



**DIARRHEAL DISEASE:**  
Solutions to Defeat a Global Killer



**Tragically, diarrheal disease remains one of the leading killers of children around the world, responsible for the deaths of nearly 1.6 million children annually, yet it is no longer considered a global health priority.**


Diarrheal disease is the most common cause of illness and the second-leading cause of child death in the world. It is claiming the lives of nearly 4,000 children each day. The burden is greatest in the developing world, where access to safe water, sanitation, and medical care is often limited.

We can change this.

The global health community has at hand the knowledge and solutions to prevent and treat diarrhea. By increasing awareness; making proven, lifesaving interventions such as health, safe water, and sanitation solutions widely available to everyone who needs them; and working to reestablish diarrheal disease as a global health priority, we can save millions of children's lives around the world.

Please join with us to aggressively meet this growing challenge, because no child should die from diarrhea.

Sincerely,

A handwritten signature in black ink, appearing to read 'Chris Elias', with a stylized flourish at the end.

Christopher J. Elias, MD, MPH  
President and CEO, PATH

### SOMETHING AS PREVENTABLE AND TREATABLE AS DIARRHEA SHOULDN'T KILL KIDS

But it does. Around the world, every day, more than 4,000 children lose their lives to diarrhea. It is the second-leading killer of children under the age of 5 worldwide. Diarrheal disease claims the lives of 1.6 million children annually and is responsible for the hospitalization of millions more.<sup>1</sup>

Beyond the potentially devastating and immediate impact of diarrheal disease, it can also have long-lasting implications. Diarrhea causes more illnesses than any other ailment.<sup>2</sup> Children who survive persistent diarrhea are likely to suffer from malnutrition, stunted growth, and learning difficulties.

While diarrheal disease is a global killer, it disproportionately strikes those living in developing nations, where the children at greatest risk are those who may be malnourished and lack access to clean water, proper sanitation, and urgent medical care.

#### Deaths from diarrhea disproportionately target the poor due to:

- Poor environmental sanitation
- Inadequate water supply
- Poverty
- Limited education

Diarrheal disease doesn't have to be a top killer of children in developing countries. Proven, lifesaving interventions already exist. They include prevention methods such as improved sanitation and hygiene, access to safe drinking water, vaccines, exclusive breastfeeding, and optimal complementary feeding. And, when diarrhea does occur, treatment options such as oral rehydration solution (ORS)/oral rehydration therapy (ORT)

and zinc treatment speed recovery and save lives. In the 1980s and 1990s, diarrheal disease was considered a global health priority. The support for the implementation and aggressive scale-up of intervention methods among political leaders along with research and funding commitments from the international community led to dramatic gains in the fight against diarrhea, including a reduction of mortality rates by almost 50 percent.

But over the last decade, momentum has slowed, with declines in research and funding commitments and competing global health priorities. The perceived lack of urgency and taboo nature of the illness may have also contributed to the current low level of awareness surrounding the issue. There have been advocacy challenges as well, because groups have acted in isolation and failed to exploit opportunities to collaborate across sectors. All of this has contributed to stagnated progress and even declines in intervention coverage in some countries. This is occurring at a time when the World Health Organization (WHO) has reported that diarrheal disease is the most common illness in the world.<sup>2</sup>

Diarrheal disease is not just a health issue but an economic one as well. In sub-Saharan Africa, for example, treating water-borne diseases like diarrhea costs governments at least 12 percent of their total health budget each year.<sup>3</sup> The World Bank estimates that environmental health problems

## **WE CAN DRAMATICALLY REDUCE DIARRHEAL DISEASE DEATHS NOW WITH PROVEN LIFESAVING PREVENTION AND TREATMENT METHODS**

**Safe water, improved sanitation, and good hygiene.** Dirty water and hands are two of the primary ways diarrheal disease is spread. Hand-washing with soap, the safe disposal of human and animal waste, and clean drinking water all help to prevent diarrheal disease.

**Vaccines.** Vaccines that prevent rotavirus—the most common and lethal cause of diarrheal disease—have the potential to save nearly 2.5 million children’s lives in the next 20 years.<sup>4</sup> In June 2009, the WHO recommended rotavirus vaccines for global use.<sup>5</sup> The recommendation was based on clinical trial data demonstrating vaccine efficacy in impoverished, high-mortality settings and builds on a 2006 recommendation to include rotavirus vaccines in the national immunization programs of countries in North America, Latin America, and Europe. Informed by the WHO’s recent global recommendation, the GAVI Alliance, a global health partnership that works to save lives by increasing access to vaccines, is accepting applications for rotavirus vaccine introduction financial support from developing countries in Africa and Asia.

**Exclusive breastfeeding and optimal complementary feeding.** Exclusive breastfeeding (no additional food and fluids) provides infants 6 months of age and younger with essential nutrients and immune factors that both protect them from diarrheal disease and speed diarrhea recovery when episodes occur. Optimal complementary feeding with continued breastfeeding for infants and young children ages 6 to 24 months is essential to ensure they are healthy, well nourished, and better able to survive an episode of diarrhea.

**Oral rehydration therapy/oral rehydration solution.** Severe diarrhea can lead to life-threatening dehydration. ORT and ORS involve rehydrating children by replacing fluids and electrolytes lost through diarrhea. The broader intervention method, ORT, involves rehydrating children through increased appropriate and available fluids and continued feeding to prevent and treat diarrhea-related dehydration. ORS is a specific way of implementing ORT. It is a simple mixture of sugar and salt added to clean water and can be administered at home.

**Zinc treatment and other micronutrients.** Treatment of diarrheal disease with zinc supplementation can reduce the severity and duration of diarrhea episodes. It may also prevent future episodes for up to three months. Other micronutrients, particularly vitamin A, are also important in controlling severe episodes.

such as diarrhea and associated malnutrition cost low-income governments up to 9 percent of their annual gross domestic product (GDP).<sup>6</sup>

### **We can change this.**

Today, the leading causes of death among children under the age of 5, particularly in the developing world, are pneumonia and diarrhea. These illnesses are both preventable and treatable. The global

health community possesses the interventions and knowledge to save millions of children’s lives worldwide. We can do this by prioritizing diarrheal disease on the global health agenda; educating, increasing awareness, and mobilizing health care providers, policymakers, and the larger global community around the burden of diarrheal disease and the lifesaving interventions that exist today; and implementing these solutions with a coordinated approach.

“Diarrhea is the world’s most effective weapon of mass destruction.”

— Rose George, journalist and author of *The Big Necessity: The Unmentionable World of Human Waste and Why it Matters*<sup>7</sup>

### Diarrheal Disease Transmission and Burden

The WHO defines diarrhea as the passage of three or more loose or liquid stools per day, or more frequently than is normal for an individual. It is caused by bacterial, viral, or parasitic organisms and is usually a symptom of gastrointestinal infection.

Diarrheal disease is transmitted through the fecal-oral route and is spread through contaminated food and drinking water or from person to person as a result of poor hygiene and sanitation. Diarrhea is life-threatening because it leads to fluid loss and can cause severe dehydration. Infants who are not exclusively breastfed, young children, and adults who are malnourished or have weakened immune systems are at greatest risk.<sup>8,9</sup>

There are three major diarrhea syndromes: acute watery, persistent, and bloody.

■ Acute watery diarrhea is the type that most likely leads to rapid dehydration. This form is the most deadly in young children and is commonly associated with rotavirus, enterotoxigenic *E. coli*, or *V. cholerae* (cholera).

■ Persistent diarrhea, a less common form, is typically connected with malnutrition and is disproportionately associated with an increased risk of death.



*Evalyne does everything she can to protect her son, shown here, from the fatal diarrhea that took his brother's life.*

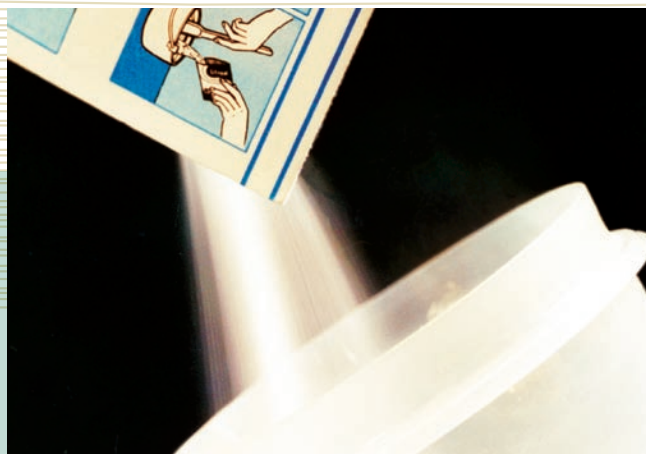
■ Bloody diarrhea is often related to malnutrition, intestinal damage, or secondary sepsis. It is often associated with dysentery.<sup>9</sup>

