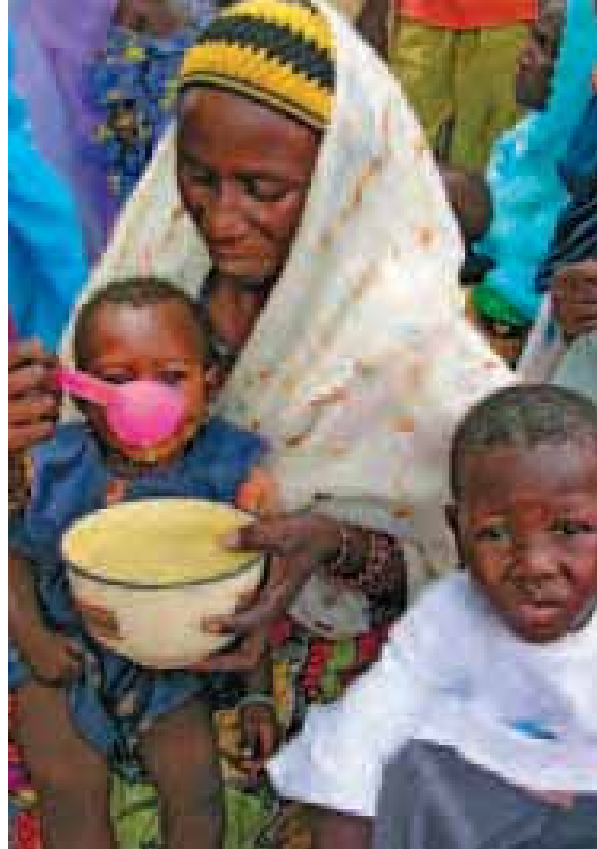


# Diarrhoea: Why children are still dying and what can be done

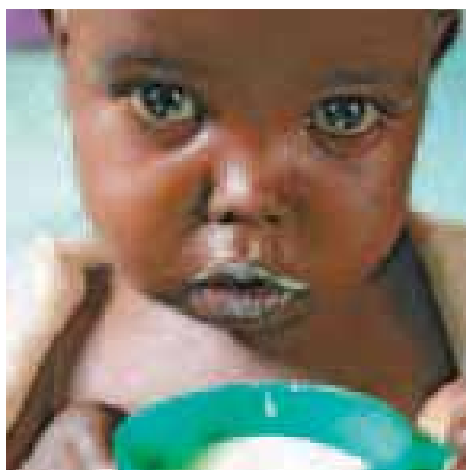
Diarrhoea: Why children are still dying and what can be done







# Diarrhoea: Why children are still dying and what can be done



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World Health  
Organization

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## Foreword

The Millennium Development Goals call for a reduction of child mortality by two thirds between 1990 and 2015. As the deadline approaches, the reality is that although progress is being made, much more remains to be done.

Nearly nine million children under five years of age die each year. Diarrhoea is second only to pneumonia as the cause of these deaths. Why is diarrhoea, an easily preventable and treatable disease, one that in the developed world is considered little more than an inconvenience, causing an estimated 1.5 million under-five deaths every year?

Reducing these deaths depends largely on delivering life-saving treatment of low-osmolarity oral rehydration salts (ORS) and zinc tablets to all children in need. However, progress will also require focusing on prevention, whether through the new rotavirus vaccine or by addressing the factors that lead to children developing the disease in the first place.

Diarrhoea is more prevalent in the developing world due, in large part, to the lack of safe drinking water, sanitation and hygiene, as well as poorer overall health and nutritional status. According to the latest available figures, an estimated 2.5 billion people lack improved sanitation facilities, and nearly one billion people do not have access to safe drinking water. These unsanitary environments allow diarrhoea-causing pathogens to spread more easily.

Improving unsanitary environments alone, however, will not be enough as long as children continue to remain susceptible to the disease and are not effectively treated once it begins. Evidence has shown that children with poor health and nutritional status are more vulnerable to serious infections like acute diarrhoea and suffer multiple episodes every year. At the same time, acute and

prolonged diarrhoea seriously exacerbates poor health and malnutrition in children, creating a deadly cycle.

In the 1970s and 1980s, the international community committed itself to reducing child mortality from diarrhoea largely by scaling up the use of oral rehydration therapy – a low-cost and highly effective solution – coupled with programmes to educate caregivers on its appropriate use. The effort met with great success. Yet today only about 39 per cent of children with diarrhoea in the developing world receive oral rehydration therapy and continued feeding, a figure that has changed little since 2000.

This report sets out a 7-point strategy for comprehensive diarrhoea control that includes a treatment package to reduce child deaths, and a prevention package to reduce the number of diarrhoea cases for years to come. The report looks at treatment options such as low-osmolarity ORS and zinc tablets, as well as prevention measures such as the promotion of breastfeeding, vitamin A supplementation, immunization against rotavirus – a leading cause of diarrhoea – and proven methods of improving water, sanitation and hygiene practices.

Diarrhoea's status as the second leading killer of children under five is an alarming reminder of the exceptional vulnerability of children in developing countries. Saving the lives of millions of children at risk of death from diarrhoea is possible with a comprehensive strategy that ensures all children in need receive critical prevention and treatment measures.

Ann M. Veneman  
Executive Director  
United Nations Children's Fund

Dr Margaret Chan  
Director-General  
World Health Organization



**Executive summary**





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**D**iarrhoea remains the second leading cause of death among children under five globally. Nearly one in five child deaths – about 1.5 million each year – is due to diarrhoea. It kills more young children than AIDS, malaria and measles *combined*.

In 2006, the United Nations Children’s Fund (UNICEF) and the World Health Organization (WHO) issued a report highlighting the most common cause of death among children (*Pneumonia: The Forgotten Killer of Children*). The purpose was to raise the profile of that neglected disease. This report is written with the same intent – to focus attention on the prevention and management of diarrhoeal diseases as central to improving child survival. Together, pneumonia and diarrhoea are responsible for an estimated 40 per cent of all child deaths around the world each year.

There are lessons to be learned from past experience. An international commitment to tackle childhood diarrhoea in the 1970s and 1980s resulted in a major reduction in child deaths. This came about largely through the scaling up of oral rehydration therapy, coupled with programmes to educate caregivers on its appropriate use. But these efforts lost momentum as the world turned its attention to other global emergencies. Today, only 39 per cent of children with diarrhoea in developing countries receive the recommended treatment, and limited trend data suggest that there has been little progress since 2000.

This report examines the latest available information on the burden and distribution of childhood diarrhoea. It also analyses how well countries are doing in making available key interventions proven to reduce its toll. Most importantly, it lays out a new strategy for diarrhoea control, one that is based on interventions drawn from different sectors that have demonstrated potential to save children’s lives. It sets out a 7-point plan that includes a treatment package to reduce childhood diarrhoea deaths, as well as a prevention package to make a lasting reduction in the diarrhoea burden in the medium to long term.

---

## A 7-point plan for comprehensive diarrhoea control

### Treatment package

The treatment package focuses on two main elements, as outlined in a 2004 joint statement from UNICEF and WHO:<sup>1</sup> 1) fluid replacement to prevent dehydration and 2) zinc treatment. Oral rehydration therapy – which has been heralded as one of the most important medical advances of the 20th century<sup>2</sup> – is the cornerstone of fluid replacement. New aspects of this approach include low-osmolarity oral rehydration salts (ORS), which are more effective at replacing fluids than the original ORS formulation, and zinc treatment, which decreases diarrhoea severity and duration. Important additional components of the package are continued feeding, including breastfeeding, during diarrhoea episodes and the use of appropriate fluids available in the home if ORS are not available, along with increased fluids in general.

### Prevention package

The prevention package highlights five main elements that require a concerted approach in their implementation. The package includes: 3) rotavirus and measles vaccinations, 4) promotion of early and exclusive breastfeeding and vitamin A supplementation, 5) promotion of handwashing with soap, 6) improved water supply quantity and quality, including treatment and safe storage of household water, and 7) community-wide sanitation promotion.

New aspects of this approach include vaccinations for rotavirus, which is estimated to cause about 40 per cent of hospital admissions due to diarrhoea among children under five worldwide.<sup>3</sup> In terms of community-wide sanitation, new approaches to increase demand to stop open defecation have proven more effective than previous strategies. It has been estimated that 88 per cent of diarrhoeal deaths worldwide are attributable to unsafe water, inadequate sanitation and poor hygiene.<sup>4</sup>

### Actions needed to take interventions to scale

In many countries, progress has been made in the delivery or promotion of several of these interventions, particularly vitamin A supplementation and exclusive breastfeeding. However, a substantial reduction in the diarrhoea burden will require greater emphasis on the following actions:

- Ensure wide availability of **low-osmolarity ORS and zinc**, which could have a profound impact on child deaths from diarrhoea if scaled up immediately. Possible strategies to increase their uptake and availability could include the development of smaller ORS packets and flavoured formulas, as well as delivering zinc and low-osmolarity ORS together in diarrhoea treatment kits.
- Include **rotavirus vaccine** in national immunization programmes worldwide, which was recently recommended by the World Health Organization. Accelerating its introduction, particularly in





Africa and Asia, where the rotavirus burden is greatest, should be an international priority.

- Develop and implement behaviour change interventions, such as face-to-face counselling, to encourage **exclusive breastfeeding**.
- Ensure sustained high levels of **vitamin A supplementation**, such as by combining its delivery, where effective, with other high-impact health and nutrition interventions.
- Apply results of existing consumer research on how to motivate people to **wash their hands with soap** to increase this beneficial and cost-effective health practice. Handwashing with soap has been shown to reduce the incidence of diarrhoeal disease by over 40 per cent.<sup>5</sup>
- Adopt **household water treatment and safe storage systems**, such as chlorination and filtration, in both development and emergency situations to support reductions in the number of diarrhoea cases.
- Implement **approaches that increase demand to stop community-wide open defecation**. As with handwashing, the new approach employs behavioural triggers, such as pride, shame and disgust, to motivate action, and leads to greater ownership and sustainability of programmes.

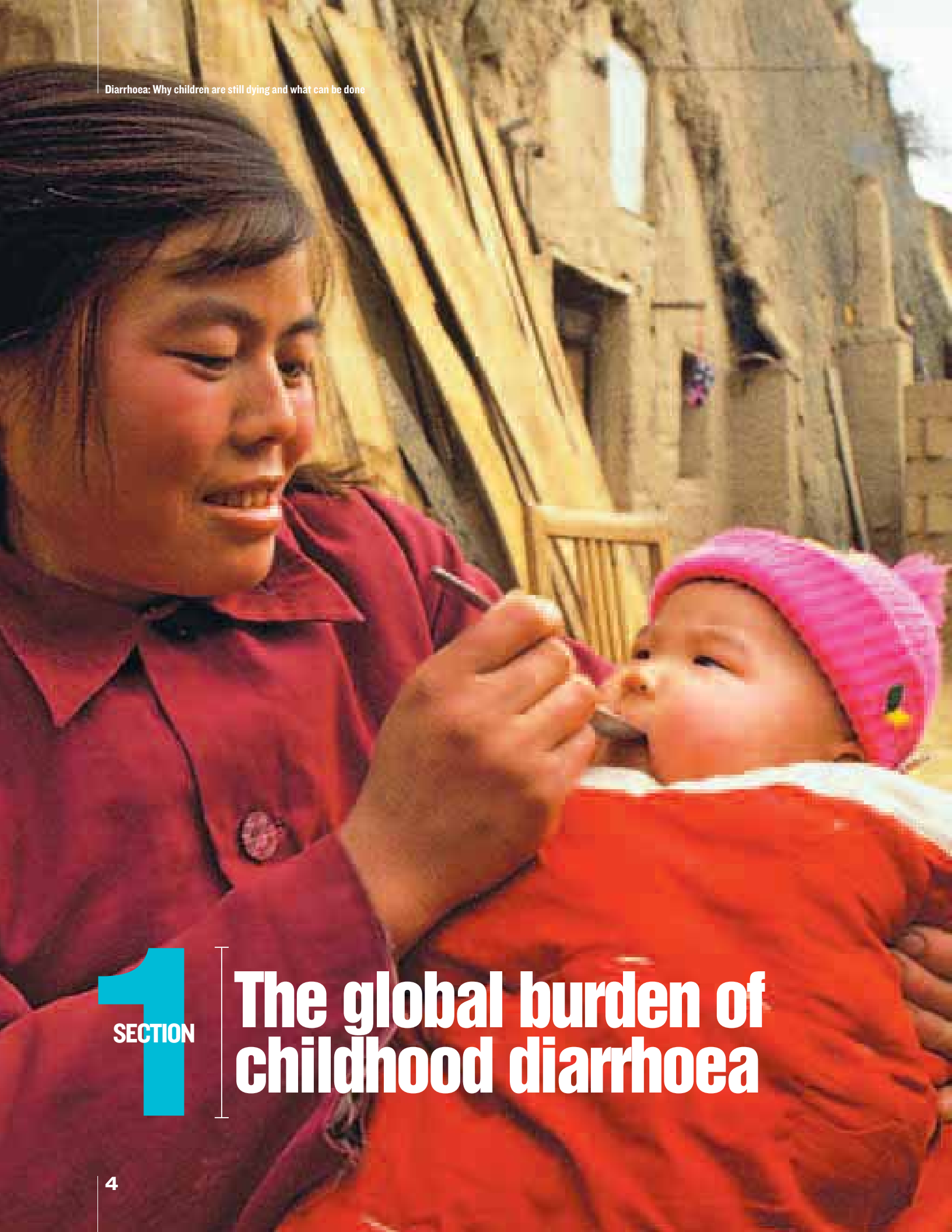
We know what works to immediately reduce deaths from childhood diarrhoea. We also know what actions will make a lasting contribution to reducing the toll of diarrhoeal diseases for years to come. But strengthened efforts on both fronts must begin right away.

The following actions are needed to take the 7-point plan to scale:

- Mobilize and allocate resources for diarrhoea control.
- Reinstate diarrhoea prevention and treatment as a cornerstone of community-based primary health care.
- Ensure that low-osmolarity ORS and zinc are adopted as policy in all countries.
- Reach every child with effective interventions.
- Accelerate the provision of basic water and sanitation services.
- Use innovative strategies to increase the adoption of proven measures against diarrhoea.
- Change behaviours through community involvement, education and health-promotion activities.
- Make health systems work to control diarrhoea.
- Monitor progress at all levels, and make the results count.
- Make the prevention and treatment of diarrhoea everybody's business.

There is no better time than now. Political momentum is building to address the leading causes of child deaths, including pneumonia and diarrhoea, to achieve measurable gains in child survival. The year 2008 marked the 30th anniversary of the Alma-Ata Declaration, with reinvigorated calls to focus on primary health care. Lessening the burden of childhood diarrhoea fits squarely with this emphasis, and is essential for achieving Millennium Development Goal 4: reduce child mortality, whose target date is now only six years away.





**1**  
SECTION

# The global burden of childhood diarrhoea



Each year, an estimated 2.5 billion cases of diarrhoea occur among children under five years of age, and estimates suggest that overall incidence has remained relatively stable over the past two decades.<sup>6</sup> More than half of these cases are in Africa and South Asia (Figure 1), where bouts of diarrhoea are more likely to result in death or other severe outcomes. The incidence of diarrhoeal diseases varies greatly with the seasons and a child’s age. The youngest children are most vulnerable: Incidence is highest in the first two years of life and declines as a child grows older.

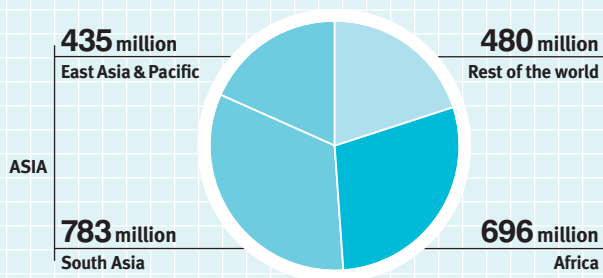
Mortality from diarrhoea has declined over the past two decades from an estimated 5 million deaths among children under five to 1.5 million deaths in 2004,<sup>7</sup> which parallels downward trends in overall under-five mortality during this period. Despite these declines, diarrhoea remains the second most common cause of death among children under five globally (Figure 2), following closely behind pneumonia, the leading killer of young children. Together, pneumonia and diarrhoea account for an estimated 40 per cent of all child deaths around

the world each year. Nearly one in five child deaths is due to diarrhoea, a loss of about 1.5 million lives each year. The toll is greater than that caused by AIDS, malaria and measles *combined*.

