

Examining the Use of Oral Rehydration Salts and Other Oral Rehydration Therapy for Childhood Diarrhea in Kenya

Lauren S. Blum,* Prisca A. Oria, Christine K. Olson, Robert F. Breiman, and Pavani K. Ram

Global Disease Detection Division, Centers for Disease Control and Prevention, Nairobi, Kenya; Epidemic Intelligence Service and Division of Foodborne, Waterborne, and Environmental Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia; Department of Social and Preventive Medicine, University at Buffalo, Buffalo, New York

Abstract. Reductions in the use of oral rehydration therapy (ORT) in sub-Saharan Africa highlight the need to examine caregiver perceptions of ORT during diarrheal episodes. Qualitative research involving group discussions with child-care providers and in-depth interviews with 45 caregivers of children < 5 years of age who had experienced diarrhea was conducted in one rural and urban site in Kenya during July–December 2007. Diarrhea was considered a dangerous condition that can kill young children. Caregivers preferred to treat diarrhea with Western drugs believed to be more effective in stopping diarrhea than ORT. Inconsistent recommendations from health workers regarding use of oral rehydration solution (ORS) caused confusion about when ORS is appropriate and whether it requires a medical prescription. In the rural community, causal explanations about diarrhea, beliefs in herbal remedies, cost, and distance to health facilities presented additional barriers to ORS use. Health communication is needed to clarify the function of ORT in preventing dehydration.

INTRODUCTION

Diarrhea continues to be one of the leading killers of children in low-income and middle-income countries, with approximately 1.9 million childhood deaths attributed to diarrhea disease annually.¹ This is despite the availability of oral rehydration therapy (ORT), which prevents death from dehydration and is considered one of the most cost effective child survival interventions.^{2,3} Diarrhea case management entails administering oral rehydration solution (ORS), recommended home fluids or increased fluids, and continued feeding.⁴ Alarming analysis of demographic and health survey data collected during 1998–2003 suggests reductions in the proportion of children less than three years of age with diarrhea receiving ORT in many sub-Saharan African and Asian countries, with results from surveys carried out in Kenya and Nigeria showing a 32% decrease in ORT use.⁵ Global trends in diarrhea management during 1986–2003 also indicate a decrease in continued feeding in children with diarrhea.⁵

In the 1980s and early 1990s, social science research was carried out to examine local explanatory models of diarrhea and ORT use in a variety of contexts, particularly in Asia and Latin America, with the aim to identify effective intervention approaches related to diarrhea management.^{6–10} Since then, little work has been conducted to elucidate why rates of ORT use have stagnated, while at the same time the proportion of mothers aware of ORS has increased.^{5,11} This incongruence in increased knowledge and decreased ORT use suggests that caregivers have formulated judgments different from those of the biomedical community regarding the benefits of ORT.⁴

We used a positive/negative deviance approach to understand why caregivers of young children in Kenya were or were not using ORS and other forms of ORT during a recent diarrheal episode. The concepts of positive and negative deviance have been widely used to examine determinants of beneficial and unfavorable caring practices affecting health outcomes for children living in the same setting.^{12–15} Understanding why one group of people within a community practices a

desired health behavior (positive deviance) and why another group fails to do so (negative deviance) can provide insights that can be incorporated into public health programming to achieve that health behavior. This study aimed to examine whether child caregiver perceptions of diarrhea management and knowledge of rehydration therapies contribute to use of ORS and other forms of ORT in Kenya, and to inform the development of interventions to improve diarrhea case management.

METHODS

Study site. The study was carried out in two sites during July–December 2007. The first site, Asembo, is a rural area in western Nyanza Province and one of the poorest regions in Kenya.¹⁶ Asembo is sparsely populated (approximately 300 persons/km²), and most residents survive on subsistence farming and fishing. Households generally have a pit latrine, and the primary water source for drinking is surface water. The Kenya Medical Research Institute (KEMRI) and the Centers for Disease Control and Prevention (CDC) operate a health and demographic surveillance system in this area,¹⁷ and also help support an inpatient hospital and five outpatient clinics. Chemist shops selling medications are found near the health centers and in more populated, central areas of Asembo. Distance to health facilities can be great, and travel sometimes takes one or more hours by walking.