Diarrhea has both short-term and long-lasting effects, ranging from severe dehydration to malnutrition, which in turn can weaken its victims' immune system and make them more susceptible to future diarrhea episodes as well as other illnesses. Children who are malnourished are also more susceptible to the consequences of diarrhea. In fact, many children dying of diarrhea would likely survive if they were adequately nourished.<sup>10</sup> Studies indicate that diarrhea can also lead to long-term physical impairments such as stunted growth and reduced intellectual development.<sup>9</sup>

Whether a child survives a diarrhea episode or not may depend on where they live. While diarrheal

## EARLY SUCCESS IN EGYPT

In 1977, diarrhea-related dehydration was responsible for the deaths of nearly half of the infants in Egypt. To address this, the National Control of Diarrheal Disease Project of Egypt was formed to promote the use of locally produced oral rehydration salts—used to treat dehydration—and inform mothers of small children about the appropriate treatment for diarrhea. The project trained health care workers on the optimal treatment for diarrhea-related dehydration and reached mothers through television and other mass media programming, which led to almost universal awareness among Egyptian mothers and a four-fold increase in the distribution of oral rehydration salts. From 1982 to 1987, with a significant funding effort by the US Agency for International Development (USAID), diarrhea-related infant deaths fell by 82 percent and diarrhea-related deaths in older children fell by 62 percent.<sup>11</sup>



disease occurs worldwide, 90 percent of diarrheal disease deaths in children under age 5 occur in developing countries.<sup>12</sup> In these regions, awareness of and access to existing lifesaving interventions are often limited. In fact, research indicates that only about one-third of children suffering from diarrheal disease in developing countries actually receive the recommended treatment they need.<sup>13</sup>

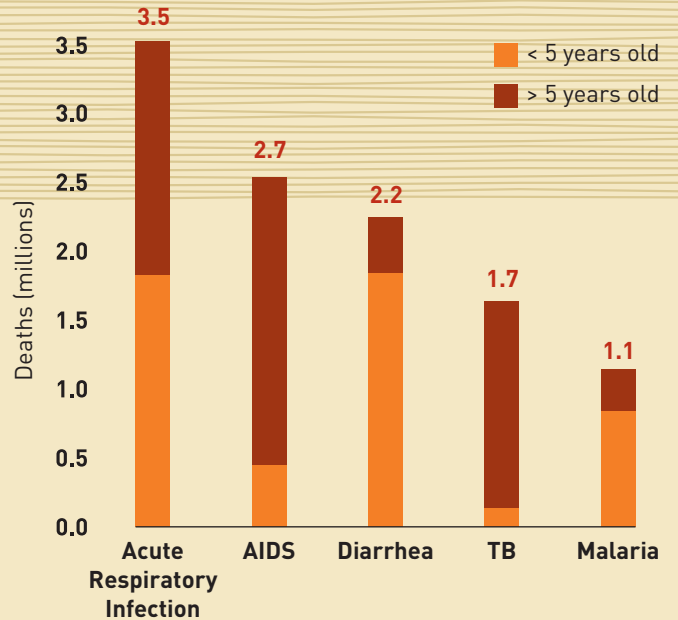
### **No Child Should Die From It. No Parent Should Dread It.**

Evalyne, a mother of three children living in Kenya's Western Province, experienced something almost all parents go through: her 2-year-old son, Abel Juma, became sick with diarrhea. While diarrheal disease is both preventable and treatable, in Kenya and many other parts of the world it can be fatal.

Concerned about Abel Juma's condition, Evalyne carried him to the nearest health clinic—journeying on foot from their home. Because the two medical officers at the clinic serve a community of more than 200,000 people, there are hundreds of visitors at the clinic each day. Evalyne and Abel Juma waited for hours to see a doctor to receive free oral rehydration for his diarrhea-induced dehydration. Evalyne, like most people in low-income countries, lives on less than US\$1 per day and could not afford the oral rehydration salts sold for US\$0.25 at the local pharmacy. As the hours dragged on and Abel Juma's condition continued to deteriorate, Evalyne grew desperate and eventually left the clinic to see a traditional healer, who treated Abel Juma with herbs. Abel Juma died the following day, having never received the doctor's care or the treatment he needed.

## THE LEADING KILLERS OF CHILDREN

### Deaths from diarrhea disproportionately target children



Source: WHO, 2000.

Evalyne’s experience, sadly, is not unique. In fact, her neighbor, Paula, lost her nephew to diarrhea when he was 6. Paula has five children of her own, and her 3-year-old daughter nearly died when she became severely dehydrated from diarrhea. Now, Paula says, when one of her children gets diarrhea, “I am afraid of losing my child every time.”

Abel Juma and Paula’s nephew are just two of more than 1 million children whose lives are lost each year to diarrheal disease. Their mothers’ excruciating experience—shared by millions of parents around the world—could have been prevented.<sup>14</sup>

### Diarrheal Disease Mortality Can Be Stopped

In the 1980s and 1990s, dramatic gains were made in the fight against diarrheal disease. Diarrhea-related deaths were reduced from nearly 5 million to almost 2.5 million annually. This was due to a combination of factors:

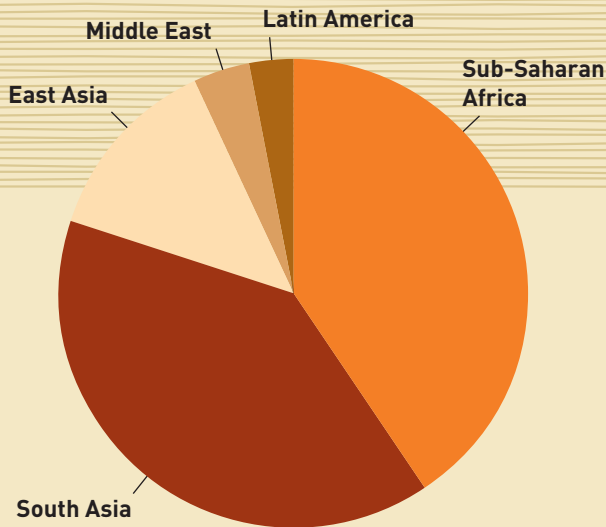
- Diarrheal disease became a highly visible global health priority.
- Extraordinary improvements were made in access to safe drinking water and sanitation. In total, development efforts during the International Drinking Water Supply and Sanitation Decade (1981 to 1990) and the following decade (1991 to 2000) provided water to more than 2 billion people and sanitation to more than 1.5 billion.<sup>15</sup>

■ Dr. James Grant focused the United Nations Children’s Fund (UNICEF) efforts on ORS, highlighting the success of the simple sugar and salt solution’s ability to prevent diarrhea-related mortality. This paved the way for other nongovernmental organizations (NGOs), countries, and donors to focus on diarrheal disease.

■ The WHO created the Diarrheal Diseases Control Program (CDD) and devoted significant resources and funding to it. The larger global health community mobilized around the issue. For example, UNICEF, USAID, the World Bank, and the United Nations Development Program (UNDP) joined efforts to collaborate on country-level programming and training for health care providers and communities.



## WHERE DO CHILD DEATHS FROM DIARRHEA OCCUR?



Source: Borrazzo, 2009.

■ Countries followed suit. ORS programs were aggressively implemented in Bangladesh, Egypt, Ethiopia, India, and Pakistan.

But throughout the 1990s, global health priorities shifted, and some considered the issue solved due to the dramatic reduction in mortality rates. As NGOs and donors reallocated attention and resources, diarrheal disease began to lose salience as a global health priority. At the same time, issues such as HIV/AIDS, TB, and malaria emerged as global health priorities.

While successful in reducing the diarrheal disease death toll, the earlier strategy focused on diarrhea treatment and mortality reduction rather than preventing diarrheal disease in the first place. Over time, diarrheal disease incidence rates continued to remain high in developing nations.

Today, even with the dramatic gains made earlier in the fight against diarrhea, it is still the second-leading killer of children around the world. Diarrheal disease is no longer considered a global health priority, and the children in developing nations where the diarrhea burden is greatest are not receiving the simple and effective interventions they need.

**We can change this and stop this global killer now.**

- Numerous cost-effective, lifesaving sanitation, hygiene, and health interventions exist. By increasing awareness of and access to these interventions, millions of lives can be saved.
- Existing interventions and the development of new tools to fight diarrheal disease have the potential to generate further funding for diarrheal disease efforts and motivate a scale-up approach to addressing diarrheal disease.
- The global health community has committed to improving conditions for children around the world with the Millennium Development Goals (MDGs). Fighting diarrheal disease can spur progress toward achieving targets in MDG 4 (reducing child mortality by two-thirds) and MDG 7 (reducing by half the number of people without sustainable access to safe drinking water and basic sanitation) before the 2015 target deadline.