Africa and South Asia are home to more than 80 per cent of child deaths due to diarrhoea (Figure 3). Just 15 countries account for almost three quarters of all deaths from diarrhoea among children under five years of age annually (Figure 4).

**FIGURE 1** Africa and South Asia account for over half the cases of childhood diarrhoea

Proportional distribution of diarrhoea cases among children under five years of age, by region, 2004



Source: Based on World Health Organization, Global Burden of Disease estimates, 2004 update. The proportional distribution for UNICEF regions was calculated by applying the WHO cause of death estimates to the most recent estimates for the total number of under-five deaths (2007).



**FIGURE 2** Diarrhoea is the second most common cause of child deaths worldwide

Proportional distribution of cause-specific deaths among children under five years of age, 2004

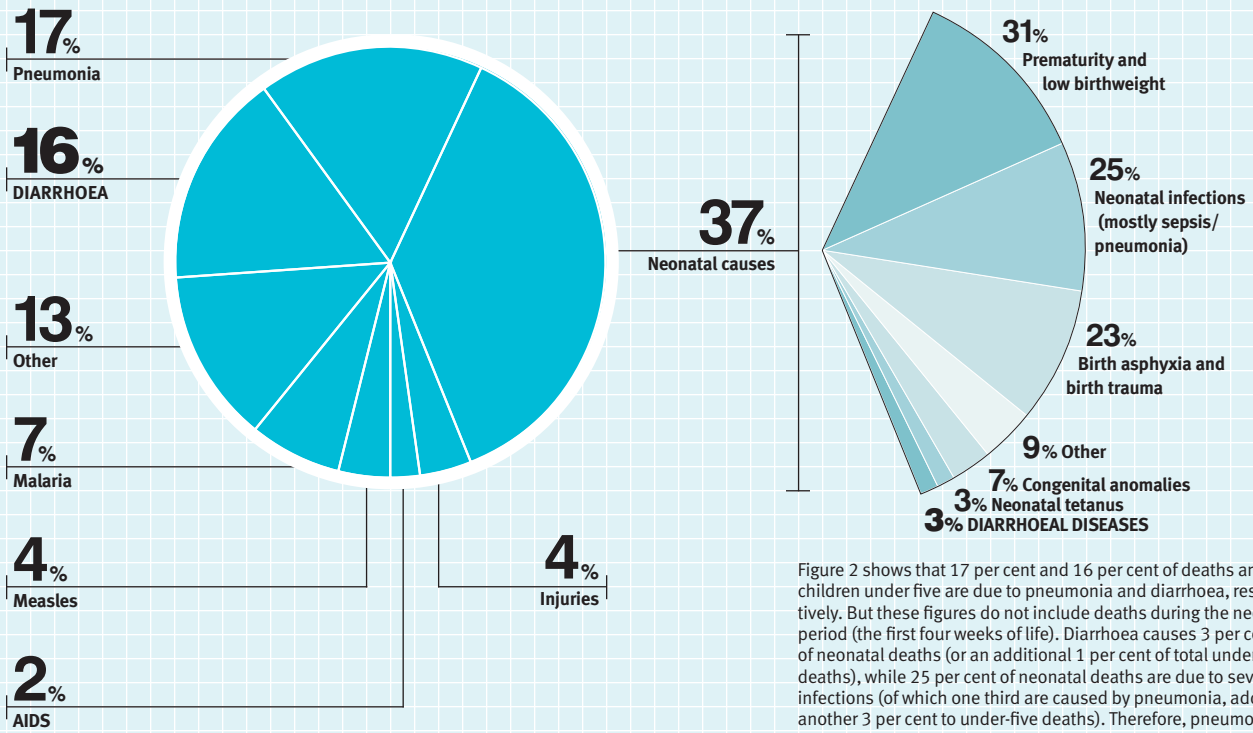


Figure 2 shows that 17 per cent and 16 per cent of deaths among children under five are due to pneumonia and diarrhoea, respectively. But these figures do not include deaths during the neonatal period (the first four weeks of life). Diarrhoea causes 3 per cent of neonatal deaths (or an additional 1 per cent of total under-five deaths), while 25 per cent of neonatal deaths are due to severe infections (of which one third are caused by pneumonia, adding another 3 per cent to under-five deaths). Therefore, pneumonia and diarrhoea actually cause about 20 per cent and 17 per cent, respectively, of total under-five deaths when estimates from the post-neonatal and neonatal periods are combined.

Source: World Health Organization, Global Burden of Disease estimates, 2004 update.

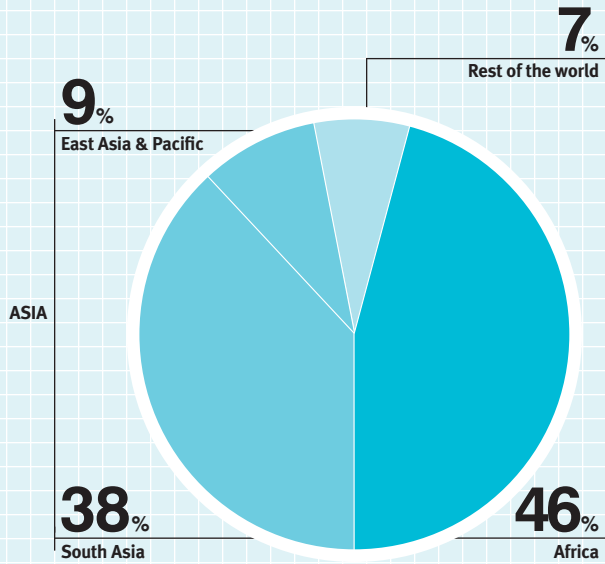
Note: Neonatal causes do not add up to 100 per cent due to rounding. Globally, more than one third of deaths among children under five are attributable to undernutrition.





**FIGURE 3** More than 80 per cent of child deaths due to diarrhoea occur in Africa and South Asia

Proportional distribution of deaths due to diarrhoeal diseases among children under five years of age, by region, 2004



Source: World Health Organization, Global Burden of Disease estimates, 2004 update, with additional analyses to calculate UNICEF regions.

**FIGURE 4** Nearly three quarters of child deaths due to diarrhoea occur in just 15 countries

RANK	COUNTRY	TOTAL NUMBER OF ANNUAL CHILD DEATHS DUE TO DIARRHOEA
1	India	386,600
2	Nigeria	151,700
3	Democratic Republic of the Congo	89,900
4	Afghanistan	82,100
5	Ethiopia	73,700
6	Pakistan	53,300
7	Bangladesh	50,800
8	China	40,000
9	Uganda	29,300
10	Kenya	27,400
11	Niger	26,400
12	Burkina Faso	24,300
13	United Republic of Tanzania	23,900
14	Mali	20,900
15	Angola	19,700

Source: World Health Organization, Global Burden of Disease estimates, 2004 update. The totals were calculated by applying the WHO cause of death estimates to the most recent estimates for the total number of under-five deaths (2007).



# 2

SECTION

## Diarrhoeal diseases: The basics



Diarrhoea is defined as having loose or watery stools at least three times per day, or more frequently than normal for an individual. Though most episodes of childhood diarrhoea are mild, acute cases can lead to significant fluid loss and dehydration, which may result in death or other severe consequences if fluids are not replaced at the first sign of diarrhoea.

### What causes diarrhoea?

Diarrhoea is a common symptom of gastrointestinal infections caused by a wide range of pathogens, including bacteria, viruses and protozoa. However, just a handful of organisms are responsible for most acute cases of childhood diarrhoea.<sup>8</sup> Rotavirus is the leading cause of acute diarrhoea, and is responsible for about 40 per cent of all hospital admissions due to diarrhoea among children under five worldwide.<sup>9</sup> Other major bacterial pathogens include *E. coli*, *Shigella*, *Campylobacter* and *Salmonella*, along with *V. cholerae* during epidemics (Box 1). *Cryptosporidium* has been the most frequently isolated protozoan pathogen among children seen at health facilities and is frequently found among

HIV-positive patients (Box 2). Though cholera is often thought of as a major cause of child deaths due to diarrhoea, most cases occur among adults and older children.

### How are diarrhoea pathogens transmitted?

Most pathogens that cause diarrhoea share a similar mode of transmission – from the stool of one person to the mouth of another. This is known as faecal-oral transmission. There may be differences, however, in the number of organisms needed to cause clinical illness, or in the route the pathogen takes while travelling between individuals (for example, from the stool to food or water, which is then ingested).

#### BOX 1

#### In humanitarian crises, diarrhoea is a major cause of death

Diarrhoea is a leading cause of death during complex emergencies and natural disasters. Displacement of populations into temporary, overcrowded shelters is often associated with polluted water sources, inadequate sanitation, poor hygiene practices, contaminated food and malnutrition – all of which affect the spread and severity of diarrhoea. At the same time, the lack of adequate health services and transport reduces the likelihood of prompt and appropriate treatment of diarrhoea cases.

In 1994, between 500,000 and 800,000 Rwandan refugees flooded into areas around Goma in what is now the Democratic Republic of the Congo. An estimated 50,000 deaths occurred in the first month alone, with 85 per cent of them attributed to diarrhoea. The scarcity of water was cited as the main cause for the outbreak. Malnutrition is also common in emergencies and tends to be heightened

when feeding practices are disrupted and sanitation deteriorates.

Diarrhoea control is a main concern when responding to complex emergencies, such as the one in Goma. Priority interventions include providing safe water in adequate quantities, setting up appropriate sanitation facilities, establishing health services to rapidly detect and treat cases, and promoting good hygiene. In recent years, progress has been made in implementing community-based interventions when responding to emergencies, such as promoting exclusive breastfeeding, micronutrient supplementation, point-of-use water treatment, handwashing with soap, and treating cases with oral rehydration salts or appropriate homemade fluids.

**Sources:** Goma Epidemiology Group, 'Public Health Impact of the Rwandan Refugee Crisis: What happened in Goma, Zaire, in July 1994', *The Lancet*, vol. 345, no. 8964, 1995, pp. 339-344.

## What are the main forms of acute childhood diarrhoea?

There are three main forms of acute childhood diarrhoea, all of which are potentially life-threatening and require different treatment courses:

- **Acute watery diarrhoea** includes cholera and is associated with significant fluid loss and rapid dehydration in an infected individual. It usually lasts for several hours or days. The pathogens that generally cause acute watery diarrhoea include *V. cholerae* or *E. coli* bacteria, as well as rotavirus.
- **Bloody diarrhoea**, often referred to as dysentery, is marked by visible blood in the stools. It is associated with intestinal damage and nutrient losses in an infected individual. The most common cause of bloody diarrhoea is *Shigella*, a bacterial agent that is also the most common cause of severe cases.
- **Persistent diarrhoea** is an episode of diarrhoea, with or without blood, that lasts at least 14 days. Undernourished children and those with other illnesses, such as AIDS, are more likely to develop persistent diarrhoea. Diarrhoea, in turn, tends to worsen their condition.

## Why are children more vulnerable?

Children with poor nutritional status and overall health, as well as those exposed to poor environmental conditions, are more susceptible to severe diarrhoea and dehydration than healthy children (Figure 5). Children are also at greater risk than adults of life-threatening dehydration since water constitutes a greater proportion of children's body-weight. Young children use more water over the course of a day given their higher metabolic rates, and their kidneys are less able to conserve water compared to older children and adults.

## How is diarrhoea prevented?

Reducing childhood diarrhoea requires interventions to make children healthier and less likely to develop infections that lead to diarrhoea; clean environments that are less likely to transmit disease; and the support of communities and caregivers in consistently reinforcing healthy behaviours and practices over time.

### BOX 2

#### The links between diarrhoea and HIV

Diarrhoea is a common manifestation of HIV infection in both adults and children. In adults, it is usually the consequence of a deteriorating immune system late in the HIV disease cycle. In children with HIV, it is often the result of frequently aggressive common childhood infections caused by pathogens such as *Campylobacter*, *E. coli*, *Salmonella*, *Shigella* or rotavirus.<sup>10</sup> When diarrhoea persists for more than two weeks in children, it may be an indicator of stage 3 HIV infection, according to WHO, and requires further evaluation and antiretroviral treatment.<sup>11</sup>

Persistent diarrhoea occurs with increased frequency in HIV-infected children, and is associated with an 11-fold increase in mortality compared to uninfected children.<sup>12</sup>  
Causes of persistent diarrhoea in HIV-positive children

include HIV-related malabsorption, gut manifestation of tuberculosis, gut infections and infestations of pathogens such as *Cryptosporidium parvum*, *Cyclospora cayentanensis*, *Isospora belli*, *Microsporidia* and cytomegalovirus. Management of diarrhoea in children with HIV is the same as in children without the virus, as outlined in this report.<sup>13</sup>

**Sources:** Partners in Health, *The PIH Guide to the Community-Based Treatment of HIV in Resource-Poor Settings* (Revised Second Edition), Partners in Health, Boston, 2008; World Health Organization, *Antiretroviral Therapy of HIV Infection in Infants and Children: Towards universal access. Recommendations for a public health approach*, WHO, Geneva, 2006; Tindyebwa, D., et al., 'Common Clinical Conditions Associated with HIV', in: *Handbook on Paediatric AIDS in Africa*, 2004; Lule, J.R., et al., 'Effect of Home-Based Water Chlorination and Safe Storage on Diarrhea Among Persons with Human Immunodeficiency Virus in Uganda', *American Journal of Tropical Medicine and Hygiene*, vol. 73, no. 5, 2005, pp. 926-933.

Many well-known child survival interventions are critical to reducing child deaths from diarrhoea. They work in two ways: by either directly reducing a child's exposure to the pathogens that cause diarrhoea (through the provision of safe drinking water, for example) or by reducing a child's susceptibility to severe diarrhoea and dehydration (through improved nutrition and overall health).

#### WATER, SANITATION AND HYGIENE

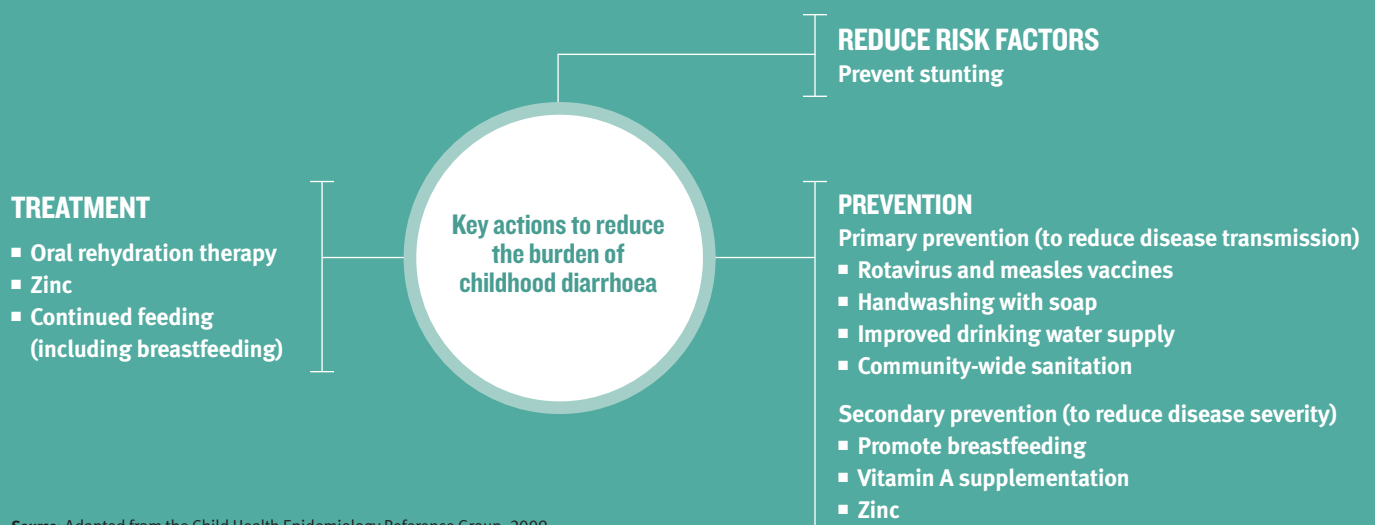
Improvements in access to safe water and adequate sanitation, along with the promotion of good hygiene practices (particularly handwashing with soap), can help prevent childhood diarrhoea. In fact, an estimated 88 per cent of diarrhoeal deaths worldwide are attributable to unsafe water, inadequate sanitation and poor hygiene.<sup>14</sup>

Water, sanitation and hygiene programmes typically include a number of interventions that work to reduce the number of diarrhoea cases. These

include: disposing of human excreta in a sanitary manner, washing hands with soap, increasing access to safe water, improving water quality at the source, and treating household water and storing it safely.