Kibera is a densely populated (> 70,000 persons/km²) slum located in the capital Nairobi.^{18–20} The study took place in villages adjacent to but not part of the existing CDC-KEMRI infectious disease surveillance in Kibera. As with most informal settlements in Nairobi, Kibera continues to grow in population; the influx of people from rural locations look for work and hard currency. Inhabitants engage in a variety of employment involving small trade or daily wage labor. Although sanitation is poor, people have regular access to communal water taps and electricity. Government, private and non-governmental health clinics are scattered throughout the community and offer low-cost curative care. Chemist shops selling a wide range of medicines are common, and drugs may also be purchased in kiosks.²⁰

*Address correspondence to Lauren S. Blum, 2130 Dakar Place, Dulles, VA 20189. E-mail: laurenblum@yahoo.com

Study design and sampling. The research strategy was qualitative and consisted of semi-structured, in-depth interviews and group discussions. In-depth interviews were carried out with the primary caregivers of children less than five years old who had recently experienced diarrhea and were interviewed in a cross-sectional survey also implemented in Asembo and Kibera.²¹ Using the positive/negative deviance approach, we used purposive sampling to identify caregivers who had used ORT and continued feeding (positive behavior) and those who did not administer ORT and did not continue feeding (negative behavior) when caring for a child during a recent diarrheal episode. Diarrhea was defined as experiencing three or more watery or loose stools over a 24-hour period. Positive-behavior caregivers were randomly selected by age group according to the decade in which the caregiver was born from lists of respondents provided by the cross-sectional survey team.

Because of the small numbers in each site, all negative-behavior caregivers in Asembo ($n = 15$ or 4% of the survey sample) and Kibera ($n = 10$ or 3% of the survey sample) identified in the larger cross-sectional study were approached for in-depth interviews. Although the original study design aimed to carry out 15 interviews with both positive-behavior and negative-behavior respondents in each site or until distinct patterns emerged, the small numbers of negative-behavior respondents identified through the cross-sectional survey reduced the number of potential respondents. In addition, we found that in several instances respondents identified as practicing negative behaviors claimed to have used a form of ORT and therefore did not meet our definition. The goal was to assess differences in perceptions of diarrheal episodes and management according to the treatment strategy and to compare results across the two study sites. Interviews were administered until information collected became repetitive and strong patterns were evident.

Discussions were carried out with groups of mothers questioned during the in-depth interviews and with separate groups of fathers and grandmothers living in households where at least one child less than five years of age resided and in proximity to communities where the in-depth interviews were administered. Fathers and grandmothers were included to obtain perspectives about diarrheal management in children from a range of family members who play various roles in childcare. Groups consisted of 8–12 participants. The purpose of the group discussions was to complement and validate preliminary study findings and to explore themes raised through the in-depth interview data.

Data collection. Four researchers, three of whom had backgrounds in anthropology, administered the interviews in the predominant local language in the research area. Before the start of the study, researchers received 2 two weeks of training on qualitative research methods from two medical anthropologists. All attempts were made to administer the in-depth interviews in private settings, generally within the household. The researchers took detailed notes during the interview and expanded upon their notes shortly after the interview was completed. Researchers paired up to lead group discussions; one researcher acted as a moderator and one took notes. Discussions were tape recorded and transcribed subsequent to their completion. All interviews and group discussion transcripts were translated into English by the researchers.

Statistical analysis. Once data collection was complete, a coding system was developed that captured the main research

themes and concepts. Using the positive/negative deviance approach, we coded interviews and organized them into matrices according to the research sites. Content analysis was used to identify and compare trends of key concepts in the coded data according to the respondent type while preserving the context to ensure appropriate interpretation of the findings. Data triangulation identified those concepts that could be validated through a combination of data sources, such as multiple interviewees and group discussions.

Ethical review. Written informed consent was obtained from all research participants. The study was approved by the institutional review boards of KEMRI/CDC (Nairobi and Kisumu, Kenya), CDC (Atlanta, GA), and the University at Buffalo (Buffalo, NY).

RESULTS

Background information. In Asembo, we interviewed 13 caregivers who displayed positive behavior and 11 caregivers who displayed negative behavior. In Kibera, we interviewed 15 positive-behavior and 6 negative-behavior caregivers. All primary caregivers were the mothers of the children, except for one respondent, who was the grandmother. No fathers were identified as the primary caregiver. Background information on the respondents interviewed according to the site and caregiver's behavior regarding ORT use are shown in Table 1. The average age of caregivers in the different behavior groups ranged from 24 to 30 years and respondents from Kibera typically had more years of schooling. The mean ages of children with diarrhea ranged from 20 to 33 months in the behavior groups. Sources of household income reflect the environments in which the study took place. More families in Asembo relied on farming, and the primary income in Kibera was skilled or day labor. Group discussions were carried out with one group of positive-behavior and one group of negative-behavior mothers, one group of grandmothers, and one group of fathers in each site.