■ Donors and policymakers have indicated an interest in investing in solutions that will help countries reach these goals. Funding for child health, water, and sanitation efforts is increasing—but not quickly enough. And leaders in countries such as India, Indonesia, and Nicaragua, where the diarrheal disease burden is great, have expressed a need to address diarrheal disease as a national health priority.<sup>16</sup>

**This is the time to act.**

“Diarrheal disease is like an emergency happening every day, and it’s easily preventable...” — Dr. Greg Allgood, Director of Children’s Safe Drinking Water, Procter and Gamble<sup>17</sup>

Nearly nine out of ten child deaths due to diarrhea could be prevented by interventions existing today. There are more effective and lifesaving solutions for preventing and treating diarrhea than any other childhood illness.<sup>18</sup> Because diarrheal disease has many different causes and infections respond differently to each intervention method, successfully combating diarrheal disease requires a coordinated approach that includes both prevention and treatment methods to effectively address and treat all of the possible causes and effects of diarrhea.

Diarrheal disease prevention methods include improving water quality, sanitation, and hygiene. Exclusive breastfeeding can prevent and mitigate the effects of diarrhea in infants under 6 months of age. In addition, existing vaccines for rotavirus and vaccines currently under development for the bacterial causes of diarrhea have the potential to save millions of lives.

### :: Safe Water

Water touches every part of our lives, from drinking to food preparation to bathing to cleaning. Because of this, access to safe, clean water is critical. However, in the developing world where infrastructure may be lacking, people are more likely to be exposed to water contaminated with pathogens, including bacteria, viruses, and parasites from human and animal waste. Exposure to contaminated water puts people, especially

young children, at risk of diarrheal disease and other illnesses.<sup>19</sup>

Worldwide, more than 1 billion people lack access to safe drinking water, and many more drink grossly contaminated water.<sup>12</sup>

Diarrhea can be prevented with proven, cost-effective measures such as water purification, improved sanitation, and hand-washing. While the long-term solution to effective diarrhea prevention likely rests on increased investment in water and sanitation infrastructure systems, home-based tools can dramatically save lives today.

### :: Point-of-Use and Household Water Treatment and Storage Approaches

**Problem.** Water can be contaminated at its source, as it is transported, and at the point of its consumption.

**Solution.** Point-of-use (POU) treatment and household water treatment and storage (HWTS) involve disinfecting water prior to use. POU treatment and HWTS both allow individuals and communities to treat their own water. These methods encompass a variety of low-cost

## CLEAN WATER, BETTER SCHOOL ATTENDANCE



The negative consequences of contaminated water extend far beyond health issues such as diarrheal disease. For example, in Malawi, contaminated drinking water and the diarrheal disease it causes led to children missing many days of school. The Midzemba ADP Schools Safe Water Project, a partnership between Procter and Gamble's Children's Safe Drinking Water Program, World Vision, and Population Services International/Malawi, worked to reduce diarrheal disease episodes and absenteeism in target area schools.

The program implemented POU water treatment in target schools using WaterGuard Wa Ufa (known as PUR in the United States). A small four-gram satchel of the powdered treatment has the capacity to clean ten liters of water by killing bacteria and viruses and removing solid materials in about 20 minutes. The water disinfectant was used by students at these schools along with complementary diarrheal disease intervention methods, including hand-washing with soap after using the restroom and improving sanitation by increasing the number of pit latrines available to students.

Students were provided with treated drinking water at school, buckets with taps for storing treated water, and materials for hand-washing. The schools also worked to raise awareness about the importance of hand-washing with soap and drinking treated water.

The program led to a 90 percent reduction in diarrheal disease in target schools and a 57 percent reduction in school absences. Additionally, pit latrine coverage increased by 75 percent.

Broader benefits were also realized in the general community. Children brought their improved hand-washing habits to their families, leading to a more than 50 percent decrease in diarrheal disease in this Malawi community.<sup>20</sup>

approaches, including disinfection by the sun, UV lamps, boiling, filtration, absorption, and chemical disinfection such as using a chlorine or bleach treatment and flocculants.<sup>19</sup> Boiling water is the most common method used in households today. Safe storage following water purification treatment is necessary in order to prevent subsequent water contamination. The success of this intervention method is dependent upon education and the resulting individual behavior change.

**Impact.** When implemented correctly, POU treatment can be more effective than treating water at its source.<sup>12</sup>

*POU treatment and safe storage can reduce diarrhea by 30 to 50 percent.<sup>21</sup>*



An excited crowd of children watch a WaterAid puppet show.

## NEW SANITATION HABITS IN MADAGASCAR

For generations of Madagascans, the prospect of using a latrine meant confronting superstitions and changing traditions—not an easy task. When children learn from an early age that squatting over a pit can induce a miscarriage or that excrement does not belong in the same ground that holds their deceased family members, education to dispel these myths is just as important as the actual latrines themselves.

Today, only 7.5 percent of the rural population in Madagascar has access to adequate sanitation, according to WaterAid. But residents of Mangarivotra are trying to change attitudes toward latrines. In a village where only a few residents are literate, the message about clean sanitation through the use of latrines is communicated by a series of puppet shows. Nearly 300 children watched several young puppeteers demonstrate how the latrines will keep them healthy. Now, the latrines are so popular in some areas, security guards have begun monitoring toilet factories.<sup>22</sup>

### ❑ Improved Sanitation

Sanitation involves the safe disposal of human and animal waste and the associated hygiene.

*More than 200 million tons of human waste goes uncollected and untreated annually, leading to contaminated water sources, food, and people's hands, all of which can spread cholera, typhoid, dysentery, and other potentially fatal diseases.*

*A child dies every 20 seconds as a direct result of poor sanitation.<sup>23</sup>*

**Problem.** Currently, 40 percent of the world's population does not even have access to a safe pit

In developing countries, one in five people does not have access to safe water.

Roughly half are without proper sanitation.<sup>24</sup>

latrine. To address global sanitation needs and the related illnesses poor sanitation can lead to in developing nations, the United Nations (UN) created a specific sanitation-related target in its MDGs. The target calls for the number of people without sustainable access to safe drinking water and sanitation to be reduced by half by 2015.<sup>25</sup> At current rates, this target will not be reached in

## COMPETITION LEADS TO REDUCTION IN DIARRHEA

The World Wildlife Fund, in partnership with Johnson & Johnson, began working in Cameroon to provide training and tools for residents in Lobeke National Park to construct latrines in their communities. A friendly competition between villages led to rapid construction across a region where sufficient sanitation is nearly nonexistent.

As a result, the Salapoumbé Private Catholic Hospital in southeastern Cameroon reported that children with diarrhea admitted to the hospital dropped significantly a few months after the latrines were introduced. Building on this success, funds were extended to the hospital to create an additional water source, thereby providing clean water to its patients as well as general residents. Construction is scheduled for 2009.<sup>26, 27</sup>



two regions where the diarrheal disease burden is greatest: it will not be reached in South Asia until 2043,<sup>28</sup> and it will not be reached in sub-Saharan Africa until 2076.<sup>29</sup>

**Solution.** Sanitation can be improved by discouraging open defecation and encouraging the safe disposal of human waste with covered, properly maintained pit latrines—which are more commonly used in rural areas—and community septic tanks and sewer systems in urban areas. Children’s waste should also be properly handled and disposed.<sup>29</sup>

**Impact.** When implemented correctly, sanitation can reduce diarrheal disease by 36 percent.<sup>29</sup>

“Far more people endure the largely preventable effects of poor sanitation and water supply than are affected by war, terrorism, and weapons of mass destruction combined. Yet, those other issues capture the public and political imagination—and public resources—in a way that water and sanitation issues do not. Why? Perhaps it is because most people...find it hard to imagine defecating daily in plastic bags, buckets, open pits, agricultural fields, and public areas...”

— Jamie Bartram, Kristen Lewis, Roberto Lenton, and Albert Wright for the WHO and UN Millennium Project Task Force on Water and Sanitation<sup>25</sup>



## SONGS CAN EFFECTIVELY EDUCATE KIDS ON HOW TO STAY HEALTHY

Maintaining good hygiene is a very serious issue in Tanzania, where cholera and diarrheal diseases frequently keep kids sick and away from school. However, school attendance has risen at Kisasi Primary School in Singida because the children are learning about good hygiene through song and sharing these songs with their families.



“We can prevent diseases like cholera, bilharzia, and diarrhea  
We have to get rid of them completely and wipe them out  
We should not walk barefoot by water  
We should boil water before drinking it  
We should wash our hands after going to the latrine and  
before eating  
Don’t wash at the water point  
We can get rid of diarrhea.”

In a country where the act of washing one’s hands can reduce diarrheal diseases by 40 percent, these simple songs are saving lives.<sup>30</sup>

### :: Better Hygiene

Many illnesses, particularly diarrhea, can be prevented with proper hygiene and sanitation practices.

**Problem.** Contaminated hands are one of the main ways diarrheal disease is spread.

**Solution.** Hand-washing with soap can interrupt the transmission path of diarrhea.<sup>19</sup> While soap is widely available in many parts of the developing world and is used for washing the body and

clothes, it is not always used in hand-washing, because it can be expensive. In areas where the cost of soap is significant, ash can be used as an effective cleanser. It is critical to educate parents and caregivers about the health benefits of hand-washing. In some countries, hand-washing after using the bathroom is not commonly practiced. Only 3 percent of people in Ghana, 6 percent in Peru, and 31 percent in Senegal wash their hands after defecation.<sup>31</sup>



The top killers of children in the developing world are diarrheal disease and acute respiratory infections like pneumonia. The simple act of hand-washing with soap can cut diarrhea risk by almost half and respiratory tract infection by a third.<sup>31</sup>

example, sanitation with increased hygiene can reduce incidences of diarrhea by 65 percent.