Improvements in sanitation reduce the transmission of pathogens that cause diarrhoea by preventing human faecal matter from contaminating environments. Improving sanitation facilities has been associated with an estimated median reduction in diarrhoea incidence of 36 per cent across reviewed studies.<sup>15</sup> (A recent survey in the *British Medical Journal* showed that their readers believed sanitation to be the most important medical milestone since 1840.<sup>16</sup>) However, a major challenge in this regard is scaling up sanitation facilities to the point where they are used by an entire community ('total sanitation'). Use of such facilities by *all* community members is necessary to significantly reduce diarrhoeal disease transmission (Box 3).<sup>17</sup>

**FIGURE 5** Nutrition, health and environmental factors all play a role in preventing and treating childhood diarrhoea



Source: Adapted from the Child Health Epidemiology Reference Group, 2009.

**BOX  
3**

**Increasing demand to stop community-wide open defecation**



Until recently, national governments and their development partners promoted the use of improved sanitation facilities primarily by constructing toilets. Today, a fundamentally new approach has been adopted – one that relies on the demand of a community to stop open defecation, which has proven far more effective.

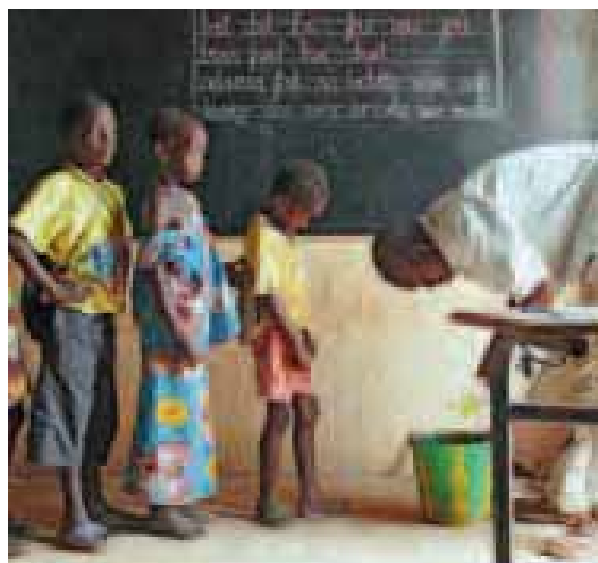
Stimulating collective action to stop open defecation is now relying on behavioural triggers related to status, pride, shame and disgust, rather than relying solely on health-related arguments. Another feature of this approach is the absence of household subsidies to prompt latrine construction. Instead, a community's desire for change tends to propel them into action and encourages innovation, mutual support and appropriate local solutions, thus leading to greater ownership and sustainability. In some instances, a large number of private entrepreneurs have emerged from nearby villages to match the demand for low-cost latrine parts.<sup>18</sup>

By generating demand in this way, complete districts, such as in Bangladesh and Zambia, have become 'open-defecation-free'. Large international development agencies such as UNICEF and the World Bank Water and Sanitation Programme are now promoting similar sanitation approaches in other areas.

**Source:** Kar, K., 'Subsidy or Self-Respect? Participatory total community sanitation in Bangladesh', IDS Working Paper 184, Institute of Development Studies, Brighton, UK, 2003.

Washing one's hands with soap is another important barrier to transmission (Box 4), and has been cited as one of the most cost-effective public-health interventions.<sup>19</sup> A number of studies have shown that handwashing with soap can reduce the incidence of diarrhoeal disease by over 40 per cent.<sup>20</sup> Accessible and plentiful water has also been shown to encourage better hygiene, handwashing in particular, although the extent to which access to improved water sources reduces diarrhoea rates often depends on the type of water source available (such as public taps or standpipes, protected dug wells or boreholes).<sup>21</sup>

Interventions to improve water quality at the source, along with treatment of household water and safe storage systems, have been shown to reduce diarrhoea incidence by as much as 47 per cent.<sup>22</sup> Proven and field-tested household water treatment options that are currently being promoted include chlorination, filtration, combined flocculation and disinfection, boiling, and solar disinfection. Household water treatment could potentially be scaled up quickly and inexpensively in both development and emergency situations. It has even become common practice in large cities where homes are connected to a municipal water supply, since water is often polluted between the source and the point of use.



**ADEQUATE NUTRITION**

Undernourished children are at higher risk of suffering more severe, prolonged and often more frequent episodes of diarrhoea. Repeated bouts of diarrhoea also place children at a greater risk of worsening nutritional status due to decreased food intake and reduced nutrient absorption, combined with the child's increased nutritional requirements during repeated episodes.

Diarrhoea often leads to stunting in children due to its association with poor nutrient absorption and appetite loss. The risk of stunting in young children has been shown to increase significantly with each episode of diarrhoea,<sup>23</sup> and diarrhoea control, particularly in the first six months of life, may help to reduce stunting prevalence among children.<sup>24</sup>

**BREASTFEEDING**

Breastmilk contains the nutrients, antioxidants, hormones and antibodies needed by a child to survive and develop. Infants who are exclusively breastfed for the first six months of life and continue to be breastfed until two years of age and beyond develop fewer infections and have less severe illnesses than those who are not, even among children whose mothers are HIV-positive. This

**BOX 4 Handwashing with soap:  
A high-impact, cost-effective intervention**

**Washing one's hands with soap can reduce rates of diarrhoeal disease when carried out at critical moments: after using the toilet, after cleaning a child's bottom and before handling food. Research suggests that handwashing with soap is effective even in overcrowded and highly contaminated slums in the developing world.**

**Studies have also pointed out that washing hands with water alone is much less effective in preventing disease than using soap. Soap breaks down grease and dirt that carry germs and disease-causing pathogens. Using soap also increases the amount of time spent washing hands, compared to water alone. Yet lack of soap does not seem to be a major barrier to handwashing: It has been found that 95 per cent of mothers in developing countries have some sort of soap product at home.**

**To better understand ways to promote hygienic behaviour, research has been carried out regarding consumers' handwashing habits and factors that motivate change. This research shows that key triggers for handwashing are feelings of disgust, nurture, comfort and desire to conform, rather than health concerns alone. These findings are being used to create more effective hygiene programmes.**

**Sources:** Adapted from: United Nations Children's Fund, *Global Handwashing Day (15 October): Planner's guide*, UNICEF, New York, 2008; Curtis, V., and S. Cairncross, 'Effect of Washing Hands with Soap on Diarrhoea Risk in the Community: A systematic review', *The Lancet Infectious Diseases*, vol. 3, no. 5, May 2003, pp. 275-281; Ensink, J., and V. Curtis, 'Health Impact of Handwashing with Soap', [www.lboro.ac.uk/well/resources/fact-sheets/fact-sheets-htm/Handwashing.htm](http://www.lboro.ac.uk/well/resources/fact-sheets/fact-sheets-htm/Handwashing.htm), accessed June 2009; Scott, B., et al., 'Health in our Hands, but Not in our Heads: Understanding hygiene motivation in Ghana', *Health Policy and Planning*, vol. 22, no. 4, May 2007, pp. 225-233.

protection has been shown to be higher where maternal literacy is lower and where sanitation is worse.<sup>25</sup> Infants who are not breastfed have a sixfold greater risk of dying from infectious diseases in the first two months of life, including from diarrhoea, than those who are breastfed.<sup>26</sup>

#### MICRONUTRIENT SUPPLEMENTATION

*Vitamin A supplementation* is a critical preventive measure, and studies have shown mortality reductions ranging from 19 per cent to 54 per cent in children receiving supplements.<sup>27</sup> This reduction is associated in large part with declines in deaths due to diarrhoeal diseases and measles. Vitamin A supplementation has also been shown to reduce the duration, severity and complications associated with diarrhoea.<sup>28</sup>

*Adequate zinc intake* among children is critical for normal growth and development. Recent supplementation trials have shown that adequate zinc leads to a substantial reduction in childhood diarrhoea cases.<sup>29</sup>

#### IMMUNIZATION

Immunizations help reduce deaths from diarrhoea in two ways: by helping prevent infections that cause diarrhoea directly, such as rotavirus, and by preventing infections that can lead to diarrhoea as a complication of an illness, such as measles.

*Rotavirus* is estimated to cause about 40 per cent of all hospital admissions due to diarrhoea among children under five years of age worldwide<sup>30</sup> – leading to some 100 million episodes of acute diarrhoea each year that result in 350,000 to 600,000 child deaths.<sup>31</sup> Introduction of rotavirus vaccine in countries with the greatest diarrhoea burdens, especially in Asia and Africa, must be accelerated on a priority basis. Global rotavirus vaccine introduction has recently been recommended by the World Health Organization (WHO).<sup>32</sup>

*Measles* is an acute viral infection that is often self-limiting. But some children, particularly those who are undernourished or have compromised immune systems, may experience serious side effects, including diarrhoea. Diarrhoea is one of the most common causes of death associated with measles worldwide.



### How is diarrhoea diagnosed?

Guidelines for the diagnosis and treatment of childhood diarrhoea are set out in the *Integrated Management of Childhood Illness* handbook.<sup>33</sup> Diagnosis is based on clinical symptoms, including the extent of dehydration, the type of diarrhoea exhibited, whether blood is visible in the stool, and the duration of the diarrhoea episode. Treatment regimens differ based on the outcomes of this clinical assessment. Microbiological culture and microscopy are not necessary to diagnose diarrhoea and initiate treatment, even in high-income countries, although these tools can help identify specific pathogens for outbreak investigations.

It is important that caregivers recognize the symptoms that require immediate attention from appropriate health personnel, including trained community health workers. These symptoms include dehydration, blood in the stool, profuse and persistent diarrhoea and repeated vomiting.

### How is diarrhoea treated?

The latest recommendations for treating childhood diarrhoea in the developing world are set out in a

UNICEF and WHO joint statement<sup>34</sup> issued in 2004. These interventions are proven, affordable and relatively straightforward to implement.

Since the 1970s, oral rehydration therapy has been the cornerstone of treatment programmes to prevent life-threatening dehydration associated with diarrhoea (Box 5). Fluid replacement should begin at home and be administered by the caregiver at the start of the diarrhoea episode. A solution made from oral rehydration salts (ORS) is the ‘gold standard’ of oral rehydration therapy, and a new formula has been developed (known as low-osmolality ORS) that improves overall outcomes when compared to the original version (Box 6). UNICEF and WHO recommend that all children with diarrhoea have access to this new ORS formula; making it widely available to children in need will require innovative delivery strategies.

When ORS are not available, other fluids will also work to prevent dehydration among children with diarrhoea, although they are not as effective in treating children who have become dehydrated. Such fluids (which many countries have designated as ‘recommended homemade fluids’) can be

#### BOX 5

#### Oral rehydration salts: One of the most important medical advances of the 20th century

A solution of oral rehydration salts (ORS) is a simple, inexpensive and life-saving remedy that prevents dehydration among children with diarrhoea. How does it work?

In a healthy child, the small intestines absorb water and electrolytes from the digestive tract so that these nutrient-rich fluids may be transported to other parts of the body through the bloodstream. In a sick child, diarrhoea-causing pathogens damage the intestines – causing an excessive amount of water and electrolytes to be secreted rather than being absorbed. When the ORS solution reaches the small intestines, the sodium and glucose in

the mixture are transported together across the lining of the intestines, and the sodium, which is now in higher concentrations in the intestines, promotes water absorption back into the body from the gut. The discovery that sodium and glucose are transported together across the small intestines through a co-transport mechanism has been called “potentially the most important medical advance of the 20th century.”<sup>35</sup> The development of ORS is a direct result of this discovery.

**Sources:** –, ‘Water with Sugar and Salt’, *The Lancet*, vol. 312, no. 8084, 1978, pp. 300-301; Rehydration.org, ‘Why is Rehydration so Important and How it Works to Save Children’s Lives’, <<http://rehydrate.org/rehydration>>, accessed June 2009.

**BOX  
6**

**Low-osmolarity ORS: A life-saving remedy just got better**

For more than two decades, WHO and UNICEF recommended a single ORS formula for treating all types of diarrhoea among all age groups. During this time, researchers also worked to improve the formula to provide additional clinical benefits to patients. Particularly important, in addition to preventing dehydration, was making ORS more acceptable to caregivers who sought to reduce their child's diarrhoea symptoms.

In 2004, WHO and UNICEF began recommending that countries use and manufacture a new ORS formula (known as low-osmolarity ORS) to treat all types of diarrhoea among all age groups. This improved formula was shown to be as safe and effective as the previous version, but also had other important clinical benefits. Stool output and vomiting decreased in children by about 20 per cent and 30 per cent, respectively, when compared to children using the original ORS formula. Unscheduled intravenous therapy also declined by 33 per cent among children with diarrhoea using this new remedy.

**Source:** World Health Organization, *The Treatment of Diarrhoea: A manual for physicians and other senior health workers*, WHO, Geneva, 2005.

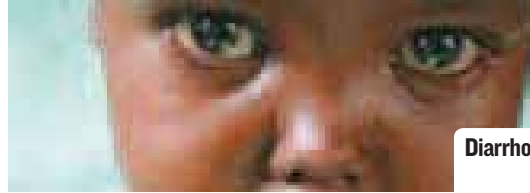


prepared at home using readily available and low-cost ingredients. Examples of rehydrating fluids include cereal-based drinks made from a thin gruel of rice, maize, potato or other readily available low-cost grain or root crop the family has at home. Breastmilk is also an excellent drink for fluid replacement and should continue to be given to infants with diarrhoea simultaneously with other oral rehydration solutions.

If ORS or other appropriate fluids are not available, increased amounts of almost any fluid could also help to prevent dehydration. Continuing to feed the child during the diarrhoea episode, while providing oral rehydration therapy, further supports the absorption of fluids from the gut into the bloodstream to prevent dehydration. Children receiving food during the diarrhoea episode are also more likely to maintain their nutritional status and their ability to fight infection.

A recent and important development in diarrhoea treatment is the addition of zinc to the regimen. Box 7 details the added value of zinc in diarrhoea treatment, and its effectiveness in reducing both the duration and severity of diarrhoea episodes as well as reducing stool volume and the need for advanced medical care. Children receiving zinc often have greater appetites and are more active during the diarrhoea episode; its use has also been associated with increased ORS uptake. The provision of zinc tablets by health workers may also reduce the demand from caregivers for other less effective drugs, such as antibiotics and antidiarrhoeal medications, which should not be routinely administered.





BOX  
7

**Zinc: Critical to diarrhoea treatment, but largely unavailable in developing countries**

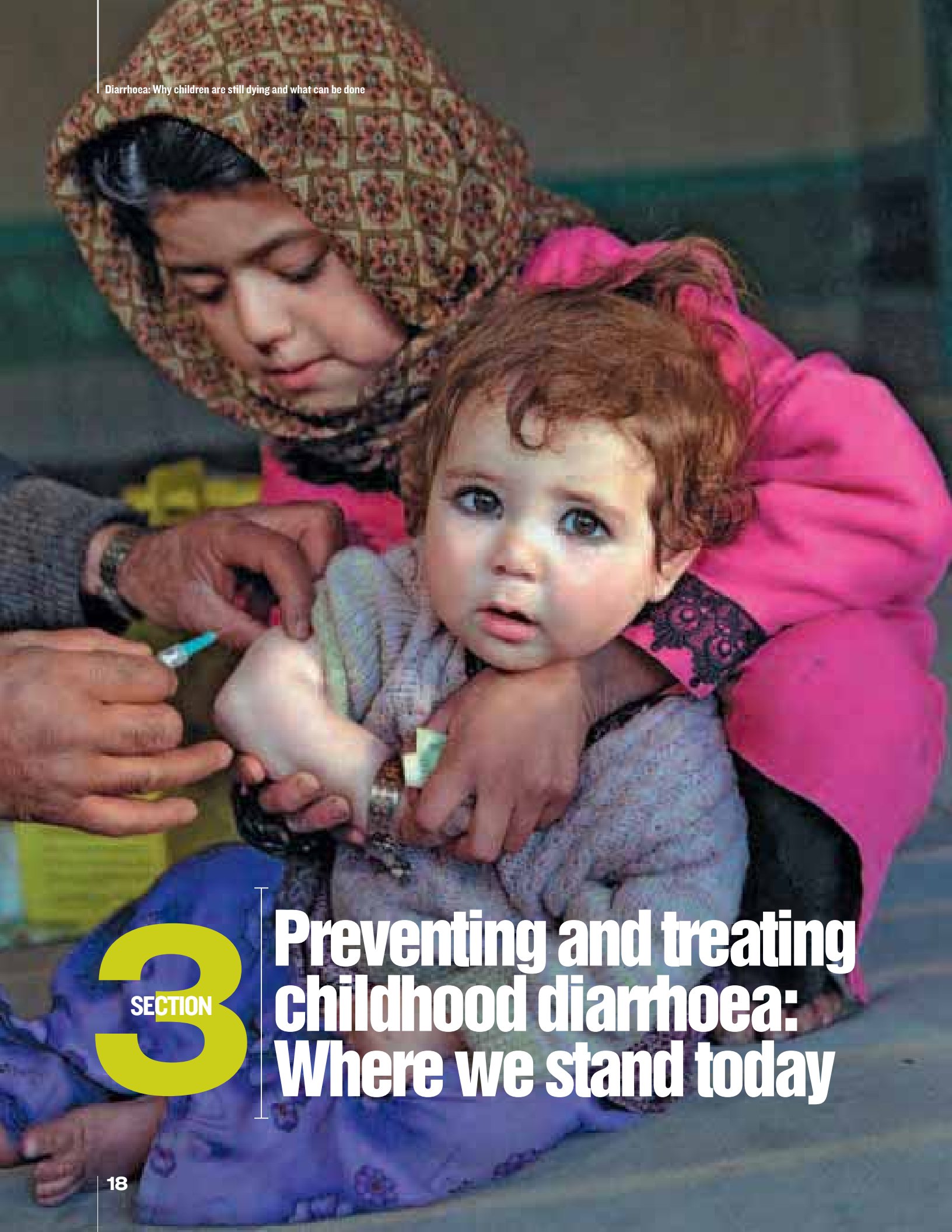
Zinc is critical for overall health, growth and development. It also supports proper functioning of the immune system. Though widely found in protein-rich and other food sources, zinc deficiency is widespread throughout the developing world and has been associated with higher rates of infectious diseases, including diarrhoea, and deaths from these illnesses. Zinc stores are further depleted during diarrhoea episodes, and supplementation as a part of treatment programmes is critical for replenishing the body's reserves – helping children to recover from illness and stay healthy afterwards.

