhood diarrhea and cryptosporidiosis with impaired physical fitness and cognitive function four-seven years later in a poor urban community in northeast Brazil. American Journal of Tropical Medicine and Hygiene. 61 (5), 707-713.

Hill, Z., Kendall, C., Arthur, P., Kirkwood, B. & Adjei, E. (2003). Recognizing childhood illness and their traditional explanations: exploring options for care-seeking interventions in the context of the IMCI strategy in rural Ghana. Tropical Medicine and International Health. 8 (7), 668-676.

Jones, G., Steketee, R.W., Black, R.E., Bhutta, A.A. & Morris, S.S. (2003). How many child deaths can we prevent this year? Lancet. 362 (9377), 65-71.

Kaler, A. (2009). Health interventions and the persistence of rumour: The circulation of sterility stories in African public health campaigns. Social Science and Medicine. 68 (9), 1711-1719.

Kendall, C., Foote, D. & Martorell, R. (1984). Ethnomedicine and oral rehydration therapy: a case study of ethnomedicine investigation and program planning. Social Science and Medicine. (19), 253-260.

Kendall, C. (1988). The implementation of a diarrheal disease control program in Honduras: is it 'selective primary health care' or 'integrated primary health care'? Social Science and Medicine. (27), 17-23.

Kendell, P., Miller, A.D., Winsor, C. & Hale, D. (2009). Treating diarrhea with ORS in Juaben Ghana. Poster session presented at: 18th Annual GHEC Conference.

King, C.K., Glass, R., Bresee, J. & Duggan, C. (2003). Managing acute gastroenteritis among children. Centers for Disease Control and Prevention: Morbidity and Mortality Weekly Report. 52 (RR16), 1-16.

Leroy, J.L., Habicht, J-P., Pelto, G. & Bertozzi, S.M. (2007). Current priorities in health research funding and lack of impact on the number of child deaths per year. American Journal of Public Health. 97 (2), 219-223.

Lorntz, B., Soares, A.M., Moore, S.R., Pinkerton, R., Gansneder, B., Bovbjerg, V.E., Guyatt, H., Lima, A.M. & Guerrant, R.L. (2006). Early childhood diarrhea predicts impaired school performance. The Pediatric Infectious Disease Journal. (25), 513-520.

GSS/MOH/UNICEF/Macro International: Multiple Indicator Cluster Survey. (2006). Monitoring the situation of children, women and men. Accra, Ghana.

Mohammed, A.S. (2009). Reducing global mortality from childhood diarrhea: future directions. Pediatric Health. 3 (6), 515-519.

McNeill, M. & O'Neill, D. (1998). Occupational disorders in Ghanaian subsistence farmers. Contemporary Ergonomics, 592-597.

Moore, D.A. & Moore, N.L. (1998). Paediatric enema syndrome in a rural African setting. Annals of Tropical Paediatrics. 18(2), 139-44.

Moore, S.R., Lima, A.A., Conaway, M.R., Schorling, J.B., Soares, A.M. & Guerrant, R.L. (2001). Early childhood diarrhoea and helminthiases associate with long-term linear growth faltering. International Journal of Epidemiology. (30), 1457-1464.

Mull, J.D. & Mull, D.S. (1988). Mothers' concepts of childhood diarrhea in rural Pakistan: What ORT program planners should know. Social Science and Medicine. 27 (1), 53-67.

Munos, M.K., Walker, C.L.F. & Black, R.E. (2010). The effect of oral rehydration solution and recommended home fluids on diarrhoea mortality. International Journal of Epidemiology. (39), 75-87.

Nations, M.K. & Rebhun, L.A. (1988). Mystification of a simple solution: oral rehydration therapy in northeast Brazil. Social Science and Medicine. (27), 25-35.

Nichter, M. (1988). From Aralu to ORS: Sinhalese perception of digestion, diarrhea and dehydration. Social Science and Medicine. 27 (1), 39-52.

Niehaus, M.D., Moore, S.R., Patrick, P.D., Derr, L.L., Lorntz, B., Lima, A.A. & Guerrant, R.L. (2002). Early childhood diarrhea is associated with diminished cognitive function 4 to 7 years later in children in a northeast Brazilian shantytown. American Journal of Tropical Medicine and Hygiene. (66), 590-593.

Patrick, P.D., Oriá, R.B., Madhavan, V., Pinkerton, R.C., Lorntz, B., Lima, A.A.M. & Guerrant, R.L. (2005). Limitations in verbal fluency following heavy burdens of early childhood diarrhea in Brazilian shantytown children. Child Neuropsychology. 11 (3), 233-244.

Petri Jr., W.A., Miller, M., Binder, H.J., Levine, M.M., Dillingham, R. & Guerrant, R.L. (2008). Enteric infections, diarrhea, and their impact on function and development. The Journal of Clinical Investigation. (118), 1277-1290.

Rutenberg, N. & Watkins, S.C. (1997). The buzz outside the clinics: Conversations and contraception in Nyanza Province, Kenya. Studies in Family Planning. 28 (4), 290-307.

Scott, B.E., Lawson, D.L. & Curtis, V. (2007). Hard to handle: Understanding mothers' handwashing behaviour in Ghana. Health Policy and Planning. 22, 2160224.

UNICEF/WHO. (2009). Diarrhoea: Why children are still dying and what can be done.

Victora, C.G., Bryce, J., Fontaine, O. & Monasch, R. (2000). Reducing deaths from diarrhoea through oral rehydration therapy. Bulletin of the World Health Organization. (78), 1246-1255.

Weiss, M.G. (1988). Cultural models of diarrheal illness: conceptual framework and review. Social Science and Medicine. (27), 5-16.

WHO. (2002). Main Causes of Childhood Mortality. Retrived from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CDAQFjAB&url=http%3A%2F%2Fwww.who.int%2Fceh%2Fpublications%2F01mortality.pdf&ei=IvczT6ORGqf10gGlptSdAg&usg=AFQjCNG9S_o0UsL6don_IBly2Bu27MoXrA&sig2=J6htvjg4KMEfresx0VUUmg