**Impact.** Optimal hand-washing with soap can reduce diarrhea by 45 percent.<sup>29</sup>

Since hand-washing requires a behavior change, it works best as part of a broader package of comprehensive intervention methods.<sup>9</sup> For



## KEEPING INFANTS HEALTHY

In Lesotho, a common cultural practice is to wait until a newborn's umbilical cord falls off to begin breastfeeding. When Mamorena Namane gave birth, she fed her child only water for the first seven days of his life. She noticed that her son was frequently ill and later learned that not beginning breastfeeding immediately could have put her baby at risk.

Breast milk is the healthiest and safest food for infants in the first six months because it gives them critical nutrients, antibodies, and fluids to help decrease their risk of illness and infection, including diarrheal disease. USAID's Infant and Young Child Nutrition Project, implemented by PATH, is working to raise awareness among families and communities about healthy and safe feeding practices for young children so that mothers learn how to protect their babies

and young children from illness. This important information is currently spreading throughout the community, strengthening support for early breastfeeding to keep all Lesotho's children safe and healthy.<sup>32</sup>

### ∴ Infant and Young Child Feeding

**Problem.** Infants are at greatest risk of diarrheal disease when foods other than breast milk are given because they lose the protection of breast milk's anti-infective properties and are more likely to be exposed to food- and water-borne pathogens. Alternatives to breast milk carry risks, particularly in areas where infectious disease levels and the potential for improper food preparation and storage practices are high.

*Infants under 2 months of age who are not breastfed are 25 times more likely to die from*

*dehydration caused by diarrhea than infants who are exclusively breastfed.*

*Infants who are fed cow milk are 18 times more likely to die from diarrhea when compared with infants who are exclusively breastfed.*<sup>33</sup>

**Solution.** Exclusive breastfeeding has many health benefits for infants less than 6 months of age, including the prevention and treatment of infections such as diarrheal disease.<sup>9</sup> Breastfeeding for children 6 to 24 months, with appropriate complementary foods, is a key component of



### Relative Risk for Infant Mortality Due to Infectious Diseases at Different Ages According to Type of Milk Consumed

Age (in months)	Type of Milk Consumed		
	Breast Only	Breast + Other*	Other Only*
<b>Diarrhea</b>			
< 2	1.0	3.1	24.7
2-11	1.0	2.5	3.5
<b>Respiratory</b>			
< 2	1.0	2.7	3.3
2-11	1.0	1.2	2.0
<b>Other Infections</b>			
< 2	1.0	0.9	3.9
2-11	1.0	0.7	2.9

\*Based on matched analysis but not adjusted for confounding variables.

Source: *The Lancet*, 1987.

an optimal feeding plan, which can significantly reduce diarrhea and provide the nutrients that prevent stunting and the negative cognitive effects of repeated diarrhea episodes.

Breast milk provides ideal and complete nutrition for infants in their first six months of life. It provides immediate immune protection from the mother and stimulates the development of an infant's immune system. It also improves responses to vaccines and provides many health and growth enhancing molecules, enzymes, proteins, and hormones that are unique to breast milk.

Initiation of breastfeeding within the first hour of life, exclusive breastfeeding for the first six months, timely and adequate complementary feeding, continued breastfeeding for two years, and good nutrition and restorative feeding for children over the age of 2 are some of the key feeding practices that can improve children's health, especially in developing countries.<sup>34</sup>

**Impact.** By increasing the duration and exclusivity of breastfeeding until infants are at least 6 months of age, an estimated 1.5 million infants' lives worldwide could be saved each year.<sup>35</sup>

Exclusive breastfeeding prevents diarrheal disease in two ways. First, it eliminates the intake of potentially contaminated food and water at the time when infants have poorly developed digestive systems. Second, breast milk contains secretory antibodies and other immune factors specific for protection against gastrointestinal pathogens and has demonstrated anti-inflammatory and immunomodulatory effects.<sup>36</sup>

For an infant, continued breastfeeding during and following an episode of diarrhea significantly reduces the risk of dehydration and prevents weight loss and malnutrition. Breastfeeding may also help infants recover from diarrheal disease faster and reduce the severity and duration of the



## A COORDINATED APPROACH TO FIGHTING DIARRHEA IN NICARAGUA

When an outbreak of rotavirus nearly crippled Nicaragua's health system six years ago, several Ministry of Health (MOH) departments formed a dedicated alliance to reduce the burden of diarrheal disease, including a unique team of experts on hygiene, epidemiology, nutrition, and child health. In less than two years, a team of representatives from the ministry—along with NicaSalud (a local coalition of NGOs), PATH, UNICEF, and others—brought public-sector clinics on board and trained health care workers to provide zinc and ORT throughout the country. A parallel demonstration project by the MOH and Merck, which donated more than 1 million doses of rotavirus vaccine, offered the opportunity to integrate rotavirus vaccination. The introduction of the rotavirus vaccine in 2006 marked the first time in history that a developing country took up a vaccine in the same year as its adoption in the United States. More than 85 percent of vaccine-eligible children were reached in the project's first year. Citing cross-disciplinary cooperation as fundamental to the program's achievements, the MOH credited the alliance with building awareness of zinc treatment, ORT, and rotavirus vaccines. Nicaragua's strategy for diarrheal disease control illustrates how a coordinated approach can strengthen efforts and achieve benefits throughout the health system. The approach is well under way and informing similar strategies throughout the region and the world.

episode because, in addition to replacing lost fluids, it ensures that critical nutrients are provided.

After six months, when breast milk needs to be complemented with other foods, health care workers need to counsel families to ensure food is hygienically prepared and fed so it is safe and adequate for infants and children 6 to 24 months of age. Children are particularly vulnerable to malnutrition during this period due to inadequate infant and young child feeding practices during and after illness.

Despite the benefits of breastfeeding, fewer than 35 percent of infants worldwide are exclusively breastfed during their first four months of life, according to the WHO. In addition, complementary feeding often begins too early or too late, with foods that are often unsafe or

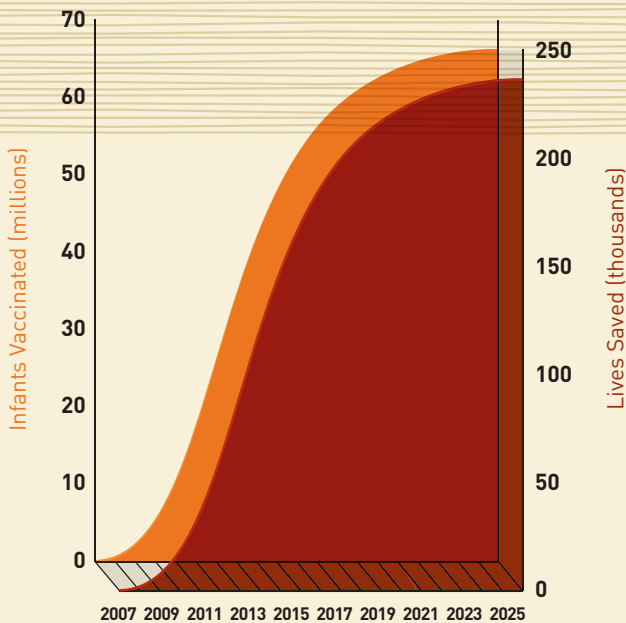
nutritionally insufficient, leading these infants, who are more likely to be sick frequently, to become malnourished and suffer the life long consequences of impaired development.<sup>37</sup>

### Rotavirus and the Promise of New Vaccines

**Problem.** Each year, rotavirus—the leading cause of severe diarrhea—kills more than 500,000 children and hospitalizes millions. While nearly every child in the world will have at least one rotavirus infection by age 3, it causes a disproportionate number of deaths in developing nations, where access to emergency care can be limited.<sup>38</sup>

**Solution.** Vaccines are another important, proven diarrheal disease prevention method. They are particularly critical in areas where appropriate medical

## POTENTIAL LIVES SAVED BY ROTAVIRUS VACCINATION



Source: PATH/D, Atherly.

treatment for severe diarrhea and dehydration is limited and access to safe water is inadequate.

In June 2009, the WHO’s Strategic Advisory Group of Experts (SAGE) on Immunization recommended rotavirus vaccines for global use, stating that rotavirus vaccination should be included in every country’s national immunization program. The WHO recommendation was based on clinical trial data demonstrating vaccine efficacy in impoverished, high-mortality settings.<sup>5</sup>

It builds on a 2006 recommendation to include rotavirus vaccines in the national immunization programs of countries in North America, Latin America, and Europe.<sup>39</sup> Informed by the WHO’s recent global recommendation, the GAVI Alliance, a global health partnership that works to save

lives by increasing access to vaccines, is accepting applications for rotavirus vaccine introduction financial support from developing countries in Africa and Asia. The GAVI Alliance is committed to making rotavirus vaccines available as quickly as possible by reducing the traditional 10- to 15-year lag time between when vaccines are first introduced in industrialized nations and when they are finally introduced in low-income nations.