Clinical studies have shown that a 10- to 14-day treatment course with zinc effectively reduces the duration and severity of both persistent and acute diarrhoea. Zinc has been associated with a 25 per cent reduction in the duration of acute diarrhoea, as well as a 40 per cent reduction in treatment failure and death in persistent diarrhoea.

The recent introduction of zinc tablets into large-scale diarrhoea treatment programmes in India, Mali and Pakistan suggests that it may be even more effective

than clinical trial results indicate. Zinc appears to increase ORS uptake and reduces inappropriate drug use with antibiotics and antidiarrhoeal medications. Children receiving zinc tablets appeared to recover more quickly, had increased strength and appetites, and were less ill than other children in their communities. In fact, a Malian mother noted that her son had “gained strength and energy unlike ever before,” which echoed the sentiments of many other caregivers.

**Sources:** World Health Organization, Department of Child and Adolescent Health and Development (CAH), 'CAH Progress Report Highlights 2008', WHO, Geneva, 2009; Bhandari, N., et al., 'Effectiveness of Zinc Supplementation plus Oral Rehydration Salts Compared with Oral Rehydration Salts Alone as a Treatment for Acute Diarrhea in a Primary Care Setting: A cluster randomized trial', *Pediatrics*, vol. 121, no. 5, 2008, pp. e1279-e1285; Winch, P.J., et al., 'Cluster-randomized Programme Effectiveness Study of Community Case Management with Zinc for Childhood Diarrhoea in Southern Mali', *Bulletin of the World Health Organization* (in press); World Health Organization, Department of Child and Adolescent Health and Development, 'CAH Meeting Report: Consultation to review the results of the large effectiveness studies examining the addition of zinc to the current case management of diarrhoea (India, Mali and Pakistan)', 30-31 January 2008.



SECTION  
**3**

**Preventing and treating  
childhood diarrhoea:  
Where we stand today**



This section provides an update on how well countries and regions are doing in making available key measures to prevent and treat childhood diarrhoea.

## Prevention

### Water, sanitation and hygiene

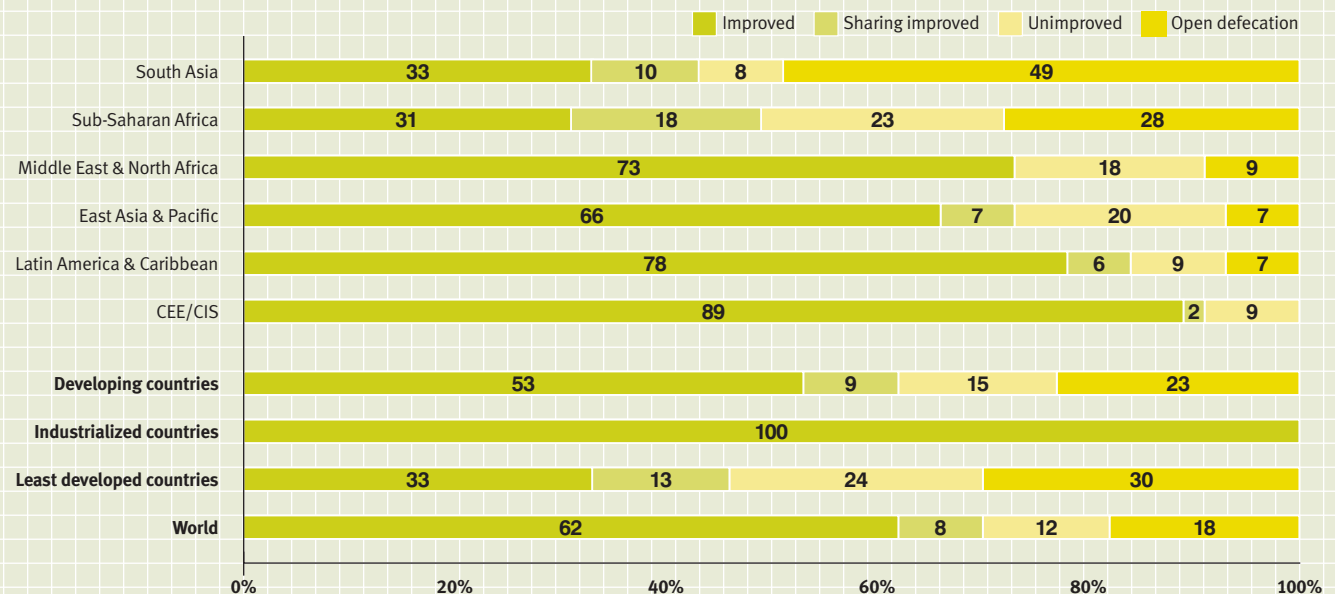
Improving access to safe drinking water and adequate sanitation, as well as promoting good hygiene, are key components in preventing diarrhoea. Yet a recent WHO/UNICEF report<sup>36</sup> indicated that, in 2006 (the latest year for which data are available), an estimated 2.5 billion people were lacking improved sanitation facilities. Moreover, nearly 1 in 4 people in developing countries were practising indiscriminate or open defecation (Figures 6 and 7). To further compound the problem, children's faeces are often unsafely disposed of in many developing countries.<sup>37</sup> Children's stools tend to carry a higher

pathogen load than adults', and many children play in areas in which stools are found. Safely disposing of them is therefore critical for reducing the number of diarrhoea cases.

Between 1990 and 2006, the proportion of the developing world's population using an improved drinking water source rose from 71 per cent to 84 per cent (Figure 8). Still, almost 1 billion people lack access to improved drinking water sources, and many households do not treat or safely store their household water supplies. Rural access to improved drinking water sources remains low, and many people using an improved source must still walk long distances to fetch water, thereby reducing the

**FIGURE 6** Nearly 1 in 4 people in developing countries practises open defecation

Percentage distribution of the population using different types of sanitation facilities, by region, 2006

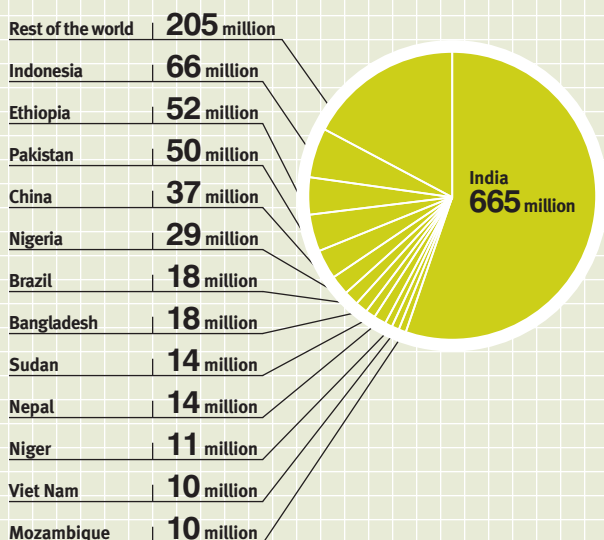


Source: World Health Organization/United Nations Children's Fund, *Progress on Drinking Water and Sanitation: Special focus on sanitation*, UNICEF, New York, 2008.

Note: Improved sanitation facilities refer to (1) flush or pour-flush to a piped water system, septic tank or pit latrine (2) ventilated improved pit latrine (3) pit latrine with slab (4) composting toilet. Unimproved sanitation refers to (1) flush or pour-flush to elsewhere (2) pit latrine without slab or open pit (3) bucket (4) hanging toilet or hanging latrine (5) no facilities or bush or field.

**FIGURE 7** Globally, 1.2 billion people practise open defecation, 83 per cent of whom live in 13 countries

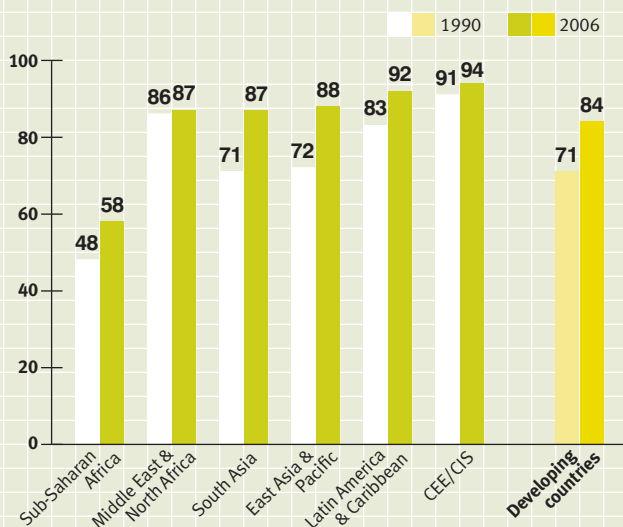
Population practising open defecation, by countries with the highest numbers, 2006



Source: World Health Organization/United Nations Children's Fund, *Progress on Drinking Water and Sanitation: Special focus on sanitation*, UNICEF, New York, 2008.

**FIGURE 8** More than 80 per cent of the developing world's population use an improved drinking water source

Trends in the percentage of the population using improved drinking water sources, by region, 2006



Source: World Health Organization/United Nations Children's Fund, *Progress on Drinking Water and Sanitation: Special focus on sanitation*, UNICEF, New York, 2008.

Note: Improved drinking water sources refer to (1) piped water into dwelling, plot or yard (2) public tap/stand pipe (3) tube well or borehole (4) protected dug well (5) protected spring (6) rainwater collection. Unimproved drinking water sources refer to (1) unprotected dug well (2) unprotected spring (3) cart with small tank/drum (4) tanker truck (5) surface water (river, dam, lake, pond, stream, canal, irrigation channel) (6) bottled water (which is only considered improved when the household uses water from an improved source for cooking and personal hygiene).

amount collected. While coverage is higher in urban areas, population growth presents a growing challenge in further increasing improved drinking water coverage. The lack of improved drinking water sources also tends to curtail personal hygiene practices, including handwashing.

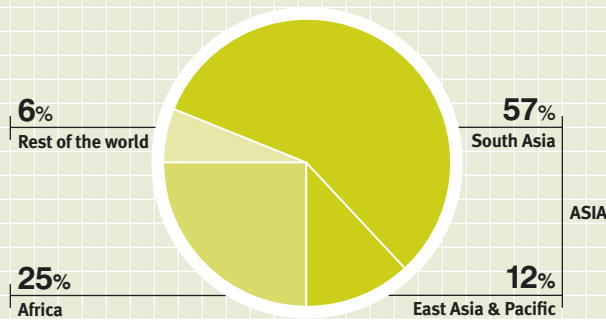
Data on handwashing with soap are not available through major national-level household surveys due to concerns about the validity of information provided by responders. However, proxy indicators such as the availability of soap and other commodities in the household for use in handwashing will be added to the next round of surveys, including the UNICEF-supported Multiple Indicator Cluster Surveys.

**Adequate nutrition**

Undernourished children are more likely to suffer from diarrhoea and its consequences, which, in turn, increases their chances of worsening nutritional status. Today, 129 million children under the age of five in the developing world are underweight for their age. Together, Africa and South Asia account for more than 80 per cent of total underweight children (25 per cent and 57 per cent, respectively) (Figure 9). About 40 per cent of chil-

**FIGURE 9** More than 4 out of 5 children who are underweight for their age live in Africa or South Asia

Percentage of children under five who are underweight (WHO Child Growth Standards), by region, 2003-2008



Source: United Nations Children's Fund, global databases, 2009 (based on WHO Child Growth Standards).



dren under five years of age are stunted in Africa, and nearly half in South Asia.

### Breastfeeding

Over the past decade, there has been some progress in exclusive breastfeeding rates among infants in the first six months of life across the developing world, and particularly in Africa. Despite these advances, overall levels remain low, and only 37 per cent of infants in developing countries are exclusively breastfed for the first six months of life (Figure 10).

### Micronutrient supplementation

**Vitamin A** supplementation rates have increased significantly in recent years. Coverage of children aged 6-59 months with at least one dose of vitamin A per year has increased by nearly 50 per cent since 1999. Moreover, between 1999 and 2007, coverage of children considered fully protected by vitamin A – that is, receiving two doses per year – increased nearly fourfold in developing countries (Figure 11). Progress was made possible through innovative strategies that included combined delivery with other high-impact interventions for health and nutrition. Reaching the poorest children and those

living in rural areas, who are most at risk of vitamin A deficiency, remains the greatest challenge.

**Zinc** is important for normal growth and development and for reducing childhood diarrhoea cases. Yet data on improving children’s zinc status as a key prevention measure are not available.

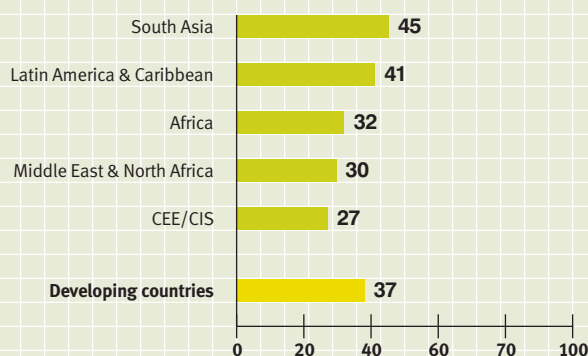
### Immunization

Only a few, mostly high- and middle-income countries include rotavirus vaccine in their routine immunization schedules. WHO recently recommended introduction of the vaccine in *all* routine schedules, and data to monitor its coverage in many countries are expected to follow implementation.

Deaths due to measles have declined rapidly in recent years. Between 2000 and 2007, global mortality attributed to measles was down by 74 per cent.<sup>38</sup> This decrease in deaths is generally credited to increases in routine measles immunization coverage, coupled with improvements in follow-up campaigns that provide second opportunities for children to get immunized. However, more work is needed to reach the UNICEF and WHO goal of reducing measles mortality by 90 per cent by 2010.<sup>39</sup>

**FIGURE 10** Just 37 per cent of infants in developing countries are breastfed for the first six months of life

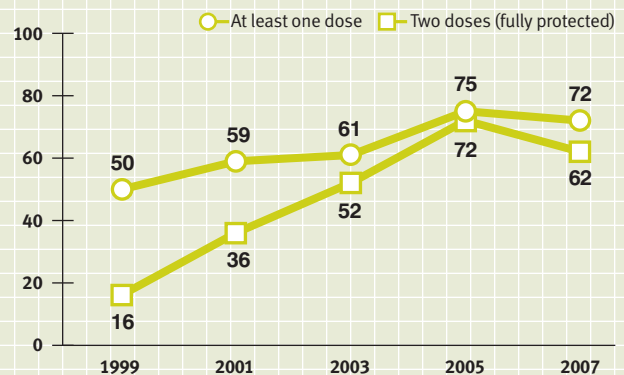
Percentage of infants who are exclusively breastfed for the first six months of life, by region, 2003-2008



Source: United Nations Children’s Fund, *The State of the World’s Children 2010*, UNICEF, New York (forthcoming). Data are insufficient for East Asia & Pacific.

