



**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 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 are 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 — including 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', written in a cursive style.

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 five 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 occurs, 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, and the support for implementation and aggressive scale-up of intervention methods — by political leaders and the international community with research and funding commitments — 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 budgets 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> Vaccines have already been approved by the WHO for use in North America, Latin America, and Europe. Once the WHO makes a global recommendation, anticipated in 2009, Africa and Asia will be eligible for GAVI financing for rotavirus vaccines.

**Exclusive breastfeeding and optimal complementary feeding.** Exclusive breastfeeding (no additional food and fluids) provides infants six 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 (ORT)/oral rehydration solution (ORS).** 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 products (GDP).<sup>5</sup>

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

Today, the leading causes of death among children under the age of five, 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 reprioritizing 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 by 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>6</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, and 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>7,8</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.



Today Evalyne does everything she can today 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, and secondary sepsis. It is often associated with dysentery.<sup>8</sup>

Diarrhea has both short-term and long-lasting effects, ranging from severe dehydration to malnutrition, which in turn can weaken its victims’ immune systems 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>9</sup> Studies indicate that diarrhea can also lead to long-term physical impairments such as stunted growth and reduced intellectual development.<sup>8</sup>

Whether a child survives a diarrhea episode or not may depend on where he or she lives. While

## 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 to 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 USAID, diarrhea-related infant deaths fell 82 percent and older children deaths due to diarrhea fell 62 percent.<sup>10</sup>



diarrheal disease occurs worldwide, 90 percent of diarrheal disease deaths in children under age five occur in developing countries.<sup>11</sup> In these regions, awareness of, and access to, existing lifesaving interventions is 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>12</sup>

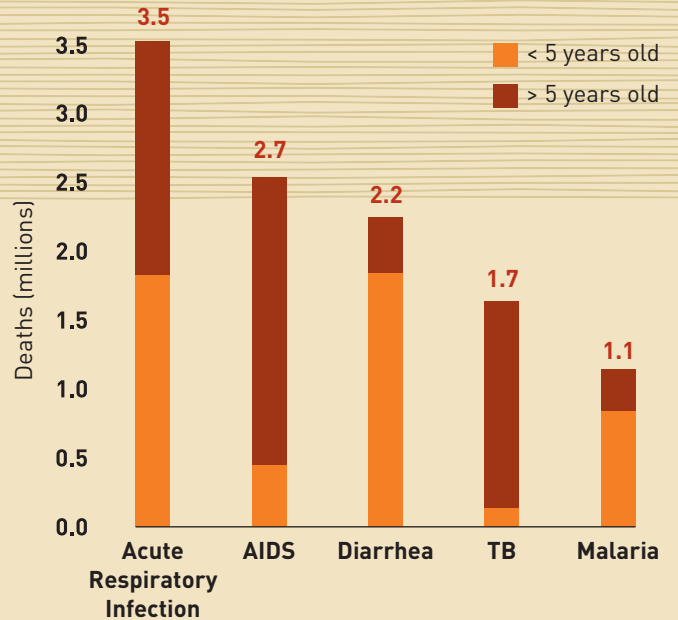
### **No Child Should Die From It. No Parent Should Dread It.**

Evalyne, a mother of three children living in Kenya's Western Province, experienced something almost all parents go through: her two-year-old son, Abel Juma, became sick with diarrhea. While diarrheal disease is both preventable and treatable, in Kenya and many 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 visits to 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 six. Paula has five children of her own, and her three-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 one million children whose lives are lost each year to diarrheal disease. Their excruciating experiences — shared by millions of parents around the world — could have been prevented.<sup>13</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:

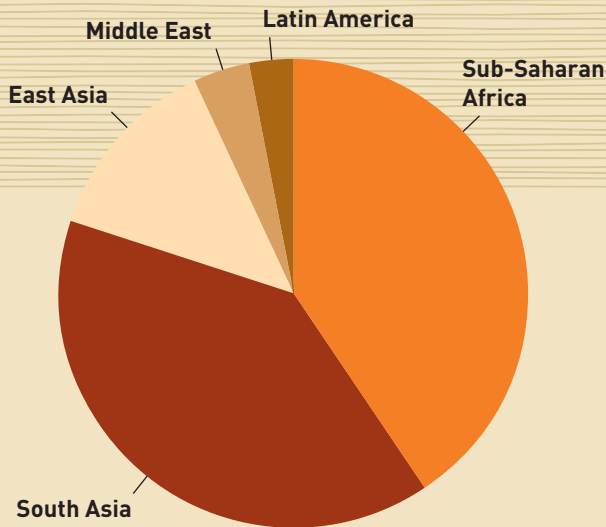
- Diarrheal disease became a highly visible global health priority.
- Extraordinary improvements were made in access to safe drinking water and sanitation. In total, development efforts during the International Drinking Water Supply and Sanitation Decade (1981 to 1990) and the following decade (1991 to 2000) provided water to more than 2 billion people and sanitation to more than 1.5 billion.<sup>14</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 non-governmental organizations (NGOs), countries, and donors to focus on diarrheal disease.

■ The WHO created the Diarrhoeal Disease Control (CDD) Programme and devoted significant resources and funding to it. The larger global health community mobilized around the issue. For example, UNICEF, the United States Agency for International Development (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 focusing on preventing diarrheal disease in the first place. Over time, diarrheal disease incident 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 the 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>15</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, Proctor and Gamble <sup>16</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>17</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 six 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>18</sup>

Worldwide, more than 1 billion people lack access to safe drinking water, and many more drink grossly contaminated water.<sup>11</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, these 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, 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>19</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>18</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>11</sup>

***POU treatment and safe storage can reduce diarrhea by 30 to 50 percent.***<sup>20</sup>



An excited crowd of children watches 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>21</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>22</sup>*

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

In developing countries, 1 in 5 people do not have access to safe water.

Roughly half are without proper sanitation.<sup>23</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>24</sup> At current rates, this target will not be reached in

## COMPETITION LEADS TO REDUCTION IN DIARRHEA

The World Wildlife Fund (WWF) 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 non-existent.

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>25, 26</sup>



two regions where the diarrheal disease burden is greatest: it will not be reached in South Asia until 2043,<sup>27</sup> and it will not be reached in sub-Saharan Africa until 2076.<sup>28</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 be properly handled and disposed.<sup>28</sup>

**Impact.** When implemented correctly, sanitation can reduce diarrheal disease by 36 percent.<sup>28</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 Millenium Project Task Force on Water and Sanitation.<sup>24</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 Kisaki 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 rhymes are saving lives.<sup>29</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>18</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 a priority for use in hand-washing, which can substantially raise its cost.

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>30</sup>