Two rotavirus vaccines—Rotarix™, manufactured by GlaxoSmithKline, and RotaTeq®, manufactured by Merck and Co., Inc—are currently available and already part of the routine immunization programs in several countries throughout the world. Manufacturers in India, China, and Brazil are also working to develop promising new rotavirus vaccines.

**“The best way to protect children from the deadly disease is to prevent them from getting it in the first place.”** — Dr. Ruth F. Bishop, leader of the team of

researchers that discovered rotavirus<sup>40</sup>

**Impact.** In the United States alone, rotavirus vaccination has led to dramatic drops in severe rotavirus-related hospitalizations and emergency room visits by as much as 80 percent. The vaccines may also have prevented illness in nonvaccinated children by limiting the number of circulating infections.<sup>41</sup>

Rotavirus vaccines stand to make the greatest impact in high-burden regions in Africa and Asia, where more than 85 percent of rotavirus deaths occur.<sup>42</sup>

“Deaths from diarrheal dehydration and other sicknesses triggered by inadequate water and sanitation remain the world’s most serious public health problem — but one that could be solved today.”

— David Douglas, President of Water Advocates<sup>43</sup>

Proven, lifesaving treatment options also exist for diarrheal disease.

When diarrhea occurs, it can be treated effectively with ORS, ORT, and zinc supplementation. Exclusive breastfeeding of infants under 6 months of age and continued breastfeeding up to 24 months of age may also help infants recover faster and reduce the risk of malnutrition, which makes infants more susceptible to dying during future diarrhea episodes.

### :: Rehydration Therapy

**Problem.** Diarrheal disease becomes fatal when it leads to severe dehydration. Children in poor countries suffer from dehydrating diarrhea an average of four times per year. In low-resource settings, it can be fatal.<sup>44</sup>

**Solution.** Oral rehydration therapy and oral rehydration solution involve rehydrating children by replacing fluids and electrolytes lost through diarrhea. The broader intervention method, ORT, involves rehydrating children through increased appropriate and available fluids such as breast milk or rice water mixed with salt, soups, and cereals and continued feeding to prevent and treat diarrhea-related dehydration.

ORS is a specific way of implementing ORT. It is a simple mixture of sugar and salt added to clean water that can be administered at home. This

lifesaving solution was discovered by scientists in the 1970s. In 1978, *The Lancet* referred to ORS as “potentially the most important medical advance of this century.” Today, ORS is the cornerstone of diarrheal disease treatment in both industrialized and developing nations. It reduces dehydration in nearly 90 percent of patients.<sup>45</sup>

*Since the 1970s, ORS has saved an estimated 50 million lives, and it costs less than US\$0.30.*<sup>44</sup>

In 2001, a new ORS with a reduced sodium and glucose content was created. The new formula, low-osmolarity ORS, is packaged as a powder to be mixed with clean water. It is easy to use and can be administered by a health care provider or at home by parents and caregivers. Compared with the original formula, the new formula improves efficacy and reduces the need for unscheduled IV interventions by almost 33 percent, lowers stool volume by nearly 25 percent, and causes almost 30 percent less vomiting.<sup>46</sup>

The WHO and UNICEF both recommend use of the low-osmolarity formula.

**Impact.** ORT and ORS were critical in preventing more than 1 million diarrheal disease deaths annually by the 1990s. However, despite these successes, ORT and ORS use has stagnated in some countries and declined in others.<sup>47, 48</sup> From 1992 to 2005, ORS use declined in 23 countries, including

## CHANGE IN ORS USE

ORS use has declined in 23 countries, 14 of which are located in Africa



Source: Ram et al, *Bulletin of the WHO*, March 2008.

Change in ORS use in children <3



## ORS SUCCESS IN BURUNDI

Diarrhea is a leading cause of child death in Burundi, accounting for 18 percent of deaths among children under 5. Population Services International (PSI)/Burundi has been distributing oral rehydration salts through commercial outlets in Burundi under the brand Orasel since 2004 as part of a USAID-funded project to reduce childhood morbidity and mortality. Despite these efforts, a nationally representative baseline survey of female caregivers of children under 5 conducted in 2006 showed that just 20 percent of caregivers had administered Orasel to their child during the child's latest diarrhea episode. Although knowledge of the role of dehydration in causing death was nearly universal, fewer than one-third of caregivers felt capable of preparing and administering Orasel to a child. Based on these findings, PSI/Burundi implemented a variety of strategies to increase Orasel use, including conducting public demonstrations on how to prepare and use it, disseminating print and radio messages about the benefits of Orasel, and changing the taste from a bitter flavor to an orange flavor. In the follow-up survey in 2007, use of Orasel among all caregivers had increased to 30 percent. Among those who were highly exposed to the PSI campaign, 75 percent had treated their child with Orasel during the child's last diarrhea episode. Caregivers highly exposed to the campaign also showed significant increases in knowledge of signs of diarrhea, dehydration, and self-efficacy for Orasel use—from 28 percent at baseline to 88 percent at follow-up. Further, 86 percent of highly exposed caregivers reported having discussed Orasel use with others. These findings suggest that social marketing of ORS and skills-building administration of the intervention can improve ORS use among caregivers.<sup>49</sup>

14 in Africa alone. This decline may be due to lack of knowledge about and access to ORS and ORT.<sup>50</sup>

A recent study found that households in the poorest socioeconomic groups consistently experienced greater diarrhea death rates and used ORT less frequently than those in higher socioeconomic groups. This disparity may be due

to households in the higher socioeconomic group having better access to safe drinking water and sanitation as well as awareness of, access to, and funding for ORT and related health care services. To address this disparity, the researchers involved in the study recommended educating lower-income groups on the importance of ORT and making it more accessible and affordable.<sup>51</sup>

## ZINC TREATMENTS AND WATER DISINFECTION FOR INDIA'S POOREST

In India, 25 percent of annual deaths caused by diarrheal disease occur in Uttar Pradesh, one of the country's most populous and impoverished states. One of the main causes of diarrhea is the lack of clean drinking water. That is why USAID and Academy for Educational Development stepped in with a household water treatment program known as Point-of-Use Water Disinfection and Zinc Treatment (POUZN) to reach more than 1 million poor residents in the region. By combining these two important treatments, POUZN expects to halve the number of instances of diarrhea among children under age 5. Self-help groups and grassroots organizations are working together with POUZN to provide households with water products and systems to create clean drinking water. Not only are the tools made available, but the families are also given information on why water disinfection is so critical. Community members are shown the contaminants in their water before water disinfection practices begin. Water samples from wells, lakes, and rivers, as well as from water stored at home, are publicly tested to demonstrate contaminated water and how important it is to disinfect water before drinking it. POUZN is also training and engaging grassroots organizations to promote improved diarrhea treatment to the Rural Medical Practitioners, who are the community's first recourse for advice and treatment when a child is sick.<sup>52</sup>



However, the decline in use and awareness of ORS and ORT is not limited to developing countries. According to research conducted in 2008, 74 percent of pediatric health facilities in London were not aware of ORT use as an intervention for diarrhea.<sup>53</sup>

**:: Zinc Treatment and Other Micronutrients Problem.** Zinc, an important micronutrient that is needed for the overall health and development of infants and young children, can become depleted through diarrhea.

**Solution.** Zinc is a critical new intervention for treating diarrhea, particularly in the developing world. It is a safe and effective treatment option

that can considerably reduce the duration and severity of diarrhea episodes, decrease stool output, and lessen the need for hospitalization. It may also prevent future diarrhea for up to three months.

Zinc can be administered as syrup or a tablet that is dissolved in clean water or breast milk. When using zinc to treat diarrheal disease, it is important that the full course of zinc is taken in conjunction with ORS/ORT and that follow-up and behavior change messages for caregivers are given to ensure full compliance.

Vitamin A supplementation is another important and low-cost intervention for controlling severe



#### Zinc treatment results in:

- 25 percent reduction in duration of acute diarrhea
- 29 percent reduction in duration of persistent diarrhea
- 40 percent reduction in treatment failure or death from persistent diarrhea<sup>54</sup>

and potentially fatal diarrhea episodes. The relative risk of dying from diarrhea increases two-fold in children with vitamin A deficiency. In countries where under-5 mortality rates are high, giving semi-annual vitamin A supplements to children 6 to 59 months old decreases overall mortality from all childhood diseases by 23 percent and mortality from diarrhea by 32 percent. A dose

of vitamin A for newborns has been found to be effective in reducing early mortality and may soon be widely recommended.<sup>55</sup>

**Impact.** In 2004, the WHO and UNICEF issued a joint statement recommending the use of a 10- to 14-day zinc treatment in conjunction with low-osmolarity ORS as a two-pronged approach to treat acute diarrhea in children.