**FIGURE 11** The proportion of children fully protected by vitamin A has increased fourfold since 1999

Percentage of children ages 6-59 months receiving at least one dose and two doses (fully protected) of vitamin A supplements, developing countries, 1999-2007



Source: United Nations Children’s Fund, global databases, 2009.

## Treatment

Since the 1970s, oral rehydration therapy, pioneered by the International Centre for Diarrhoeal Disease Research, Bangladesh (Box 8), has been the mainstay of diarrhoea treatment programmes. However, treatment recommendations have changed over time to reflect a better understanding of what works to reduce child deaths from diarrhoea as well as new insights into treatment feasibility.<sup>40</sup>

These changes in treatment recommendations have subsequently led to changes in how treatment coverage has been monitored (Figure 12) and the indicators used to measure progress. These various treatment indicators may show markedly different coverage and, in some cases, different assessments of trends over time (Figure 13). There are other challenges in monitoring treatment coverage, which are discussed in the section entitled ‘Data used in this report’ on page 37. Despite these challenges, the data presented here are useful indications of how well regions and countries are doing in treating childhood diarrhoea.

This section assesses coverage of key interventions to prevent dehydration and worsening nutritional status among children with diarrhoea. It includes

both the overall recommended treatment package – oral rehydration therapy and continued feeding – as well as its individual components (ORS, appropriate homemade fluids, increased fluids and continued feeding). Zinc coverage is not assessed since data are largely unavailable.

### Recommended treatment package:<sup>\*</sup> ORT with continued feeding

In developing countries, only 39 per cent of children under five with diarrhoea receive the recommended treatment (ORT with continued feeding) to prevent dehydration and worsening nutritional status. Africa has the lowest levels of treatment coverage (35 per cent), followed by South Asia (37 per cent) and the Middle East & North Africa (39 per cent). East Asia and the Pacific (excluding China) have the highest treatment coverage levels, at 55 per cent (Figure 14).

Boys and girls receive appropriate care at similar rates. Children in urban areas (42 per cent) are more likely to receive the recommended treatment than those living in rural areas (38 per cent). Similarly, children from the wealthiest households (40 per cent) are more likely to receive the recommended treatment than those from the poorest households (34 per cent) (Figure 15).

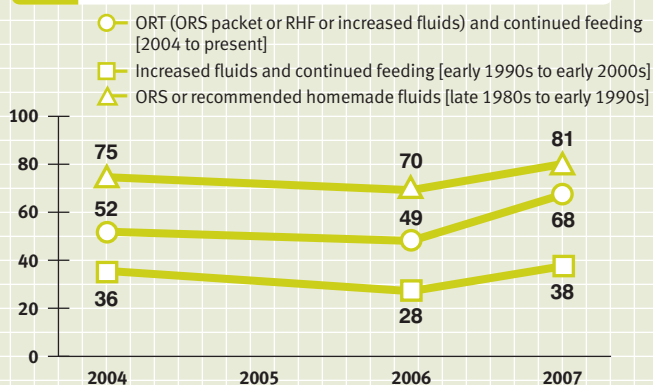
<sup>\*</sup> Zinc is not included since data are largely unavailable.

**FIGURE 12** Treatment recommendations and indicators to monitor coverage have changed over time

TIME PERIOD	RECOMMENDED TREATMENT	INDICATOR FOR MONITORING TREATMENT COVERAGE
2004 to present	Oral rehydration therapy with continued feeding	Proportion of children under five with diarrhoea receiving oral rehydration therapy (an ORS packet or recommended homemade fluids or increased fluids) and continued feeding
Early 1990s to early 2000s	Increased fluids and continued feeding (known as home management of diarrhoea)	Proportion of children under five with diarrhoea receiving increased fluids and continued feeding
Late 1980s to early 1990s	Oral rehydration salts or recommended homemade fluids (RHF)	Proportion of children under five with diarrhoea receiving an ORS packet or RHF

Note: UNICEF and WHO currently recommend the use of zinc in treating childhood diarrhoea, but data regarding coverage are limited. Questions on zinc are now included in some recent Demographic and Health Surveys, and will be included in the next round of Multiple Indicator Cluster Surveys.

**FIGURE 13** Different treatment indicators show different levels of coverage (using Bangladesh as an example)



Sources: Bangladesh Demographic and Health Survey 2004, Multiple Indicator Cluster Survey 2006, and Demographic and Health Survey 2007. Data from these surveys were re-analysed to conform to the different indicator definitions used over time.



**BOX  
8**

**The International Centre for Diarrhoeal Disease Research, Bangladesh: A pioneer in effective diarrhoea control**

The International Centre for Diarrhoeal Disease Research, Bangladesh is an internationally acclaimed institute that is considered a leader in diarrhoea research. The Centre has been saving lives from acute diarrhoea since it opened a cholera research laboratory in Dhaka in 1960. In 1968, Bangladeshi researchers, supported by the United States Agency for International Development, contributed to the discovery of the ORS solution. Ten years later, WHO launched a worldwide campaign to reduce diarrhoea mortality, with ORS as one of the principal elements of that programme.

The International Centre for Diarrhoeal Disease Research treats over 100,000 people for diarrhoeal diseases and related nutritional and respiratory problems each year. Without such treatment, many of these people would die. The Centre's hospital now saves the vast majority of its patients; most are children and almost all are undernourished, coming from the lowest strata of society.<sup>41</sup>

The Centre strongly advocates the use of ORS, and Bangladesh became the first country to scale up oral rehydration therapy through a national programme. Oral rehydration salts are distributed to all corners of the country and are now a household name; they are also available for purchase without a prescription. The hospital promotes the active participation of mothers

in the diarrhoea treatment process, particularly in the administration of ORS, and gives women and families the training and confidence they need to treat diarrhoea themselves.

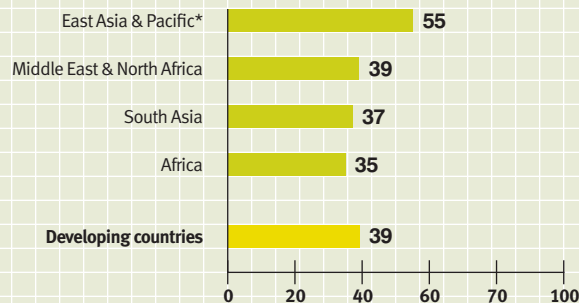
The Centre was also involved in early studies that showed that zinc supplements, used in conjunction with ORS, protect the intestinal lining and significantly reduce the duration of diarrhoeal episodes as well as the risk of recurrence. Recently, the Centre has worked to scale up a programme to provide zinc tablets to every child in need.

At the same time, the Centre emphasizes prevention, which is at the heart of any long-term response. The Government of Bangladesh has focused on community-led approaches and works through a wide network of hygiene promoters to support behaviour change for improved hygiene, safe sanitation and water. These programmes are expected to reach more than 30 million people in Bangladesh, who will receive assistance in the installation of drinking water and sanitation facilities and hygiene education. This is one of the largest intensive sanitation, hygiene and water programmes implemented in a developing country.

**Source:** Special contribution from the International Centre for Diarrhoeal Disease Research, Bangladesh, 2009; United Nations Children's Fund, *Habits for a Lifetime*, UNICEF, Dhaka, 2008.

**FIGURE 14** Too few children with diarrhoea receive the recommended treatment

Percentage of children under five with diarrhoea receiving oral rehydration therapy (ORS packet or recommended homemade fluids or increased fluids) and continued feeding, by region, 2005-2008

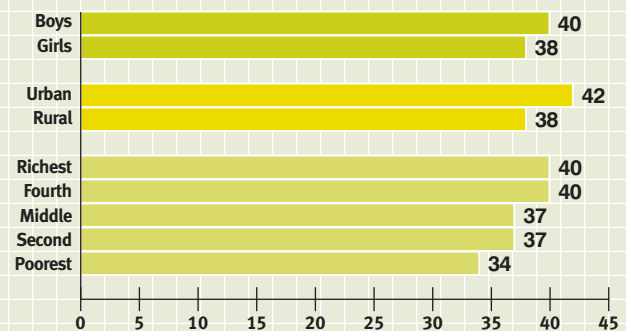


**Source:** United Nations Children's Fund, *The State of the World's Children 2010*, UNICEF, New York (forthcoming). Data are insufficient for Latin America & Caribbean and CEE/CIS.

\* Excludes China

**FIGURE 15** Children in poor households and rural areas are less likely to receive the recommended treatment

Percentage of children under five with diarrhoea receiving oral rehydration therapy (ORS packet or recommended homemade fluids or increased fluids) and continued feeding, developing countries, by background characteristics, 2005-2008



**Source:** UNICEF global diarrhoea databases, 2009.

Trend analysis is limited by the lack of comparable data for the treatment recommendations from the 1990s (see section entitled ‘Data used in this report’). However, limited data for a subset of developing countries with comparable trend data since around 2000 suggest little progress in expanding coverage with the recommended treatment.

In Africa, where nearly half of child deaths due to diarrhoea occur, these limited data also suggest little or no progress since 2000 in expanding treatment coverage for diarrhoea and other major childhood illnesses, including malaria and pneumonia (Figure 16). The lack of progress in the case management of these diseases underscores the urgent need to strengthen integrated, community-based treatment of major childhood illnesses. This will require training for caregivers and community health workers who are linked to a functioning and responsive health-care system.

### ORS packets, including low-osmolarity ORS

Only one third (33 per cent) of children with diarrhoea in developing countries receive ORS to treat their illness. This is true in almost every developing

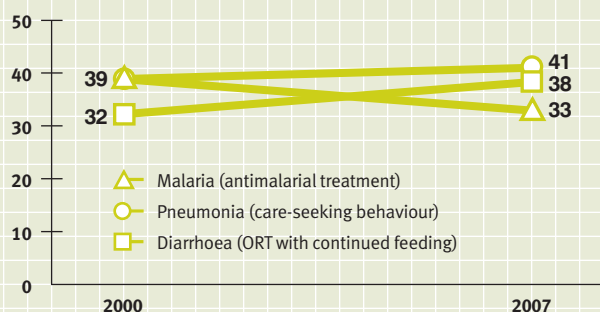
region of the world. Africa has the lowest levels of ORS use, at 29 per cent, and East Asia and the Pacific (excluding China) has the highest levels, although still reaching only 38 per cent of children in need (Figure 17).

Boys and girls are equally likely to receive ORS to treat diarrhoea. Children in urban areas (39 per cent) are more likely to receive ORS than those living in rural areas (31 per cent). Similarly, children from the wealthiest families are 1.5 times as likely to receive ORS to treat their diarrhoea as the poorest children (Figure 18).

There has also been little or no progress in increasing the use of ORS among children with diarrhoea since 2000. This is true for every region with data, including Africa and South Asia, the regions with the greatest diarrhoea burdens (Figure 19).

The new ORS formula (known as low-osmolarity ORS) is the ‘gold standard’ for treating childhood diarrhoea, as well as treating dehydration once it occurs. However, data on the use of low-osmolarity ORS specifically are not available through household surveys.

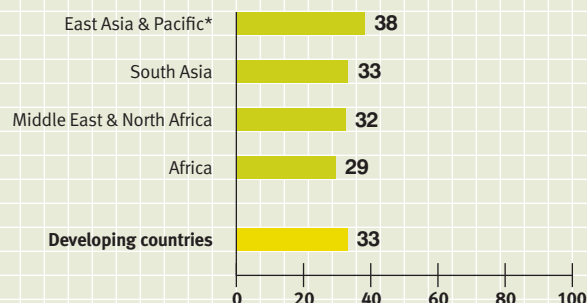
**FIGURE 16** Little progress has been made in the treatment of major childhood illnesses in Africa



Source: UNICEF global diarrhoea databases, 2009. Trend analysis is based on data for a subset of African countries with two or more comparable data points for periods around 2000 and 2007. This subset of countries covers 75 per cent (pneumonia), 50 per cent (diarrhoea) and 57 per cent (malaria) of children under age five in Africa.

**FIGURE 17** Too few children receive ORS to treat their diarrhoea

Percentage of children under five with diarrhoea receiving at least one ORS packet during the illness, by region, 2005-2008



Source: UNICEF global diarrhoea databases, 2009. Data are based on the latest available data during the period 2005-2008. Data are insufficient for Latin America & Caribbean and CEE/CIS.

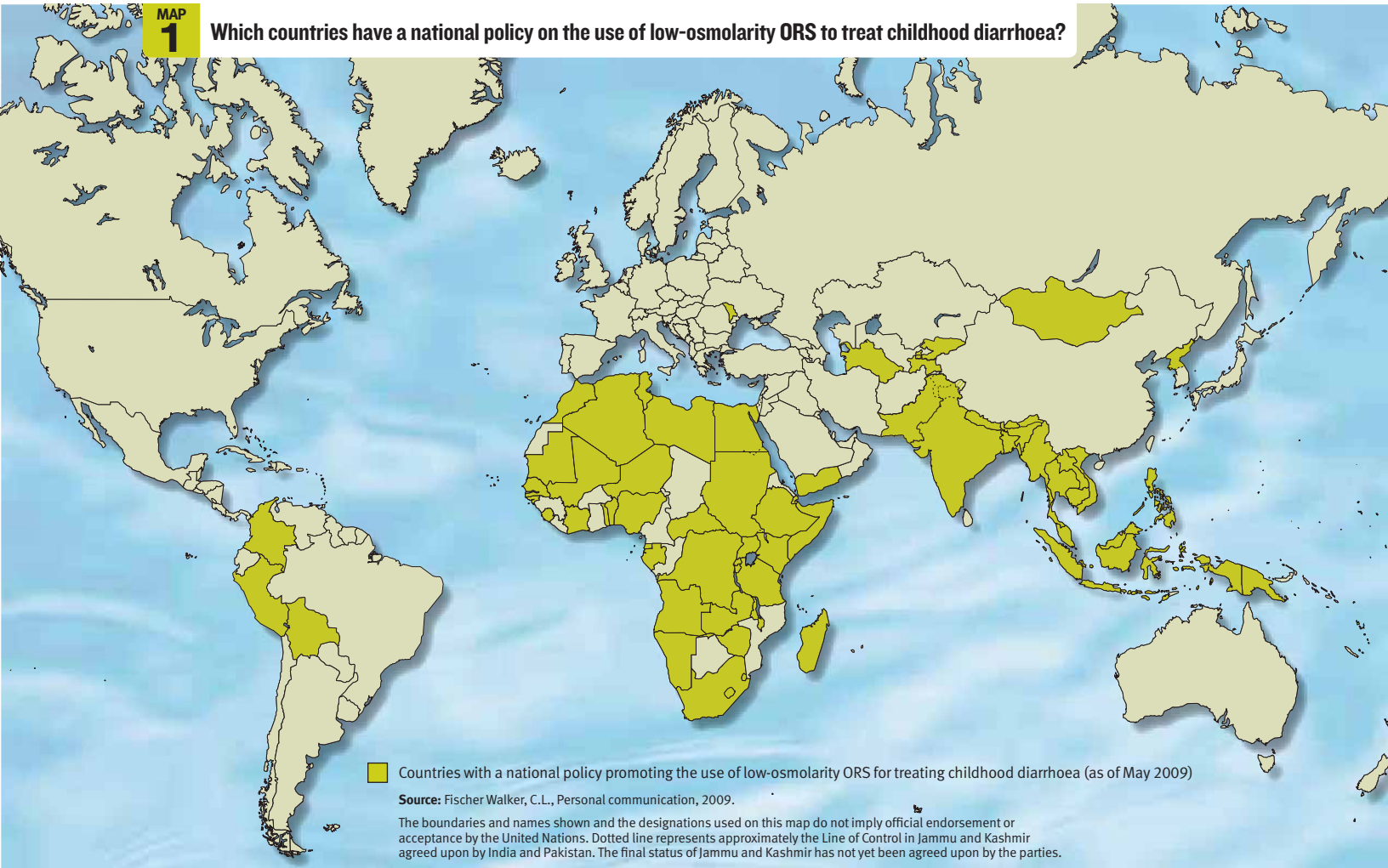
\* Excludes China





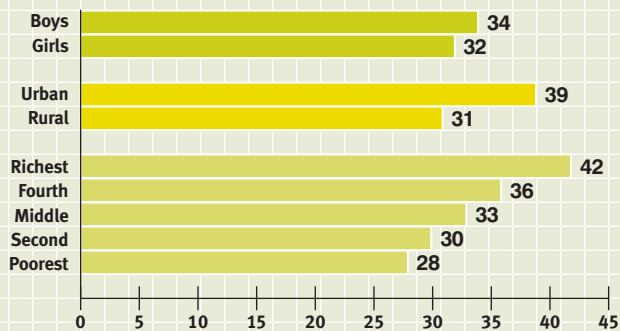
MAP  
**1**

Which countries have a national policy on the use of low-osmolarity ORS to treat childhood diarrhoea?