Perceptions of watery diarrhea and its complications. Nearly all caregivers in both groups characterized their child's recent diarrheal illness as watery diarrhea and explained that with watery diarrhea the child loses excessive water and energy, which precipitates lack of appetite, weight loss, and ultimately a weakened state that can result in death if not treated quickly. A mother in Asembo (ANR6) in the negative-behavior group explained,

The child becomes very weak because the body dries up as a result of losing water. Because the child does not eat food, the body eats itself, making the baby lose weight. The child might end up dying.

All respondents were familiar with dehydration, which they recognized as a serious condition indicating that the child might die. Commonly associated signs and symptoms of dehydration included wrinkled skin, tiredness, dry mouth, extreme thirst, sunken and pale eyes, and fatigue. Caregivers recommended first administering plenty of home fluids, and respondents from Kibera frequently mentioned ORT. Some caregivers also advised going to the hospital, where the child could receive intravenous fluids.

Use of and attitudes towards ORS and other forms of ORT. Caregivers from both behavioral groups possessed basic knowledge about ORT, and generally stated that homemade

TABLE 1
Background information on respondents from positive-behavior and negative-behavior groups, Kenya

Variable	Type of respondent			
	Positive behavior		Negative behavior	
	Asembo, n = 13	Kibera, n = 15	Asembo, n = 11	Kibera, n = 6
Average age of child's caregiver, years (range)	25 (18–52)	24 (16–30)	30 (25–38)	26 (23–28)
Caregiver's education				
Never attended	0	7%	0	0
Failed to complete elementary school	38%	7%	36%	0
Completed elementary school	46%	40%	36%	83%
Completed high school or above	8%	33%	27%	17%
Average age of child with diarrhea, months (range)	28 (6–48)	25 (6–54)	20 (8–42)	33 (13–59)
Source of household income				
Farming	46%	7%	55%	0
Fishing	15%	0	0	0
Business	15%	7%	9%	0
Skilled labor	8%	53%	27%	50%
Non-skilled labor	15%	13%	9%	17%
No response	0	20%	0	33%

Values are percentages unless otherwise indicated.

solutions are a combination of salt and water, with many failing to mention sugar, and that ORS is a powder that contains salt that should be mixed with water. Most learned about rehydration solutions from facility-based health workers such as nurses; respondents were generally more knowledgeable about ORS than homemade solutions. Most caregivers stated that rehydration solutions are important to give to children during a diarrhea episode to replace lost water and energy. Despite this finding, when asked about habitual use, most negative-behavior caregivers from Asembo and all from Kibera said they do not generally administer homemade solutions including ORS. Several respondents from both sites suggested that providing fluids intravenously is the best approach to replacing lost water. Overall, caregivers perceived oral fluid therapies to be medicines because they are given for an existing condition and are believed to contain special properties to replace lost fluids and provide energy.

Before seeking care from health providers, most positive-behavior caregivers gave a form of ORT during initial home management, with homemade salt solution constituting the most common home treatment, followed by increased home fluids and ORS (Table 2). Those caregivers who administered ORS during initial home treatment had received it from a health care provider during a previous visit and stored it at home. Reasons cited for administering ORT at home were the high frequency of passing watery stool and the perceived need to replace lost fluids and energy and to reduce or stop diarrhea. Most caregivers indicated that the solutions did not

stop the diarrhea, and because the diarrhea continued, most children were taken to a health provider. Although caregivers emphasized that it is important to replenish the water and energy lost, stopping the diarrhea was expressed as their principal aim of treatment. Many respondents stipulated that the primary role of ORT is to replenish water loss, indicating they have found through experience that fluid-based medicines are not as effective in stopping diarrhea compared with Western antimicrobial and anti-motility drugs.

Diarrhea management strategies used by negative-behavior caregivers are shown in Table 3. Caregivers from Kibera mentioned several reasons for not giving rehydration solutions at home, most frequently specifying that they do not have anti-motility qualities and children do not like the salty taste and thus either refuse to take or vomit the solutions after administration. One negative-behavior respondent (KNR5) from Kibera explained,

During the last diarrhea episode, my biggest concern was to stop diarrhea, which ORS does not do. Therefore, I did not bother using it. That is why I decided to use syrups, which stop diarrhea within hours.