In a study in Bangladesh, the use of zinc therapy not only expanded control of diarrheal diseases, but also increased use of ORS and decreased the administration of unnecessary antibiotics.<sup>56</sup> It has been determined that the use of both zinc and ORS for diarrhea can dramatically reduce the need for unscheduled IV therapy and, more importantly, reduce the number of diarrheal disease-related deaths.



## PROGRESS: IDENTIFYING NEW INTERVENTIONS

■ The Institute for OneWorld Health (iOWH) is working on two new treatments to complement existing interventions for diarrheal disease. iOWH is working to develop novel medicines through a new approach by reducing or preventing the massive fluid loss that can lead to death from diarrhea caused by dehydration. Used in conjunction with ORT, such a medicine could speed recovery and help save many lives. Additionally, iOWH is in the early stages of discovering antibiotic combination therapies that can overcome the emergence of dysentery-causing bacteria such as *Shigella*. These bacteria are resistant to current antibiotic therapies.

■ PATH is working with public- and private-sector partners on new vaccines to address the main bacterial causes of diarrhea: enterotoxigenic *Escherichia coli* (ETEC) and *Shigella*, which combined are responsible for at least 1 million diarrheal disease deaths each year. For many infants, ETEC may be the first enteric illness they encounter, and *Shigella*, along with rotavirus, is the most frequent cause of hospitalization for infants and young children. These bacterial causes of diarrhea can easily spread in areas with poor sanitation and limited access to clean water, which are frequent concerns in the developing world. Their growing antibiotic resistance further underscores the need for vaccines to prevent these forms of bacterial diarrhea. A number of vaccine candidates for the prevention of ETEC and *Shigella* are in development, and they are moving through a series of rigorous preclinical and clinical trials to ensure their safety and efficacy.

■ Two oral vaccines—one an inactivated whole cell vaccine and the other an attenuated vaccine—against cholera, which is one of the deadliest forms of diarrhea, are already licensed internationally. However, work continues toward developing a vaccine that is both effective and affordable in low-resource and emergency settings. A vaccine tested in India by scientists working with the Seoul-based International Vaccine Institute recently demonstrated positive results that may pave the way for the world's first affordable cholera vaccine.

■ Pediatricians and research scientists at Yale University, Christian Medical College Vellore, and Flinders University are collaborating on the development and testing of a new starch-based ORS formulation that has shown promise in reducing symptoms faster and being more appealing to caregivers.

■ PATH is working with partners to develop a point-of-care diagnostic tool called “lab on a card.” This credit card-sized piece of plastic will contain minute amounts of the chemicals and reagents needed to translate a stool sample into an instant diagnosis. An accurate diagnostic tool that can be used in real-world conditions will help quickly identify infections, determine efficient treatment plans, and avoid the inappropriate use of antibiotics that fosters resistance.

“It is still just unbelievable to us that diarrhea is one of the leading causes of child deaths in the world.” — Melinda French Gates, Bill & Melinda Gates Foundation<sup>57</sup>

### Fighting Diarrheal Disease With a Coordinated Strategy

We have the lifesaving, cost-effective prevention and treatment interventions at hand to stop the second-leading killer of children worldwide. Over the last three decades, millions of children's lives have been saved by protecting them against diarrheal disease through proven methods such as ORS, ORT, optimal infant and young child feeding practices such as exclusive breastfeeding, zinc treatment, improved hygiene, better sanitation, and the availability of clean water. But individual solutions alone will not be enough. We need a coordinated approach that involves both prevention and treatment solutions.

■ Because there are many different causes of diarrheal disease, we need to enlist every available intervention to ensure we are preventing and treating all of its forms. For example, rotavirus vaccines only prevent diarrheal disease caused by rotavirus, so additional methods are necessary in order to prevent and treat other forms of diarrheal disease.

■ Diarrhea prevention and treatment methods are complementary. Improved sanitation and hand-washing go hand in hand. Safe drinking water is a necessary component of ORS and ORT.

■ One intervention can mobilize the adoption of others. For example, the WHO and UNICEF recently issued a recommendation that zinc and ORS be used together as a two-pronged approach to treating diarrheal disease.

■ Combining and implementing interventions together may be more cost effective.

**We have the tools at hand. What we need now is a renewed commitment.**

“Looking forward, the large-scale introduction of pneumococcal and rotavirus vaccines in developing countries will provide us with a historic opportunity to address two of the most important causes of mortality in children under 5—pneumonia and diarrhea—in a comprehensive way...a focus on ORT, vitamin A, and zinc; community-case management of diarrhea and pneumonia; social and behavior change, including promotion of early and exclusive breastfeeding; hand-washing with soap; and home-treatment of water; as well as community sanitation approaches. By introducing these new vaccines as part of a comprehensive package of services and strengthening community-based systems, we will maximize their impact on MDG 4, and do so in a sustainable way.” — Saad Houry, Deputy Executive Director of

UNICEF<sup>58</sup>

## EVERY CHILD'S ADVOCATE

Women rarely hold office in Kenya. Florence Weke-sa is an exception. As the only female member of the Kimilili Municipal Council, she has become a voice for the mothers of her ward and their children. Wrapped in her customary bright colors, Florence stands out in a crowd—and so does her message: “We need to care for our children.”

As a councilor, it is Florence's duty to be present at every funeral in her district. Too often, the funerals are direct evidence of how quickly and how often diarrhea kills. The funerals affect Florence as both a leader and a mother. She vividly remembers a long week almost 20 years ago that she spent nursing her son through a nearly fatal outbreak.

Florence took part in a pilot project run by PATH, joining a workshop that taught practical methods to reduce diarrheal disease with a comprehensive approach: breastfeeding, use of oral rehydration solution, zinc treatment, and proper hygiene. The workshop was part of a new, community-based approach to diarrheal disease control in the region and a proving ground for techniques that will be integrated into Kenya's National Plan for Diarrheal Disease Control. The model will soon be transitioned to Vietnam as well.

Learning how to respond when diarrhea breaks out in a village—including slowing its spread from household to household, keeping children hydrated, and ensuring the availability of clean water—gave her a fresh set of tools. Florence, who believes a councilor's job is to lead by example, said, “The seminar opened up so much.”

Armed with information, Florence can provide immediate aid to families who come to her when a child is violently ill. She travels every week to churches, schools, and health clinics, spreading awareness among parents and community leaders and creating a safety net for her community's children. According to Florence, “Diarrhea is still here—but it is no longer killing.”



*Florence attends a diarrheal disease control workshop held by PATH in Kenya.*



*The Chaudhary family from the village of Beli in the terai of Nepal stands next to their new pit latrine.*

## MDG 7 CALLS FOR IMPROVED SANITATION BY 2015<sup>25</sup>

### Sanitation can be improved with:

- Composting toilets
- Coverable pit latrines
- Ventilated pit latrines
- Flush/pour toilets that send waste to a piped sewer tank, septic tank, or pit latrine

### **We Have an Opportunity to Defeat Diarrhea Now**

Millions of children's lives have been saved by diarrheal disease interventions and millions more can be saved moving forward.

#### **Proven, lifesaving interventions already exist.**

Unlike many other global health crises, cost-effective, lifesaving prevention and treatment methods already exist for diarrheal disease. These interventions include ORS, ORT, optimal infant and young child feeding practices such as exclusive breastfeeding, improved sanitation, and good hygiene, as well as new tools like zinc treatment and rotavirus vaccines. Because diarrheal disease has many different causes and infections respond differently to each intervention technique, a coordinated approach is needed to address the multiple sources of infection.

History has demonstrated that diarrheal disease interventions work. Deaths of children under the age of 5 have declined by nearly half since the 1980s. But progress has stalled, and today 1.6 million children still die from diarrhea each year. That's too many.