**FIGURE 18** Poor children and those living in rural areas are less likely to use ORS to treat diarrhoea

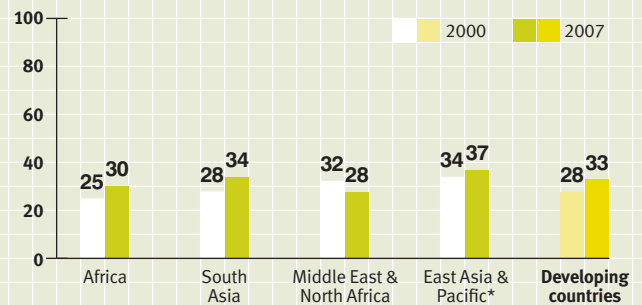
Percentage of children under five with diarrhoea receiving at least one ORS packet during the illness, developing countries, by background characteristics, 2005-2008



Source: UNICEF global diarrhoea databases, 2009.

**FIGURE 19** There has been little or no progress in the use of ORS to treat diarrhoea

Trends in the percentage of children under five with diarrhoea receiving at least one ORS packet during the illness, by region, 2000 and 2007



Source: UNICEF global diarrhoea databases, 2009. Trend analysis is based on data for a subset of developing countries with two or more comparable data points for around 2000 and 2007. Data are insufficient for Latin America & Caribbean and CEE/CIS.

\* Excludes China

## Low-osmolarity ORS

Though UNICEF and the WHO now recommend the use of low-osmolarity ORS for treating childhood diarrhoea, only 66 countries around the world currently have explicit national policies to that effect (Map 1). Indeed, an important first step to increasing coverage of this intervention is to ensure that national guidelines are established that promote their use. But this is just a first step. Policies will need to be coupled with strengthened distribution systems and new delivery strategies to make a real difference in the availability of the new formula to children with diarrhoea. Communication strategies are also needed to ensure that families understand and accept ORS as a key treatment component.

There have been major increases in the procurement of ORS, which may lead to higher coverage levels in coming years. Though information from private manufacturers is not readily available, UNICEF alone has procured more than 350 million ORS packets since 2000 (Figure 20). Procurement of low-osmolarity ORS started in 2003, and over 80 countries have received the new formulation. In

2008, UNICEF purchased more than 50 million packets, and remains one of the largest international procurers. There is an urgent need to ensure that all manufacturers produce low-osmolarity ORS, since the pace of progress in changing over to the new formula has been slow.

## Appropriate homemade fluids

If ORS are not available to treat diarrhoea, a set of appropriate homemade fluids are also effective in preventing dehydration. Data collected through household surveys to monitor this indicator are problematic, however, and are therefore not assessed in this section.

Different countries have different policies on what constitutes an appropriate homemade fluid, and these policies are not always clearly defined or readily available to survey implementers. The Multiple Indicator Cluster Surveys and Demographic and Health Surveys include questions on whether a child with diarrhoea received a government-recommended home fluid. The question should be customized for individual countries, prior to starting survey work, and reflect national guidelines.

**FIGURE 20** UNICEF has procured more than 350 million ORS packets since 2000

Number (in millions) of ORS packets procured by UNICEF, 2000-2008

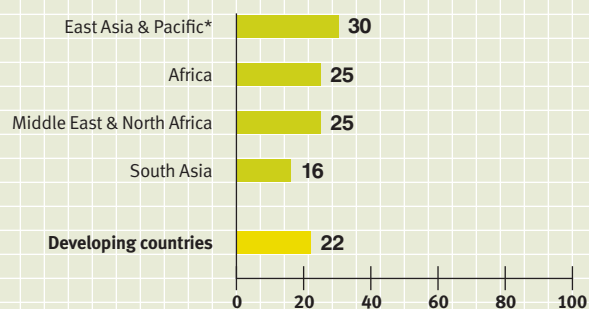


Source: UNICEF Supply Division, 2009.

Note: Low-osmolarity ORS was proposed by UNICEF and WHO in 2003 and procurement of this new formula began at this time. Data exclude local procurement by India and Bangladesh, which is significant (up to 10 million packets per year).

**FIGURE 21** Less than one quarter of children with diarrhoea drink more fluids of any type

Percentage of children under five with diarrhoea receiving more to drink than usual during the illness, by region, 2005-2008



Source: UNICEF global diarrhoea databases, 2009. Data are based on the latest available data during the period 2005-2008. Data are insufficient for Latin America & Caribbean and CEE/CIS.

\* Excludes China



However, this is not always done and, in many countries, interviewers ask the generic question about the use of a government-recommended home fluid, which then leaves respondents to define for themselves whether the fluid was, in fact, a recommended one. This could lead to major data quality issues. Strengthened efforts are now under way to customize these survey questions in the future.

### Increased fluids

When ORS and appropriate fluids are not available, increasing the intake of almost any fluids could also help to prevent dehydration caused by diarrhoea. Yet less than one quarter (22 per cent) of children with diarrhoea in developing countries drink more fluids of any type during their illness (Figure 21). These low levels underscore the urgent need to educate caregivers regarding current treatment recommendations, including the need to provide increased amounts of fluids to children with diarrhoea.

Every region with data has seen slight declines since 2000 in the proportion of children who receive more to drink during episodes of diarrhoea (Figure 22). Again, lack of progress on an intervention that

is readily available to all caregivers highlights the urgent need to expand education and behaviour change programmes to encourage appropriate home management of diarrhoea.

### Continued feeding

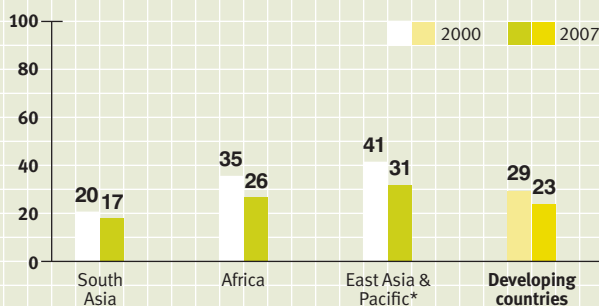
Nearly one third of children with diarrhoea in developing countries receive either much less food or none at all during their illness – placing far too many children at risk of worsening nutritional status (Figure 23). Limited data are available to assess trends over time for continued feeding due to changes in survey questions around the year 2000 (see section entitled ‘Data used in this report’).

### Zinc

Limited information from household surveys is currently available on the use of zinc to treat childhood diarrhoea. Questions on the use of zinc supplements have recently been included in some Demographic and Health Surveys and will be incorporated into the next round of UNICEF-supported Multiple Indicator Cluster Surveys, which are scheduled for 2009-2010.

**FIGURE 22** Every region with data has seen declines in the share of children with diarrhoea who are drinking more fluids

Trends in the percentage of children under five with diarrhoea receiving more to drink than usual during the illness, by region, 2000 and 2007

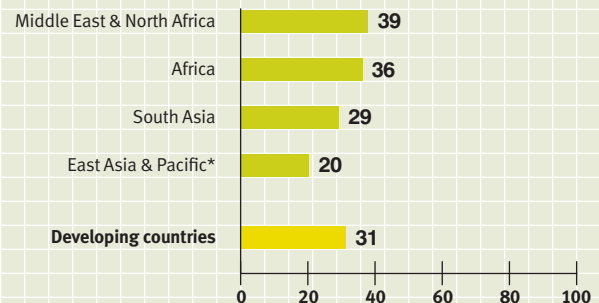


**Source:** UNICEF global diarrhoea databases, 2009. Trend analysis is based on data for a subset of developing countries with two or more comparable data points for around 2000 and 2007. Data are insufficient for Latin America & Caribbean, CEE/CIS and Middle East & North Africa.

\* Excludes China

**FIGURE 23** Nearly one third of children with diarrhoea receive much less food than usual or none at all

Percentage of children under five with diarrhoea receiving either much less food than usual or none at all during the illness, by region, 2005-2008

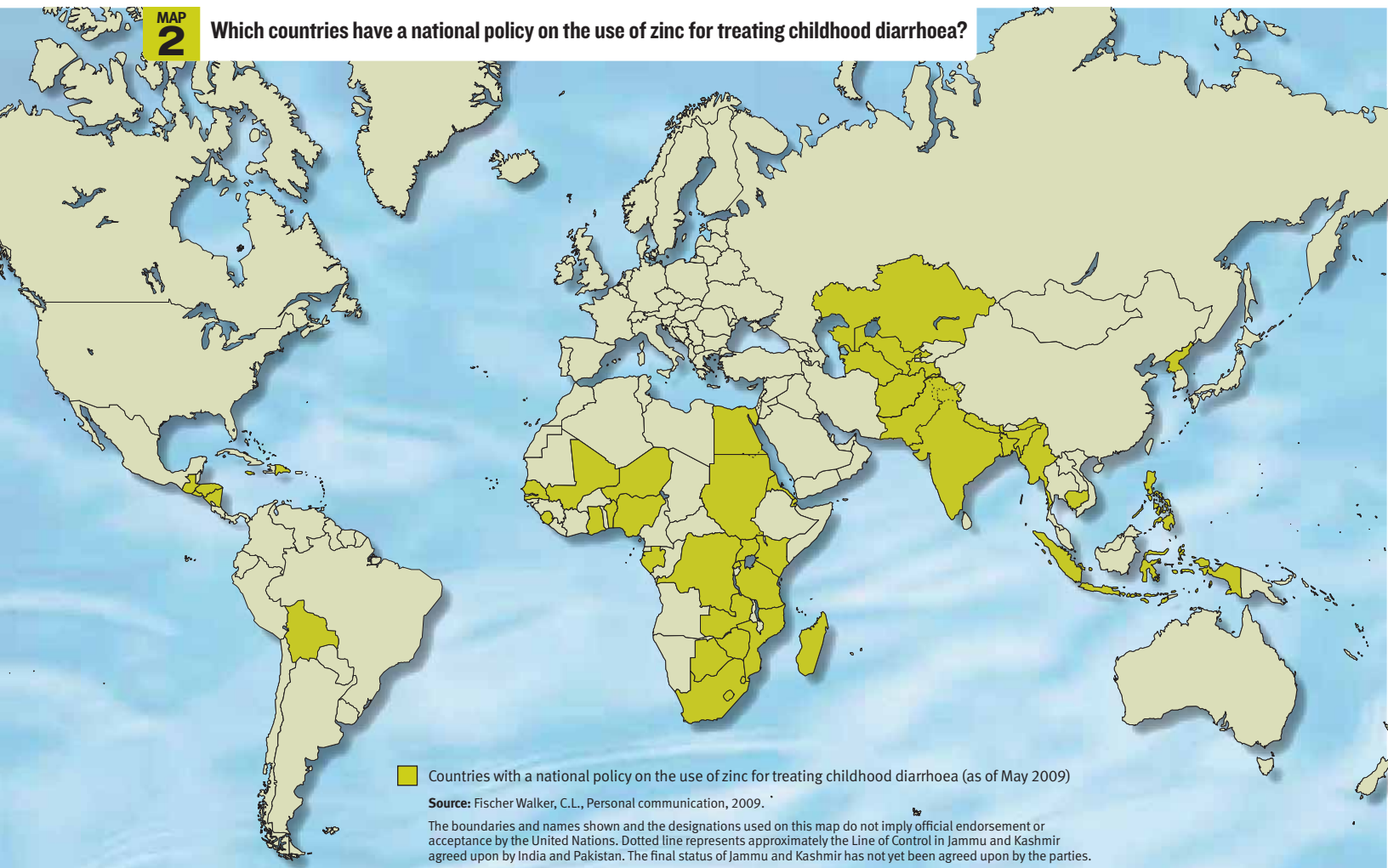


**Source:** UNICEF global diarrhoea databases, 2009. Data are based on the latest available data during the period 2005-2008. Data are insufficient for Latin America & Caribbean and CEE/CIS.

\* Excludes China

MAP  
2

Which countries have a national policy on the use of zinc for treating childhood diarrhoea?



An important first step to increasing zinc coverage is ensuring that national guidelines are established that promote its use. Yet only 46 countries worldwide currently have explicit national policies that promote the use of zinc in treating childhood diarrhoea (Map 2). Beyond changing policies, countries must overcome implementation challenges to scale up the use of this life-saving treatment, and develop effective communication strategies to promote the use of zinc (Box 9).

At the same time, UNICEF and partners are working closely with manufacturers to increase future

availability of zinc tablets. UNICEF is the largest buyer of such tablets, representing over 80 per cent of international procurement.<sup>42</sup> UNICEF procurement of zinc tablets started in 2006 and has increased significantly since that time (Figure 24). In 2006, UNICEF procured 20.5 million zinc tablets; the figure rose to 73.7 million in 2007 and 157.9 million tablets in 2008. In 2008, zinc tablets were distributed by UNICEF to 38 countries – a significant increase from the 11 countries to which zinc was distributed in 2006. Despite this major progress, global zinc availability is still dismally low compared to the global need.



**BOX**  
**9**

**A renewed call to action: Making zinc and low-osmolarity ORS an international priority**

Five years after UNICEF and WHO issued a joint statement recommending a new ORS formula and zinc treatment for diarrhoea, these products are largely unavailable in most developing countries. Why?

For a number of years, there was one zinc product that met quality standards for international procurement by UNICEF. Zinc is now procured by UNICEF, governments and other agencies and is manufactured locally in a handful of countries. However, meeting policy and regulatory requirements for importing a new product continues to present challenges for zinc introduction in many countries. Moreover, changing child health treatment recommendations nationally can also be difficult.

Compounding the problem is the fact that initial start-up funds for these new treatments can be significant, and beyond the scope of regular health budgets. In addition, many countries are hesitant to buy zinc because they have little experience with it as part of diarrhoea management programmes: They are unsure of the demand and are reluctant to devote funds to one-time start-up activities, such as developing training materials.

A few countries have recently taken steps to make zinc and low-osmolarity ORS more widely available. In Nepal, for example, government approval and acceptance of the zinc

policy, approval and registration of local zinc products, and inclusion of zinc on the essential drug list have all helped to establish an environment conducive to a zinc programme. In addition, Nepal's Ministry of Health has collaborated with partners to train both public and private sector health personnel in key districts, coordinate the development of promotional materials, and encourage local manufacturing of quality zinc products at an affordable price.

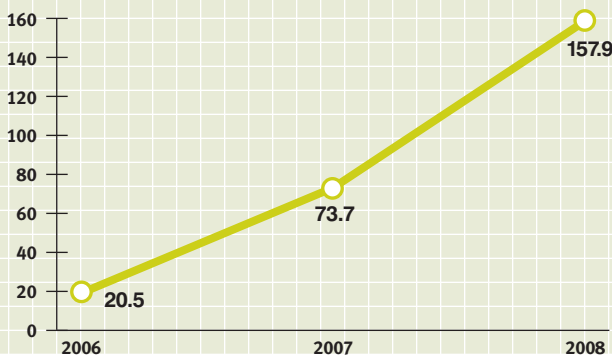
In Benin, the Ministry of Health and UNICEF are working closely to introduce a diarrhoea treatment kit – containing both ORS and zinc tablets – through the public health system in areas with the highest diarrhoea prevalence rates. And in Madagascar, the Ministry of Health is working closely with the United States Agency for International Development and UNICEF to pilot zinc-related diarrhoea management training in several districts at both the community and health-facility level, with a view to reaching at least half the country's 110 districts by end-2009.

The challenges of scaling up zinc and increasing usage rates of ORS are steep, but not prohibitive. A renewed call to action is needed to ensure that increasing coverage of diarrhoea treatment interventions becomes an international priority.

Sources: Global Zinc Task Force, 2009; UNICEF Supply Division, 2009.

**FIGURE 24** UNICEF procurement of zinc tablets has increased significantly since 2006, but still falls far short of global need

Number (in millions) of zinc tablets procured by UNICEF, 2006-2008



Source: UNICEF Supply Division, 2009.



# 4

SECTION

## A 7-point plan for comprehensive diarrhoea control



We know what needs to be done to reduce the burden of childhood diarrhoea. A package of proven prevention and treatment measures are now available that, if taken to scale, would have a profound impact on reducing child deaths and would lead to a significant reduction in the diarrhoea burden in the medium to long term.