In Asembo, caregivers from the negative-behavior group stated either that they did not know whether homemade solutions are appropriate for all diarrhea episodes or they did not have ORS packets at home.

Caregivers, particularly those in negative-behavior groups, were often unsure how to prepare sugar-salt solution, which

TABLE 2
Strategies used by positive-behavior caregivers to manage diarrheal episodes before and after seeking care, Kenya

Approaches used to manage the episode	Timing of introduction of ORT or other remedy					
	Asembo, n = 13, no. (%)			Kibera, n = 15, no. (%)		
	Before seeking care	After seeking care	Total	Before seeking care	After seeking care	Total
Sugar-salt solution	4 (31%)	–	4 (31%)	5 (33%)	–	5 (33%)
ORS	3 (23%)	5 (38%)	8 (62%)	2 (13%)	7 (47%)	9 (60%)
Herbs	4 (31%)	–	4 (31%)	3 (20%)	–	3 (20%)
Western medicine	2 (15%)	9 (69%)	11 (85%)	–	14 (93%)	14 (93%)
Both ORS and home solution	–	1 (8%)	1 (8%)	1 (7%)	–	1 (7%)
Other fluids						
Increased	4 (31%)	–	4 (31%)	4 (27%)	–	4 (27%)
Same or less	9 (69%)	–	9 (69%)	11 (73%)	–	11 (73%)

TABLE 3
Strategies used by negative-behavior caregivers to manage diarrheal episodes before and after seeking care, Kenya

Approaches used to manage the episode	Timing of introduction of ORT or other remedy					
	Asembo, n = 11, no. (%)			Kibera, n = 6, no. (%)		
	Before seeking care	After seeking care	Total	Before seeking care	After seeking care	Total
Sugar-salt solution	–	–	–	–	–	–
ORS	–	–	–	–	–	–
Herbs	2 (18%)	1 (9%)	3 (27%)	3 (50%)	–	3 (50%)
Western medicine	1 (9%)	7 (64%)	8 (73%)	1 (17%)	4 (67%)	5 (83%)
Both ORS and home solution	–	–	–	–	–	–
Other fluids						
Increased	–	–	–	–	–	–
Same or less	11 (100%)	–	11 (100%)	6 (100%)	–	6 (100%)

ORS = oral rehydration solution.

consists of half a teaspoon of salt and six level teaspoons of sugar dissolved in one liter of safe water.²² Those caregivers who believed that they could prepare sugar-salt solution described a variety of recipes such as adding a half or one teaspoon of salt and sugar to 1–3 cups of water, one teaspoon of sugar and salt to a half or one liter of water, or eight teaspoons of sugar and salt to half a liter of water. Preparation of ORS was also variable across all groups; some respondents stated contents should be added to a half or a full liter of water, and in a few instances, Asembo respondents and one positive-behavior Kibera respondent recommended adding ORS to one cup of water, and others in the negative-behavior groups suggested adding salt to the mixture. Frequency of administration varied; some caregivers gave fluid-based solutions after every diarrhea episode and others followed a schedule (e.g., every 10 minutes, 2 times a day or 4 times a day). Several caregivers gave one-fourth to half a cup during each session, and others spoon-fed the child small amounts. Respondents from all groups indicated that ORT is time-consuming and difficult to administer, and many stated that children did not like the taste.

Virtually all caregivers believed that ORS was superior to home-prepared solutions and cited a variety of reasons. These reasons included that ORS is packaged and thus considered safer and free of contaminants, and that sugar, which is necessary for home-prepared solutions, attracts insects. Caregivers also emphasized that ORS is developed by experts and is therefore believed to contain special therapeutic ingredients, which makes it more effective in reducing or stopping diarrhea. Other advantages mentioned were that the orange flavor of ORS tastes better and the fact it is pre-mixed makes it easier to prepare. Many respondents mentioned that ORS can be obtained for free at health facilities, while homemade solution is considered expensive because it requires the purchase of sugar and salt, which are typically sold in bulk.

Many caregivers from all groups stipulated that it is first necessary to consult a health provider to ensure that ORS is the suitable treatment. If the health provider does not prescribe ORS, the caregiver assumes it is not appropriate. This negative-behavior respondent (ANR7) from Asembo said,

It is not that we do not like to give ORS; we administer it when it is given in the hospital. The other day I took my child to the hospital and I was not given ORS. I assumed it was not appropriate. There is nothing more I can do because doctors know best.