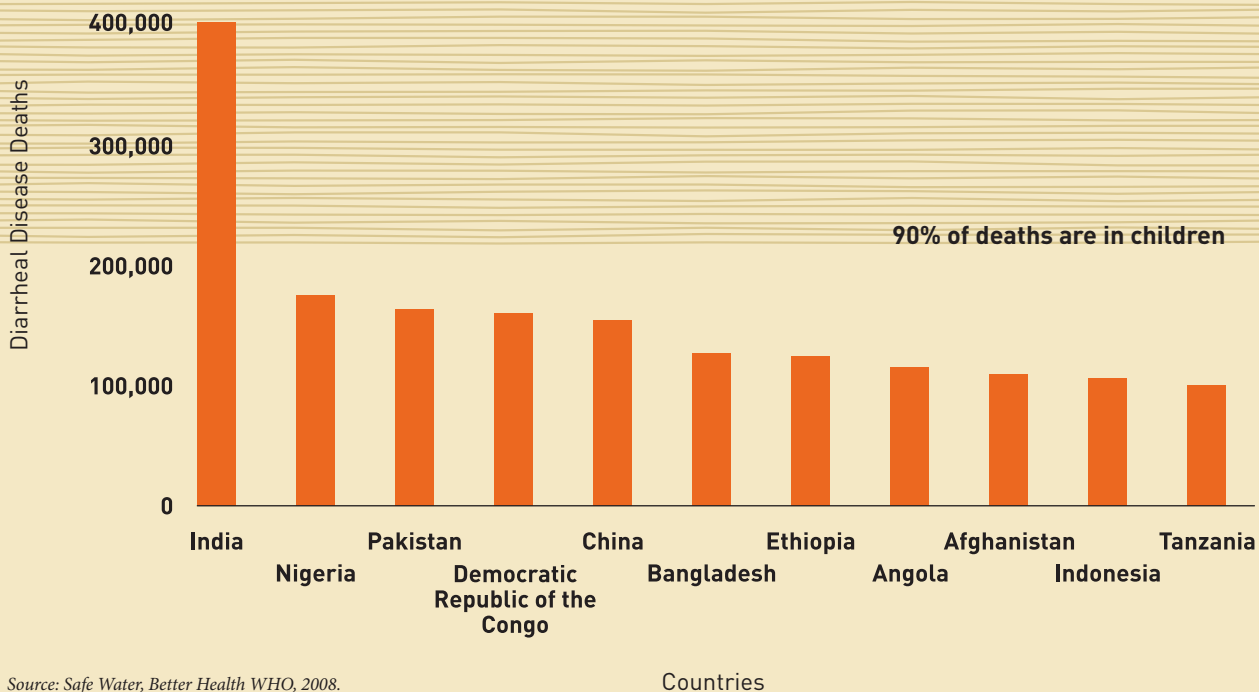
#### **We know what works. What we need now is the political will and resources to make it happen.**

#### **World leaders are committed to child survival.**

For a child in a poor country, simply surviving early childhood can be a tremendous feat. For example, one in six children in sub-Saharan Africa dies before their fifth birthday. A child in Sierra Leone, which has the world's highest child mortality rate (262 out of 1,000 in 2007)<sup>59</sup> is almost 100 times more likely to die than one born in Sweden (with a rate of 3).<sup>60</sup>

## COUNTRIES WITH THE GREATEST NUMBER OF DIARRHEAL DISEASE DEATHS

11 countries account for more than 70% of global deaths each year from diarrheal disease



*Every year, 9.2 million children under the age of 5 die, and 90 percent of those deaths are from preventable conditions like diarrheal disease.<sup>24</sup>*

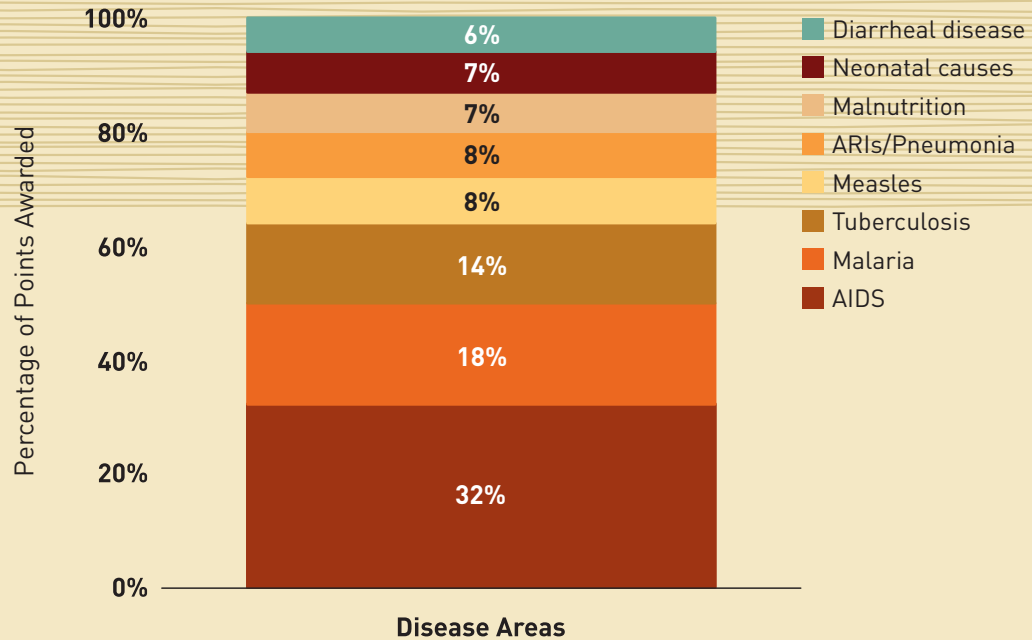
To address the inequities between low-income and wealthier countries, as well as the needs of future generations everywhere, world leaders came together in 2000 at the UN Millennium Summit and drafted the MDGs—a “blueprint for a better future.”<sup>61</sup> The goals establish a set of priorities to be reached by 2015.

Aggressively combating diarrheal disease is crucial to the success of two of the goals that came out of the UN meeting. MDG 4 calls on the global community to reduce the mortality rate of children under the age of 5 by two-thirds or fewer than 5 million deaths per year. MDG 7 calls for reducing the number of people without access to safe drinking water and sanitation by half.<sup>62</sup>

As our world’s climate and demographics change and natural resources are depleted, diarrheal disease will become an even more significant global health threat. The threat of diarrheal disease outbreaks related to natural disasters such as the cyclone in Myanmar portends major diarrheal disease-related health crises in the future. The International Federation of Red Cross and Red Crescent Societies (IFRC) recently reported that diarrheal disease such as cholera is increasingly becoming the major cause of recurring disease and death throughout the world, particularly in sub-Saharan Africa. According to 2007 and 2008 IFRC data, approximately 60 percent of all requests submitted for IFRC Disaster Response Emergency funding were related to outbreaks of acute diarrheal disease.<sup>63</sup>

## POLICYMAKER AND GLOBAL HEALTH FUNDING RESEARCH INDICATES:

### Diarrheal disease ranks low among global health priorities



Source: PATH.

“We have noticed a significant increase in the number of operations undertaken to respond to acute [diarrheal disease outbreak] situations... This trend is the combined result of poor hygiene practices, lack of awareness of disease transmission, and a shortage of safe water. Poor sanitation linked to unplanned urbanization is also a major factor. This is further complicated by the effects of climate change, which have led to an increase in the frequency and intensity of floods and related epidemics...Humanitarian efforts have had some impact, but data suggests we may be losing the battle. This is especially true in countries affected by extreme poverty and conflict, where diarrheal diseases have become endemic. Such countries now require long-term commitment if this worrying scenario is to be pushed back.”

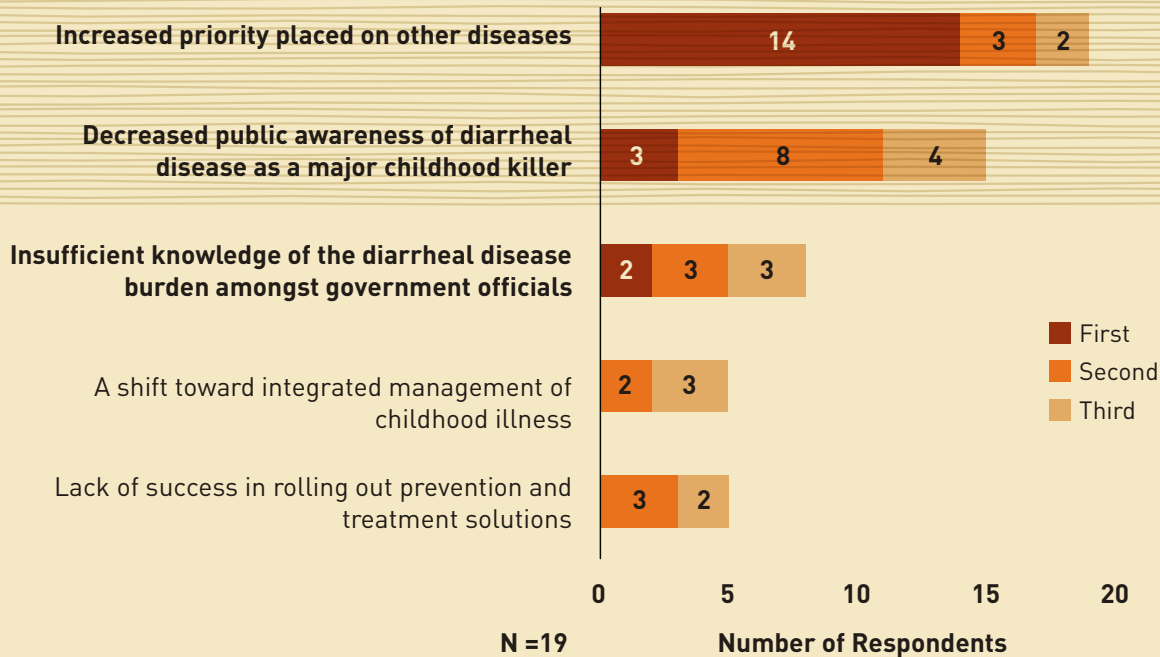
— Uli Jaspers, head of the IFRC water and sanitation team<sup>43</sup>



### Challenges Remain

We have more proven intervention methods to combat diarrheal disease than ever before, but the momentum to control it has slowed, and children in the poorest countries are dying because they are not getting the simple, lifesaving treatments they need to survive.