### Treatment package

The treatment package focuses on two main elements, as laid out in the UNICEF and WHO 2004 joint statement:<sup>43</sup>

1. Fluid replacement to prevent dehydration
2. Zinc treatment.

Oral rehydration therapy is the cornerstone of fluid replacement. New elements of this approach include low-osmolarity ORS, which are more effective at replacing fluids than the previous ORS formulation, and zinc treatment, which decreases diarrhoea severity and duration. Important additional components of the package are continued feeding, including breastfeeding, during the diarrhoea episode and use of appropriate fluids available in the home if ORS are not available.

### Prevention package

The prevention package focuses on five main elements to reduce diarrhoea in the medium to long term:

3. Rotavirus and measles vaccinations
4. Promotion of early and exclusive breastfeeding and vitamin A supplementation
5. Promotion of handwashing with soap
6. Improved water supply quantity and quality, including treatment and safe storage of household water
7. Community-wide sanitation promotion.

New aspects of this approach include rotavirus vaccination, which was recently recommended for global introduction (Box 10). In terms of community-wide sanitation, new approaches to increase demand to stop open defecation have proven more effective than previous strategies.



It is important that implementation of the prevention package is approached in a concerted way, since single interventions alone are likely to result in lesser overall impact. For example, diarrhoea caused by rotavirus cannot be prevented solely by improvements in water and sanitation. And rotavirus vaccine does not prevent other pathogens (such as *E. coli* and *Shigella*) from causing diarrhoea. The package should be accompanied by clear, targeted and integrated behaviour and social change communication strategies to improve uptake by families and communities.

### Action needed now to reduce child deaths from diarrhoea

- **Mobilize and allocate resources for diarrhoea control.** Diarrhoea remains a leading killer of children, though the tools needed to address it are available and affordable. New resources for child survival must include funding for diarrhoea prevention and treatment. And global initiatives must keep the management of diarrhoea high on the list of priorities for public health resource

allocation, including rotavirus vaccination, which has now been recommended for global introduction. At the same time, national and district health planners should include diarrhoea control in programmes targeting childhood malaria, pneumonia and HIV, and ensure support to accelerate coverage of proven interventions.

- **Reinstate diarrhoea prevention and treatment as a cornerstone of community-based primary health care.** To effectively control diarrhoea, treatment and prevention measures should be integrated into the training of health workers and reflected in supply chains and programme monitoring. Expanding the reach of health services into communities to deliver integrated interventions is critical. These include community-based promotion of breastfeeding, hygiene and sanitation and the provision of low-osmolarity ORS and zinc to children with diarrhoea.
- **Ensure that low-osmolarity ORS and zinc are adopted as policy in all countries.** Clear policy guidance is needed to ensure that the latest recommendations for treating childhood

#### BOX 10

#### Rotavirus vaccination: Urgently needed worldwide

Rotavirus is a leading cause of severe diarrhoea and dehydration in children under five in both developing and industrialized countries. Accelerating the introduction of rotavirus vaccine in national immunization programmes is urgently needed, particularly in Asia and Africa, where the rotavirus burden is greatest.

The first rotavirus vaccine was licensed in the United States in 1998 and was shown to be 80 per cent or more effective in preventing severe rotavirus disease in vaccinated infants. However, the vaccine was soon withdrawn from the market, since it was associated with an increased risk for intussusception (an intestinal blockage formed when part of the intestine folds onto itself). In 2006, two new rotavirus vaccines were licensed after studies showed them to be safe and efficacious in a number of middle- and high-income countries. And in April 2009, WHO recommended the introduction of the rotavirus vaccine in all national immunization programmes, based on preliminary results from safety and efficacy studies in African countries.

Accelerating the introduction of rotavirus vaccine globally will not only prevent severe diarrhoea and dehydration among children, but will also help to strengthen other aspects of diarrhoea control. Parents and communities will need to understand that this new vaccine will only prevent a portion of all diarrhoea cases, and education about the vaccine should include promotion of other preventive strategies as well as advice for home treatment and when to seek care. Surveillance to monitor the impact of the vaccine on diarrhoea cases can also be used to guide other aspects of prevention and control.

**Sources:** Parashar, et al., 'Global Illness and Death Caused by Rotavirus Disease in Children', *Emerging Infectious Diseases*, vol. 9, no. 5, 2003, pp. 565-572; Murphy, T.V., et al., 'Intussusception Among Infants Given Oral Rotavirus Vaccine', *New England Journal of Medicine*, vol. 344, 2001, pp. 564-572; Strategic Advisory Group of Experts (SAGE) on Immunization, Meeting minutes, April 2009, <<http://www.who.int/immunization/sage/en/>>, accessed June 2009.





diarrhoea are adopted and promoted, using effective delivery strategies. One way of facilitating the delivery of low-osmolarity ORS and zinc is by combining these life-saving remedies in a single treatment kit.

- **Reach every child with effective interventions.** This will require a flexible approach that takes into account the special circumstances of each country; often it will require a mix of public and private sector responses. Community-based approaches are needed to ensure high coverage of health, nutrition and water and sanitation interventions, rather than relying solely on the public sector for these services. Emergency and conflict situations may require immediate intervention by governments and international aid organizations, especially to prevent cholera outbreaks.
- **Accelerate the provision of basic water and sanitation services.** This can best be accomplished through partnerships between the health sector and other agencies responsible for water and sanitation, and the use of community-based approaches. Eliminating open defecation must be

a priority, along with promoting the construction of basic sanitation facilities by households and providing safe water facilities close to people's homes that can be operated and maintained by the community.

- **Use innovative strategies to increase the adoption of proven measures against diarrhoea.** All available options should be exploited to reach every household with a package of high-impact interventions against diarrhoea (Box 11), including the testing of new approaches to achieve high and equitable coverage. This could include, for example, the development of flavoured ORS formulas or systems for treating and safely storing household water. Other types of innovations include alternative delivery strategies, such as Child Health Days, to reach a high proportion of the target group. Consumer research to improve packaging, marketing and product positioning will be essential for greater acceptance of ORS, soap and household water treatment.
- **Change behaviours through community involvement, education and health-promotion activities.**



Clear and targeted health promotion and behaviour change communication programmes must accompany the delivery of interventions to ensure that caregivers understand the simple actions they can take at home to prevent and manage diarrhoea. Engaging communities and caregivers early on – at the outset of programme planning – to strengthen their knowledge and practice of these essential measures is critical to their success and sustainability.

- **Make health systems work to control diarrhoea.** National governments and their partners can transform general activities to strengthen health systems into specific agreements needed to reach every child with effective measures to control diarrhoea. These include meeting the need for human resources, reducing staff turnover, improving training programmes and seeking creative ways to motivate community health workers.
- **Monitor progress at all levels, and make the results count.** As national programmes accelerate their diarrhoea control activities, it will become increasingly important for countries to collect, analyse and report quality data in a timely manner to monitor programmes and increase accountability and performance.
- **Make the prevention and treatment of diarrhoea everybody's business.**

- **Families and communities** can ensure that breastfeeding, handwashing, sanitation and the treatment of household water receive the priority they deserve. They must also be supported in working with government to access safe water supplies and to operate and maintain water supply systems once they are built. Everyone from adolescents and schoolteachers to religious leaders and local business people can get involved.
- **The public sector** can advance comprehensive prevention and treatment programmes at both the national and local levels, not only through the ministry of health but also through agencies involved in education, commerce, water and sanitation, nutrition, women's affairs and urban and rural development.
- **The private sector** can promote innovation in the supply and delivery of key interventions, in partnership with public institutions.
- **Government leaders** can expand public awareness of the problem and its solutions, thereby increasing demand for services to reduce deaths from diarrhoea.
- **Global partnerships and networks** can forge new links across initiatives, leading to strong and effective advocacy and reducing the risk of competing activities.





**BOX 11** Innovation in delivery strategies

New and creative delivery strategies are needed to improve the uptake and effectiveness of key diarrhoeal disease control interventions. Some possible solutions being developed:

**PRODUCTS NEED TO BE MADE MORE ATTRACTIVE TO USERS.**

Flavoured ORS would increase acceptability among children who may refuse treatment due to poor taste. Such flavouring has not been recommended previously due to concerns of overconsumption leading to potentially harmful side effects. However, the new ORS formula largely eliminates this risk. A challenge remains to establish which flavouring agents provide acceptable taste and are safe. Another case in point: More than 95 per cent of mothers in the developing world with children under five have some sort of soap product in their homes, yet use of soap for handwashing does not approach that percentage.<sup>44</sup> Communication strategies are needed on an ongoing basis to encourage the use of soap to prevent diarrhoea transmission.

**PRODUCTS NEED TO BE PACKAGED FOR MORE EFFECTIVE USE.**

Since 1978, ORS packets have been available to most countries in only one size (a one-litre packet). Consequently, caregivers often adapt preparation instructions to avoid discarding leftover salts, since the one-litre packet may

be more than needed. This tends to result in solutions of unknown concentrations that could be either ineffective or potentially dangerous. Smaller packet sizes are needed so that caregivers can more effectively treat their children's diarrhoea at home.

**PRODUCTS NEED TO BE DELIVERED IN INNOVATIVE WAYS THAT MAXIMIZE ACCESS.**

ORS packets and zinc could reach more children in need if packaged together in diarrhoea treatment kits, which could be delivered by community health workers, or directly to households through campaigns or Child Health Days. Pregnant women could also receive such kits during antenatal care visits. In terms of promoting sanitation and hygiene, schools are an important training ground; schoolchildren, in turn, often influence such practices at home. Household water treatment has also become more mainstream in recent years, allowing more households to increase their access to safe drinking water. Finally, market-based solutions are often the most effective way to deliver key diarrhoea control commodities, such as soap, latrines or home water treatment products.

**Sources:** Touchette, P.E, J. Elder, M. Nagiel, 'How Much Oral Rehydration Solution is Actually Administered During Home-based Therapy?', *Journal of Tropical Medicine Hygiene*, vol. 93, no. 1, Feb 1990, pp. 28-34; Curtis, V., L. Danquah, R. Aunger, 'Habitual, Motivated and Planned Handwashing: A review of formative research from 11 countries', Health Education Research, 2009.







## Data used in this report

The data used in this report were derived from a range of sources, which are summarized below.

### Childhood diarrhoea burden

Estimates of the global and regional number of diarrhoea cases and deaths are based on the Global Burden Disease project, and are for the year 2004 (the latest year estimates are available). The project provides a comprehensive assessment of mortality and loss of health due to diseases, injuries and risks for all regions of the world. When reviewing these estimates, it is important to note that the distribution of under-five deaths by cause refers to the primary cause of death. The estimated percentage distribution of cause-specific mortality for the year 2004 was applied in this report to the 2008 envelope of total under-five deaths worldwide (8.8 million in 2008) to arrive at the number of under-five deaths due to diarrhoea globally.

### Prevention and treatment coverage

Data on prevention and treatment interventions were derived largely from national-level household surveys, notably the Multiple Indicator Cluster Surveys (MICS), supported by UNICEF, and the Demographic and Health Surveys (DHS), supported by the United States Agency for International Development (USAID). Information from the surveys are compiled by UNICEF Headquarters and made available in a series of public-access databases found at [www.childinfo.org](http://www.childinfo.org), which are also published annually in *The State of the World's Children* report.

**Multiple Indicator Cluster Surveys** are nationally representative, standardized sample surveys to which UNICEF provides financial and technical support. Since their inception in 1995, nearly 200 MICS have been carried out globally. The latest round of surveys (MICS3) was conducted in more than 50 countries between 2005 and 2006. The next round is scheduled for 2009-2010. More information is available at [www.childinfo.org](http://www.childinfo.org).

**Demographic and Health Surveys** are also nationally representative, standardized surveys that are usually implemented every five years with funding from USAID. The DHS is designed to collect a variety of data on a broad range of demographic and health issues and to be comparable over time and across countries. More information is available at [www.measuredhs.com](http://www.measuredhs.com).

### Indicators

#### Prevention indicators

The indicators to monitor prevention coverage (such as immunization, nutrition, and water and sanitation) presented in this report are based on well known and long-standing child survival indicators that are regularly used to monitor progress towards global goals and commitments. For example, data on water supply and sanitation are based on the work of the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation ([www.wssinfo.org](http://www.wssinfo.org)). Further information on these prevention indicators, such as definitions and data sources, are available at [www.childinfo.org](http://www.childinfo.org).

## Treatment indicators

**Oral rehydration therapy with continued feeding** – *Proportion of children aged 0-59 months with diarrhoea receiving oral rehydration salts or recommended homemade fluids or increased fluids, and continued feeding during the diarrhoea episode.* This indicator reflects the UNICEF and WHO programme recommendations for diarrhoea treatment (with the exception of zinc). The recommendations were developed on the basis of broad consensus by leading experts in the field during a UNICEF and WHO advisory meeting in 2004,<sup>45</sup> and re-confirmed in a 2007 follow-up technical conference.<sup>46</sup>

**ORS packets** – *Proportion of children aged 0-59 months with diarrhoea receiving oral rehydration salts during the diarrhoea episode.* This indicator is based on information provided by mothers or caregivers. Caregivers are asked whether their children suffered from diarrhoea in the two weeks prior to the survey. If so, they are then asked if the child received a fluid made from a special packet of ORS or a pre-packaged ORS fluid (where applicable) during the diarrhoea episode.

**Recommended homemade fluids** – *Proportion of children aged 0-59 months with diarrhoea receiving a government-recommended homemade fluid (to be customized based on national guidelines) during the diarrhoea episode.* This indicator is based on information provided by mothers or caregivers. Caregivers are asked whether their children suffered from diarrhoea in the two weeks prior to the survey. If so, they are then asked if the child received a government-recommended homemade fluid during the diarrhoea episode. This question should be customized prior to starting survey work to include the specific fluids recommended by national guidelines to treat diarrhoea.

**Increased fluids** – *Proportion of children aged 0-59 months with diarrhoea receiving more to drink during the diarrhoea episode.* This indicator is based on information provided by mothers or caregivers. Caregivers are asked whether their children suffered from diarrhoea in the two weeks prior to the survey. If so, they are then asked if (during this illness) the child received none, much less, somewhat less, about the same, or more to drink than usual. Children reported to have received more to drink than usual during the illness are considered to have received this intervention.

**Continued feeding** – *Proportion of children aged 0-59 months with diarrhoea receiving more, about the same or somewhat less food during the diarrhoea episode.* This indicator is based on information provided by mothers or caregivers. Caregivers are asked whether their children suffered from diarrhoea in the two weeks prior to the survey. If so, they are then asked if (during the illness) the child received none, much less, somewhat less, about the same, or more food than usual. Children reported to have received either somewhat less, about the same, or more food than usual during the illness are considered to have received this intervention.

## Methodology

**Regional and global estimates** – These are based on population-weighted averages, weighted by the total number of children under five years of age. These estimates are presented only if available data cover at least 50 per cent of total children under five years of age in regional or global groupings. The list of countries included in these groupings is available at [www.childinfo.org](http://www.childinfo.org).

**Trends over time** – Changes in treatment indicator definitions over the years have resulted in a relative



lack of comparable data from the 1990s in order to assess trends over time. To the extent possible, data collected through previous surveys have been re-analysed for the purposes of this report to conform to the current indicator definition (ORT with continued feeding) to monitor treatment coverage.

For each of the treatment indicators, regional assessments of trends over time were conducted on the basis of a subset of countries with two or more comparable data points around the time periods 2000 and 2007. A linear regression line was then fitted through all available data points for each country included in the assessment to derive an estimate for the earlier (2000) and later time periods (2007). A regional estimate was then presented in this report if the subset of countries included in the trend analyses represented at least 50 per cent of the total children under five in the regional or global grouping.

### Interpreting treatment coverage data from household surveys

The interpretation of treatment coverage must take into account a number of important issues:

First, the indicator to monitor current treatment guidelines (ORT with continued feeding) reflects the multiple components of this recommendation (with the exception of zinc). As mentioned previously, this indicator definition was developed and agreed upon by leading experts at a UNICEF and WHO meeting in 2004, and was recently re-confirmed during a Countdown to 2015 technical meeting in 2007.<sup>47</sup> It is important to evaluate the contribution of each individual component of the indicator to the overall coverage value, and this assessment was presented in this report.

Second, for some countries, comparisons of treatment coverage based on the current indicator definition with previously used indicators may result in markedly different values. There may



also be a different assessment of trends over time depending on the indicator used. It is therefore important for countries to adopt and promote the latest recommendations for treating diarrhoeal diseases, and to monitor these programmes using the appropriate indicators.

Third, prevalence estimates derived from national-level household surveys may vary markedly by season and by timing of outbreaks (such as cholera). Prevalence estimates are also affected by the survey respondents' understanding of what constitutes a diarrhoea episode. The survey does not measure the type of diarrhoea experienced by the child (including its length and severity), nor the extent of dehydration resulting from the diarrhoea episode. These prevalence estimates are used to derive the denominator for diarrhoea treatment coverage values.