Caregivers indicated uncertainty about when ORS should be given, particularly because clinicians are inconsistent in

prescribing it. Negative-behavior respondents from Asembo (ANR8) and Kibera (KNR2) explained,

People know that ORS is beneficial but fail to use it because of the problem of not knowing when to use it. There are times when I take my child to the doctor and it is not given and at other times it is given, so I do not understand whether it is only for certain conditions. I cannot keep a supply in the house because when I go to the hospital I may only be given one or two packets, all of which I use during the episode. When I go to the chemist, he does not prescribe it. I cannot just buy it because it is expensive, costing about 15 shillings (US \$0.24 at the time of the study).

If I had been given ORS I would have administered it. I only give ORS when it is prescribed because I do not believe that it is appropriate for all types of diarrhea, particularly since the doctor does not always prescribe ORS when my child has diarrhea. Time and again we are warned about giving children the wrong medications and this is what has been causing me fear. The wrong medication can cause another illness or even worsen the diarrhea. This has made me believe that ORS is appropriate only for certain types of diarrhea and that it is therefore important that a doctor first examines the sick child and recommends the most appropriate treatment.

Correspondingly, most caregivers in positive-behavior and negative-behavior groups emphasized they do not feel confident treating diarrhea at home, underscoring that as non-health professionals, they could not be certain of the cause and type of diarrhea, which made decisions about treatment difficult. Caregivers commonly believed that drug regimens can be variable, thus requiring experts such as health workers to advise about diarrhea treatment. Information collected during group discussions confirmed that caregivers preferred seeking care with trained providers because they first examine the child and are perceived to have the expertise to diagnose and treat diarrheal illnesses appropriately. However, many group discussion respondents suggested that trained providers offer minimal information, and recommended that health workers should better inform caregivers about diarrhea illnesses and home management during health facility visits. Group discussion respondents also emphasized that outreach agents such as community health workers are an important resource that could be more widely used to impart valuable information on diarrhea management and to distribute ORS near their homes.

Most Asembo respondents believed that ORS can only be obtained in health facilities, and caregivers in both the

positive-behavior and negative-behavior groups indicated that distance to the facility made ORS inaccessible. This positive respondent from Asembo (APR8) explained,

ORS is difficult to get though it is safer and more effective because it comes packaged unlike home solution, which is made with measurements that are not always the same. To make sugar-salt solution, I must have sugar in the house, which is expensive. While I get ORS at the hospital, I have to pay 140 shillings (US \$2.22 at the time of the study) for transport because I do not have the strength to walk long carrying a sick child. I have never thought of buying ORS from the shop.

When asked whether they would purchase ORS, Asembo respondents and negative-behavior Kibera respondents generally expressed an unwillingness, and many explained that it is free in health facilities. In contrast, many Kibera caregivers in the positive-behavior group said they would buy sachets for 10–15 shillings (US \$0.16–0.24 at the time of the study) if it is not available in the health center, and several had purchased packets from chemists. However, in practice, caregivers in all groups generally indicated that they only gave ORS when they had a supply at home left over from a previous episode or when they took the child to a health facility.

Use of and attitudes towards Western medicines and herbal treatment. Although few children were given Western medications initially at home, use of Western drugs in the form of tablets and syrups increased substantially after caregivers sought care outside the household. Overall, Kibera caregivers stated that Western medications are the preferred treatment because they stop diarrhea within several hours, and emphasized once again that ORT primarily replenishes water. Several Kibera respondents in the positive-behavior and negative-behavior groups added that syrups are easier to administer than ORT because of the sweet taste. Many of these caregivers did not understand the value of continuing fluid-based therapy once tablets or syrups were obtained, and some stated that these medications were sufficient to treat the diarrhea. Others expressed concerns that the combination of fluid-based and Western drugs may be too powerful and cause harm to the young child.

Asembo caregivers in both groups mentioned a strong preference for herbal remedies, which can be collected in the bush and are believed to be powerful medicines known to stop diarrhea, treat several illnesses simultaneously, purge the stomach of “bad” things, and cure evil eye or witchcraft, which in the rural area was more frequently linked to the cause of diarrhea illness. Many of these caregivers advised against mixing fluid-based remedies with herbs and believed that it may cause a negative reaction in the young child.