### Three significant factors contribute to stalled or decreased attention and funding for diarrheal disease



Source: PATH.

Today, although diarrhea is the second leading killer of children under the age of 5 worldwide, it is not treated as a global health priority. In fact, a 2008 research study conducted by PATH to evaluate the global health funding and policy landscape found that diarrheal disease ranked last among a list of other global health issues. Public awareness of this issue is also low, making it difficult to mobilize commitments and resources. In donor countries such as the United States, many are unaware of the burden of diarrheal disease and the existing prevention and treatment interventions available.<sup>16</sup>

- Ninety-three percent of Americans think child survival should be a global health priority.
- Seventy-three percent say knowing how to prevent the major causes of child death is a major

Only thirty-eight percent of children under 5 with diarrhea receive oral rehydration and continued feeding.

Sixty-two percent of infants under 6 months of age are not exclusively breastfed.<sup>64</sup>

reason the United States should be doing more to save lives around the world.

- However, most do not realize preventable and treatable diarrheal disease is a leading killer.<sup>65</sup>

Despite the persistently high burden of the disease, research into childhood diarrhea has been steadily decreasing since the 1980s, according

## PROVEN INTERVENTIONS FOR THE LEADING KILLERS OF CHILDREN

More proven interventions are available to prevent and treat diarrhea than any other major child killer

Intervention	Diarrhea	Pneumonia	Measles	Malaria	HIV/AIDS	Birth asphyxia	Preterm delivery	Neonatal tetanus	Neonatal sepsis
<b>Preventive Interventions</b>									
*Breastfeeding	1	1							1
Insecticide-treated materials				1			1		
Complementary feeding	1	1	1	1					
Water, sanitation, hygiene	1								
Hib vaccine		1							
Zinc	1	1		2					
Vitamin A	1		2	2					
Antenatal steroids							1		
Newborn temperature management							2		
Tetanus toxoid								1	
Nevirapine and replacment feeding					1				
Antibiotics for premature rupture of membranes							2		2
Clean delivery								1	1
Measles vaccine			1						
Antimalarial intermittent preventive treatment in pregnancy							1		
<b>Treatment Interventions</b>									
Oral rehydration therapy	1								
Antibiotics for pneumonia		1							
Antimalarials				1					
Antibiotics for sepsis									1
Newborn resuscitation						2			
Antibiotics for dysentery	1								
Zinc	1								
Vitamin A			1						

1 Level 1 (sufficient) evidence

2 Level 2 (limited) evidence

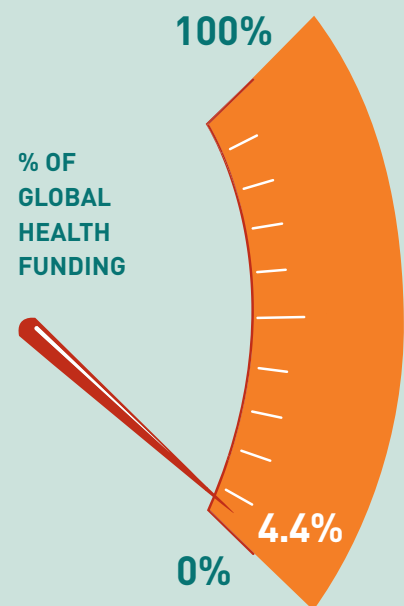
Hib=Haemophilus influenzae type b

\* Exclusive breastfeeding in the first 6 months of life and continued breastfeeding from 6 to 11 months.

Source: Jones G, Bryce J, et al., *The Lancet CS*, series 2003.



**ONLY 4.4 PERCENT OF GLOBAL HEALTH FUNDING GOES TOWARD  
DIARRHEAL DISEASE RESEARCH AND DEVELOPMENT**



Source: George Institute, 2009.

to the WHO. Funds available for research into diarrhea are less than those available for research into other diseases that cause fewer deaths. For example, diarrheal disease receives less than one-tenth the funding that Type 2 diabetes receives.<sup>66, 67</sup>

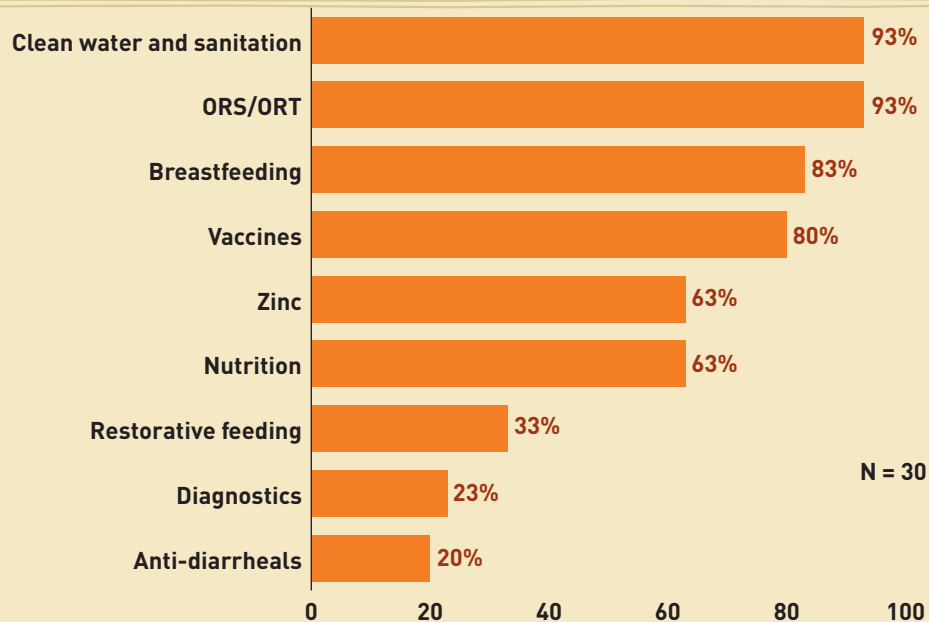
Barriers exist at the country level, due to the lack of awareness of and access to lifesaving interventions, and at the global level, due to advocacy challenges

that have prevented the global health community from mobilizing around the issue and committing to stop it. Additionally, research also indicates that while a great deal is known about effective treatments for diarrhea, there is a critical lack of knowledge on how to make sure the children who need diarrheal disease treatment can get access to it.<sup>66</sup>

Widespread adoption of proven, existing water, sanitation, hygiene, and health interventions has

## INCREASING ACCESS TO INTERVENTIONS

Interventions are seen as an integral part of a coordinated approach to fighting diarrheal disease



Increasing access to proven interventions is believed to be the most effective way to accelerate progress toward MDG 4

Source: PATH.

been hampered by the lack of political leadership and commitment to fight diarrheal disease. In turn, this has led to a decline in funding and research on the issue. Interventions that may be easily accessible in the developed world are not as accessible to the children who need them most in the developing world.

The challenges are great, but so are the opportunities to save millions of children's lives worldwide. Leaders from all sectors can take practical steps to begin to galvanize the funding

and political will necessary to reduce the illnesses and deaths from diarrhea. These steps include:

- Investing the resources to ensure that funding for diarrheal disease, including both prevention and treatment interventions, is commensurate with the scope of the burden the illness places on families and communities around the world.
- Redoubling commitment to reducing the child mortality MDG by 2015 as stated in the WHO/UNICEF

“The persisting high mortality rate from diarrhea in the presence of existing, cost-effective interventions and available resources to implement them represents a continuing scandal.” — Olivier Fontaine, Margaret Kosek, Shinjini Bhatnagar, Cynthia

*Boschi-Pinto et al., PLOS Medicine*<sup>66</sup>



sanitation, water, and hygiene; further including sanitation, water, and hygiene interventions in health efforts to prevent and control diarrheal disease.

By making diarrheal disease a global health priority and educating, increasing awareness among, and mobilizing the global community around the burden of diarrheal disease and the lifesaving health, hygiene, sanitation, and safe water interventions that exist today, we can save lives. A coordinated approach will be crucial to the effort to ensure that this preventable and treatable disease is no longer a leading killer of children. Because no child should die from diarrhea.

joint statement on the MDGs, focusing on addressing diarrheal disease as a strategy for clear and rapid progress towards that goal.

- Investing in the research and development of new effective, appropriate, and affordable prevention and treatment options for diarrheal disease.

- Prioritizing the implementation of an appropriate combination of interventions against diarrhea, including improved water, hygiene, and sanitation; optimal infant and young child feeding; increased access to and uptake of vitamin A, ORS, and zinc; and rotavirus vaccination.

- Including diarrhea prevention and control in international, regional, and country plans on

## End Notes

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Enhanced Diarrheal Disease Control Resource Center:  
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1800 K Street NW, Suite 800  
Washington, DC 20006 USA  
[info@path.org](mailto:info@path.org) [www.path.org](http://www.path.org)

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