Continued feeding. Most breastfeeding children in all groups took less breast milk during the diarrhea episode because of a reduced appetite, and one child in the positive-behavior group in Asembo terminated breastfeeding during the episode. Efforts were made to give porridge, which is believed to provide energy and harden the stool. However, children consumed smaller than usual quantities once again because of a loss of appetite. Most children continued to be offered family meals twice a day, but again took reduced amounts of food. In both negative-behavior groups, a small percentage of children refused to take solids or vomited all foods offered. Although the quantities were smaller, caregivers stated that the ingested

TABLE 4

Frequency of care seeking for treatment of diarrhea in children with health providers of different types by positive-behavior and negative-behavior caregivers, Kenya

Type of provider	Positive behavior, no. (%)		Negative behavior, no. (%)	
	Asembo, n = 13	Kibera, n = 15	Asembo, n = 11	Kibera, n = 6
Health facility	8 (62%)	11 (73%)	3 (28%)	2 (33%)
Chemist	1 (8%)	3 (20%)	4 (37%)	2 (33%)
Herbalist	–	–	1 (9%)	–
Diviner	1 (8%)	–	–	–
Did not seek outside care	3 (23%)	1 (7%)	3 (28%)	2 (33%)

foods provided essential energy and strength necessary for the recovery of the child. Some caregivers added that the herbal remedies or Western drugs administered would have had less effect on an empty stomach and could have even harmed the child in the absence of feeding.

Care seeking behaviors and perceptions about health workers. Caregivers sought health care because the diarrhea continued, and most positive-behavior caregivers went to a health facility with the expectation of receiving Western medications that stop diarrhea (Table 4). Other reasons positive-behavior caregivers gave for choosing the health facility were that services were free or less expensive, the facility was close to home, and professional care was available. Negative-behavior caregivers most frequently sought outside care with a chemist or at a health center and explained that the provider was nearby. In the case of those who visited a health facility, it was also mentioned that care was free or inexpensive. Once again, the expectation was to receive Western medicines that would stop diarrhea quickly. Group discussion participants claimed that care is sought with chemists only when caregivers know which medicine to give and explained that chemists are often poorly trained. Combinations of medicines were reportedly prescribed by health facility workers and chemists, and ORS was given in most positive-behavior cases. As a result, administration of ORS increased substantially after positive-behavior caregivers visited a trained health provider. Caregivers in the negative-behavior groups stated that ORS was not provided by the health worker, and therefore they understood it was inappropriate for that diarrhea episode. Respondents in both behavioral groups mentioned they would have been dissatisfied if only ORS was given because it is not believed to be sufficient as a single treatment of diarrhea.

One negative-behavior caregiver from Kibera (KNR4) said,

I would have felt my husband had been cheated were the child given ORS only. This is because ORS only adds water and energy to the child's body; based on previous experience, it does not stop diarrhea. The most important thing is to stop the diarrhea. The other thing is that I am told to give ORS in large quantities and I find this difficult because my child does not like the salty taste. I prefer that the doctor give me syrups because they are easy to administer.

DISCUSSION

The qualitative nature of this study enabled us to examine in depth barriers to use of ORS and other forms of ORT in rural and urban sites in Kenya, where diarrhea remains a

leading cause of childhood death. The results underscore that the primary concern of caregivers is to stop the diarrhea. Misunderstandings about the role of ORS and other forms of ORT in diarrhea case management, perceptions that ORT is not appropriate in all cases of watery diarrhea, and beliefs that ORS is a medication that must be prescribed by health workers interfered with initial use at home. Caregivers prefer to treat diarrhea with Western medications obtained from health providers who may also provide ORS. A heavy reliance on facility-based workers for ORS, and inconsistencies in the way these workers recommend ORS, decrease use at home by caregivers. In the rural community, beliefs in herbal remedies, cost, and distance to health facilities presented additional barriers to use of fluid-based therapies, especially ORS.

Although respondents consistently recognized the importance of replacing water and energy during diarrheal episodes, many lacked confidence in administering ORS without first consulting a health provider. This reluctance to administer ORT at home appears to be linked to the common perception that ORS, and even homemade solutions, are medications. There was a prevailing concern about administering a drug before obtaining a medical diagnosis and treatment recommendation. Paradoxically, the perceived need to elicit the advice of facility-based health workers, who are widely regarded as indisputable experts in the treatment of childhood diarrhea and believed to hold special powers to cure with medications, combined with the inconsistency by which health workers prescribe rehydration solutions, appeared to work on many levels to decrease administration of ORT.

Research conducted in Haiti and Nicaragua also found that ORS use was related to attendance in a medical facility, and in northeastern Brazil, Nations and Rebhun⁹ reported that health workers medicalized the use of ORT as a complicated procedure that needed to be confined to hospitals and clinics. In our study, caregivers assumed that ORS was not appropriate for that particular diarrhea episode if the health worker failed to recommend it. Correspondingly, differences between positive and negative behaviors were frequently linked to whether trained providers prescribed or did not prescribe ORS. The control of the health provider over the use of ORS has likely influenced perceptions that ORS is a medication and that diarrhea should be treated in a facility, thus undermining the simplicity of this life-saving technology. This information helps to explain findings from the cross-sectional study carried out in the same sites, which showed that caregivers who gave ORT were more likely to have sought care from a health facility than caregivers who did not give ORT.²¹ In sharp contrast, in countries such as Bangladesh where more than 75% of children with diarrhea are reported to be given ORS, caregivers take initiative to obtain ORS from informal providers such as chemists and shopkeepers and to administer ORT independently and manage diarrhea episodes at home.²³

Our data highlight that because of the perceived seriousness of diarrhea illnesses in young children, the first priority of caregivers was to stop the diarrhea. Many caregivers erroneously attributed anti-motility qualities to ORT and were subsequently dissatisfied when ORT failed to meet expectations to reduce stool output, concluding that it was not effective and subsequently choosing not to use it. Health workers regularly prescribed Western drugs for diarrhea, which given their posi-

tions of authority, likely influenced the belief that Western medications are the most effective diarrhea treatment and ORT is less critical. Our findings also revealed perceptions that it is not necessary to continue administering ORT once Western drugs are introduced, illustrating the mistaken belief that drugs hold superior properties in stopping diarrhea and that their application obviates the need to ensure rehydration. Although the data suggest widespread knowledge about the seriousness of dehydration, the understanding of the rehydration function of ORT and its relation to prevention and treatment of dehydration, which is what kills young children, appears to be missing.

Social scientists studying diarrhea management in the 1980s and 1990s also found that perceptions that ORT has curative functions in relation to reducing or stopping diarrhea interfered with ORT use.^{6,7,10} Judging ORT with the same anti-motility criteria as other remedies was shown to lead to dissatisfaction in its effect and to decrease use. Conversely, caregivers who held an appreciation for the function of ORT in dehydration prevention and treatment supported its importance. In Haiti, Coreil and Genece⁷ were able to distinguish between non-users and users of ORS as caregivers who held either a curative theory model or those who held a hydration theory model. Hudelson¹⁰ explained the differences between users and non-users in a semi-urban center of Nicaragua by highlighting discrepancies in subscription to the folk meaning of diarrhea treatment (stopping the diarrhea), as opposed to the biomedical perspective (maintaining fluid balance). Results from these studies highlight the importance of informing people that rehydration is critical to diarrhea treatment and explaining the function and properties of ORT in preventing dehydration. In Kenya, imparting such knowledge should overcome some of the barriers to ORT use and encourage caregivers to initiate therapy at home.

Even if understanding of the role and perceived value of ORT improved, limited access to ORS packets poses another key barrier to widespread use. In the rural site, distance and money required for transport were given as major obstacles to care seeking, highlighting the need to distribute lifesaving ORS packets to outlets closer to the homes of persons. The continued use of herbs in the rural site is likely in part caused by the lack of easy availability of alternative strategies and health information. Historically, ORS was effectively distributed through community health workers, and group discussion respondents from this study emphasized that outreach workers could play a critical role in informing communities about diarrhea management and distributing ORS packets. Expanding its distribution to kiosks and pharmacies and promoting awareness of their availability in those settings might substantially increase use of ORS.

The data illuminated a strong preference for ORS over homemade solutions. The findings revealed many obstacles to preparation and administration of homemade solutions, including the cost of purchasing ingredients, difficulty in storing ingredients under hygienic conditions, and confusion about ingredient proportions. Recipes collected varied widely, yielding a range of concentrations of solutions unlikely to be effective, and in some cases potentially dangerous because of their high salt or sugar concentrations. The frequency of fluid administration was also highly variable, and often much lower than recommended. We also detected confusion about ORS preparation, which likely reflected availability of

different types of packets in Kenya. Inappropriate preparation and administration of rehydration therapies undermine their efficacy and may adversely impact acceptability to caregivers and children. These data highlight the need to develop and disseminate simple, easily understood messages, focusing on the proper preparation and effective administration of the widely preferred ORS packets over homemade solutions. The findings also underscore the need to improve the taste of ORS products so that they are more readily consumed by children.

In Kenya, facility-based health workers who are presently giving conflicting and often false advice on ORS use have the responsibility to share technically appropriate knowledge designed to provide suitable expectations regarding ORT function and to equip caregivers to take the initiative to administer ORS at home early in the course of every episode of diarrhea. This responsibility is especially important because risk of death for children from severe watery diarrhea is greatest within the first 24 hours of illness.^{24,25} Findings from this study suggest that refresher training should be offered to existing facility-based health workers. Given the heavy dependence of caregivers on the advice of the health care worker, education for future health workers on the therapeutic properties of and indications for ORS use should be strengthened, as should the importance of consistently prescribing and distributing ORS and how to communicate ORS preparation and administration.

Efforts should also be made to educate informal providers such as chemists about the function of ORS and encourage that they prescribe rehydration salts for diarrhea illness. As part of this process, information should be transmitted to health workers to discourage the use of antimicrobial and anti-motility drugs, unless specifically indicated. Investigations should also be carried out to identify factors or incentives that may influence the over prescription of antimicrobial drugs by health workers and how these can be addressed. In addition, community health messaging must go beyond simply imparting knowledge about the benefits of ORS, information that does not necessarily change behavior. It will be critical to disseminate medically correct and culturally relevant information that give caregivers confidence about the safety and value of ORS and the lack of need for a recommendation from formal health workers before giving rehydration therapy to their children with diarrheal illness. These efforts must take into account existing beliefs and practices related to the perceived role of ORT and drug and herbal therapies in diarrhea management and determinants of treatment choice for people living in poverty.

Policy makers need to endorse more effectively the government approach to diarrhea management, which involves use of ORS packets.²⁶ Renewed efforts are necessary to ensure that ORS packets are available in remote areas at an affordable price and that outreach workers are more instrumental in encouraging and monitoring their proper use. Efforts are also needed to incorporate herbalists into diarrhea case management programs so that they can also promote the use of ORS for prevention of dehydration from diarrhea.

This qualitative study provided important insights into the use of ORT in Asembo and Kibera. Our findings elucidate why survey data showing increased knowledge of biomedical facts did not correspond to increased adoption of ORS and other forms of ORT. Rather, the misconception that replenishing fluids is less important than stopping diarrhea and errone-

ous beliefs about the function of ORT in diarrhea treatment undermine ORT use. These findings once again highlight how incongruities between local and biomedical models related to the meaning of successful treatment can interfere with appropriate care.¹⁰

Strikingly, similar barriers to ORT use identified in a variety of contexts in the 1980s and 1990s still exist. Although findings from the 2008–2009 Demographic and Health Survey suggest that the ORT use rate has increased in Kenya since the last survey, the data also show a sharp increase in the percentage of children with diarrhea who were taken to a health facility or provider for treatment, indicating that the perceived need to consult formal health providers during episodes of diarrhea is increasing.²⁷ Moreover, recent trends showing a general reduction of ORT use in sub-Saharan Africa suggest that obstacles identified in this study are likely to be encountered in other settings in Africa. This finding raises serious concerns about the inability to translate research findings into action and poses questions about why we are failing to ensure widespread use of this simple, highly effective, life-saving intervention. In Kenya, present efforts to improve diarrhea case management that are implemented primarily in health facilities are not sufficient. Alternative outreach strategies providing accurate information on the function of ORS in the prevention and treatment of dehydration, and focusing on behavioral change at the community and household level need to be revitalized so that caregivers understand the importance of ORT and feel empowered to obtain ORS and manage diarrheal illness at home.

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Authors' addresses: Lauren S. Blum, Dulles, VA, E-mail: laurenblum@yahoo.com. Prisca A. Oria, Centers for Disease Control and Prevention, Nairobi, Kenya, E-mail: Porja@kemricdc.org. Christine K. Olson, Centers for Disease Control and Prevention, Atlanta, GA, E-mail: colson@cdc.gov. Robert F. Breiman, Centers for Disease Control and Prevention, Nairobi, Kenya, E-mail: rbreiman@ke.cdc.gov. Pavani K. Ram, Department of Social and Preventive Medicine, University at Buffalo, Buffalo, NY, E-mail: pkram@buffalo.edu.

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