Fourth, information is not collected on the number and timing of interventions used during the diarrhoea episode, including whether children received early ORS administration, the number of ORS packets received during the course of the illness, or whether homemade fluids were correctly prepared. In addition, different countries have different guidelines on what constitutes a recommended homemade fluid. These policies are not always clearly defined, and survey questions may therefore not be customized for countries according to their specific national guidelines prior to starting survey work. In these cases, survey respondents must decide for themselves if the fluid the child received was a government-recommended one, leading to major data quality issues.

Fifth, while questions on diarrhoea treatment have been incorporated into major national-level household surveys, such as the DHS, since the 1980s, there have been a number of slight changes to the construction of these questions over time, as well as

their response categories. Here again, it is important to note that survey questionnaires are translated into different languages, which may also result in slight differences in the wording of questions across countries and over time – affecting data collected not only for the diarrhoea treatment indicators, but for other information as well. Further research is needed to determine the extent to which these slight wording changes may have affected overall coverage values.

The change in response categories for the continued feeding indicator around 2000 has particularly affected the availability of data to report on this indicator as well as the ORT with continued feeding indicator. For example, prior to 2000, caregivers were asked if the child received more, the same or less to eat during the diarrhoea episode. After that time, the response categories were revised to include 'somewhat less' and 'much less' in addition to the other categories. Children are considered to have received the continued feeding intervention if they received the same, more or somewhat less to eat during their illness. This leads to a lack of available data to measure this indicator definition prior to 2000, given that the caregiver responses did not include a 'somewhat less' category.



## References

- 1 United Nations Children's Fund and World Health Organization, 'WHO/UNICEF Joint Statement: Clinical management of acute diarrhoea', UNICEF, New York, 2004, <[http://www.afro.who.int/cah/documents/intervention/acute\\_diarrhoea\\_joint\\_statement.pdf](http://www.afro.who.int/cah/documents/intervention/acute_diarrhoea_joint_statement.pdf)>, accessed June 2009.
- 2 —, 'Water with Sugar and Salt', *The Lancet*, vol. 312, no. 8084, 1978, pp. 300-301.
- 3 —, *Weekly Epidemiological Record*, vol. 83, no. 47, 21 November 2008.
- 4 Black, R.E., S. Morris and J. Bryce, 'Where and Why are 10 Million Children Dying Every Year?', *The Lancet*, vol. 361, no. 9376, 28 June 2003, pp. 2226-2234.
- 5 Fewtrell, L., et al., 'Water, Sanitation, and Hygiene Interventions to Reduce Diarrhoea in Less Developed Countries: A systematic review and meta-analysis', *The Lancet Infectious Diseases*, vol. 5, no.1, 2005, pp. 42-52; Curtis V., and S. Cairncross, 'Effect of Washing Hands with Soap on Diarrhoea Risk in the Community: A systematic review', *The Lancet Infectious Diseases*, vol. 3, no. 5, 2003, pp. 275-281; Luby, S.P., et al., 'Effect of Handwashing on Child Health: A randomised controlled trial', *The Lancet*, vol. 366, no. 9481, July 2005, pp. 225-233.
- 6 Boschi Pinto, C., et al., 'The Global Burden of Childhood Diarrhoea', in: Ehiri, J.E., M. Meremikwu (editors), *International Maternal and Child Health*, 2009 (in press).
- 7 Ibid.
- 8 World Health Organization, *The Evolution of Diarrhoeal and Acute Respiratory Disease Control at WHO*, WHO, Geneva, 1999, <[http://whqlibdoc.who.int/hq/1999/WHO\\_CHS\\_CAH\\_99.12.pdf](http://whqlibdoc.who.int/hq/1999/WHO_CHS_CAH_99.12.pdf)>, accessed June 2009.
- 9 *Weekly Epidemiological Record*, vol. 83, no. 47, 21 November 2008.
- 10 Partners in Health, *The PIH Guide to the Community-Based Treatment of HIV in Resource-Poor Settings* (Revised Second Edition), Partners in Health, Boston, 2008.
- 11 World Health Organization, *Antiretroviral Therapy of HIV Infection in Infants and Children: Towards universal access. Recommendations for a public health approach*, WHO, Geneva, 2006.
- 12 Tindyebwa, D., et al., 'Common Clinical Conditions Associated with HIV', in: *Handbook on Paediatric AIDS in Africa*, 2004.



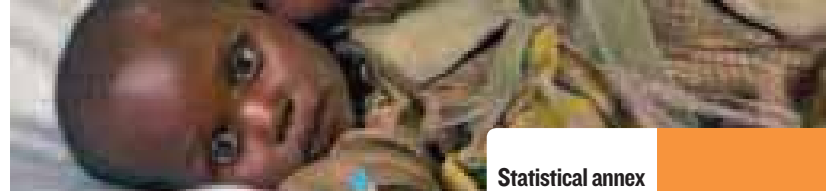
- 13 Lule, J.R., et al., 'Effect of Home-Based Water Chlorination and Safe Storage on Diarrhea Among Persons with Human Immunodeficiency Virus in Uganda', *American Journal of Tropical Medicine and Hygiene*, vol. 73, no. 5, 2005, pp. 926-933.
- 14 Black, R.E., S. Morris and J. Bryce, 'Where and Why are 10 Million Children Dying Every Year?', *The Lancet*, vol. 361, no. 9376, 28 June 2003, pp. 2226-2234.
- 15 Jamison, D.T., et al. (editors), *Disease Control Priorities in Developing Countries* (Second Edition), London School of Hygiene and Tropical Medicine, London, 2008, <<http://www.dcp2.org/pubs/DCP>>, accessed June 2009.
- 16 Ferriman, A., 'BMJ readers choose the "sanitary revolution" as greatest medical advance since 1840', *British Medical Journal*, vol. 334, no. 7585, 2007, p. 111.
- 17 World Health Organization, 'Water, Sanitation and Hygiene: Quantifying the health impact at national and local levels in countries with incomplete water supply and sanitation coverage', Environmental burden of disease series, no.15, 2007.
- 18 Kar, K., 'Subsidy or Self-Respect? Participatory total community sanitation in Bangladesh', IDS Working paper 184, Institute of Development Studies, Brighton, UK, 2003.
- 19 Jamison, Dean T., et al. (editors), *Disease Control Priorities in Developing Countries* (Second Edition), London School of Hygiene and Tropical Medicine, London, 2008, <<http://www.dcp2.org/pubs/PIH/2/>>, accessed June 2009.
- 20 Fewtrell, L., et al., 'Water, Sanitation, and Hygiene Interventions to Reduce Diarrhoea in Less Developed Countries: A systematic review and meta-analysis', *The Lancet Infectious Diseases*, vol. 5, no. 1, 2005, pp. 42-52; Curtis V., and S. Cairncross, 'Effect of Washing Hands with Soap on Diarrhoea Risk in the Community: A systematic review', *The Lancet Infectious Diseases*, vol. 3, no. 5, 2003, pp. 275-281; Luby, S.P., et al., 'Effect of Handwashing on Child Health: A randomised controlled trial', *The Lancet*, vol. 366, no. 9481, July 2005, pp. 225-233.
- 21 Curtis, V.A., and S. Cairncross, 'Domestic Hygiene and Diarrhoea, Pinpointing the Problem', *Tropical Medicine and International Health*, vol. 5, no. 1, 2000, pp. 22-32.
- 22 World Health Organization, 'Safe Water, Better Health', WHO, Geneva, 2008, <[http://www.who.int/quantifying\\_ehimpacts/publications/saferwater/en/index.html](http://www.who.int/quantifying_ehimpacts/publications/saferwater/en/index.html)>, accessed June 2009.
- 23 —, Maternal and Child Undernutrition: Global and regional exposures and health consequences', *The Lancet*, vol. 371, no. 9608, 2008, pp. 243-260.
- 24 Checkley, W., et al., 'Effects of Acute Diarrhea on Linear Growth in Peruvian Children', *American Journal of Epidemiology*, vol. 157, no. 2, 2003, pp. 166-175.
- 25 Feachem, R.G., et al., 'Interventions for the Control of Diarrhoeal Diseases Among Young Children: Promotion of breastfeeding', *Bulletin of the World Health Organization*, vol. 62, no. 2, 1983; Victora, C.G., et al., 'Evidence for the Protection of Breastfeeding Against Infant Deaths from Infectious Diseases in Brazil', *The Lancet*, vol. 2, no. 8554, 1987, pp. 319-322.
- 26 WHO Collaborative Study Team on the Role of Breast-feeding on the Prevention of Infant Mortality, 'Effect of Breastfeeding on Infant and Child Mortality due to Infectious Diseases in Less Developed Countries: A pooled analysis', *The Lancet*, vol. 355, no. 9202, 2000, pp. 451-455.
- 27 International Vitamin A Consultative Group, 'IVACG Policy Statement on Vitamin A, Diarrhea and Measles', IVACG, Washington DC, 1996; Barreto, M.L., et al., 'Effect of Vitamin A Supplementation on Diarrhoea and Acute Lower Respiratory Infections in Young Children In Brazil', *The Lancet*, vol. 344, no. 8917, 1994, pp. 228-231; Fawzi, W.W., et al., 'Vitamin A Supplementation and Child Mortality: A meta-analysis', *Journal of the American Medical Association*, vol. 269, no. 7, 1993, pp. 898-903.
- 28 International Vitamin A Consultative Group, 'IVACG Policy Statement on Vitamin A, Diarrhea and Measles', IVACG, Washington DC, 1996; Barreto, M.L., et al., 'Effect of Vitamin A Supplementation on Diarrhoea and Acute Lower Respiratory Infections in Young Children in Brazil', *The Lancet*, vol. 344, no. 8917, 1994, pp. 228-231.



- 29 Zinc Investigators' Collaborative Group, 'Prevention of Diarrhea and Pneumonia by Zinc Supplementation in Children in Developing Countries: Pooled analysis of randomized controlled trials', *Journal of Pediatrics*, vol. 135, no. 6, 1999, pp. 689-697; Lazzerini, M., and L. Ronfani, 'Oral Zinc for Treating Diarrhoea in Children', *Cochrane Database of Systematic Reviews*, issue 3, article no. CD005436. DOI: 10.1002/14651858.CD005436.pub2, 2008.
- 30 —, *Weekly Epidemiological Record*, vol. 83, no. 47, 21 November 2008.
- 31 World Health Organization, 'Estimated Rotavirus Deaths for Children Under Five Years of Age: 2004', <[http://www.who.int/immunization\\_monitoring/burden/rotavirus\\_estimates/en/index.html](http://www.who.int/immunization_monitoring/burden/rotavirus_estimates/en/index.html)>, accessed June 2009.
- 32 Rotavirus Vaccine Program, 'Rotavirus Facts', <<http://www.rotavirusvaccine.org>>, accessed August 2009.
- 33 United Nations Children's Fund and World Health Organization, *Model IMCI Handbook: Integrated management of childhood illness*, WHO, Geneva, 2005, <[http://www.who.int/child\\_adolescent\\_health/documents/9241546441/en/index.html](http://www.who.int/child_adolescent_health/documents/9241546441/en/index.html)>, accessed June 2009.
- 34 United Nations Children's Fund and World Health Organization, 'WHO/UNICEF Joint Statement: Clinical management of acute diarrhoea', UNICEF, New York, 2004, <[http://www.afro.who.int/cah/documents/intervention/acute\\_diarrhoea\\_joint\\_statement.pdf](http://www.afro.who.int/cah/documents/intervention/acute_diarrhoea_joint_statement.pdf)>, accessed June 2009.
- 35 —, 'Water with Sugar and Salt', *The Lancet*, vol. 312, no. 8084, 1978, pp. 300-301.
- 36 World Health Organization/United Nations Children's Fund, *Progress on Drinking Water and Sanitation: Special focus on sanitation*, UNICEF, New York, 2008.
- 37 Ibid.
- 38 Measles Initiative, 'Progress in Global Measles Control and Mortality Reduction, 2000-2007', *The Morbidity and Mortality Weekly Report*, vol. 57, no. 48, 5 December 2008, p.1303, <<http://www.measlesinitiative.org/docs/mi-mmwr-measles-update.pdf>>, accessed June 2009.
- 39 Hoekstra, E.J., et al., 'Reducing Measles Mortality, Reducing Child Mortality', *The Lancet*, vol. 368, no. 9541, 2006, pp. 1050-1052.
- 40 Victora, C.G., et al., 'Reduce Deaths Through Oral Rehydration Therapy', *Bulletin of the World Health Organization*, vol. 78, no. 10, 2000, pp. 1246-1255.
- 41 United Nations Children's Fund, *Habits of a Lifetime*, UNICEF, Dhaka, 2008, <[http://www.unicef.org/bangladesh/media\\_4550.htm](http://www.unicef.org/bangladesh/media_4550.htm)>, accessed June 2009.
- 42 UNICEF Supply Division, 2009.
- 43 United Nations Children's Fund and World Health Organization, 'WHO/UNICEF Joint Statement: Clinical management of acute diarrhoea', UNICEF, New York, 2004, <[http://www.afro.who.int/cah/documents/intervention/acute\\_diarrhoea\\_joint\\_statement.pdf](http://www.afro.who.int/cah/documents/intervention/acute_diarrhoea_joint_statement.pdf)>, accessed June 2009.
- 44 Curtis, V., L. Danquah and R. Aunger, 'Habitual, Motivated and Planned Handwashing: A review of formative research from 11 countries', *Health Education Research*, 2009.
- 45 United Nations Children's Fund/World Health Organization, Summary of a meeting held on 17-18 June 2004, <[http://www.childinfo.org/mdg\\_methodology.html](http://www.childinfo.org/mdg_methodology.html)>, accessed June 2009.
- 46 'Countdown to 2015', Report of the meeting of the Coverage Working Group for the Countdown to 2015 Conference, 7 September 2007, UNICEF, New York.
- 47 United Nations Children's Fund/World Health Organization, Summary of a meeting held on 17-18 June 2004, <[http://www.childinfo.org/mdg\\_methodology.html](http://www.childinfo.org/mdg_methodology.html)>, accessed June 2009; 'Countdown to 2015', Report of the meeting of the Coverage Working Group for the Countdown to 2015 Conference, 7 September 2007, UNICEF, New York.

## Statistical annex

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**TABLE 1** Demographics and diarrhoea treatment indicators

Country or territory	Under-five mortality rate (per 1,000 live births)	Number of under-five deaths (thousands)	Number of children under five (thousands)	Percentage of children under five with diarrhoea receiving:					Source
				ORT with continued feeding	ORS packet	Recommended homemade fluids	Increased fluids	Continued feeding	
	2008	2008	2008	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	
Afghanistan	257	311	4,907	–	–	–	–	–	
Albania	14	1	217	50	56	76	12	53	MICS 2005
Algeria	41	30	3,328	24	19	12	7	79	MICS 2006
Andorra	4	0	4	–	–	–	–	–	
Angola	220	165	3,170	–	–	–	–	–	
Antigua and Barbuda	12	0	4	–	–	–	–	–	
Argentina	16	11	3,361	–	–	–	–	–	
Armenia	23	1	221	59	25	25	43	90	DHS 2005
Australia	6	2	1,327	–	–	–	–	–	
Austria	4	0	391	–	–	–	–	–	
Azerbaijan	36	6	738	31	21	14	45	68	DHS 2006
Bahamas	13	0	28	–	–	–	–	–	
Bahrain	12	0	69	–	–	–	–	–	
Bangladesh	54	183	16,710	68	77	20	48	80	DHS 2007
Barbados	11	0	14	–	–	–	–	–	
Belarus	13	1	472	54	36	61	37	62	MICS 2005
Belgium	5	1	590	–	–	–	–	–	
Belize	19	0	36	26	27	33	22	42	MICS 2006
Benin	121	39	1,450	42	23	10	35	77	DHS 2006
Bhutan	81	1	71	–	–	–	–	–	
Bolivia, Plurinational State of	54	14	1,245	54b	35	16b	51b	82b	pDHS 2008 DHS 2003
Bosnia and Herzegovina	15	0	172	53	35	39	22	75	MICS 2005-2006
Botswana	31	1	221	7b	49b	2b	9b	8b	MICS 2000
Brazil	22	67	16,125	–	44b	16b	55b	–	DHS 1996
Brunei Darussalam	7	0	37	–	–	–	–	–	
Bulgaria	11	1	349	–	–	–	–	–	
Burkina Faso	169	117	2,934	42	17	8	51	74	MICS 2006
Burundi	168	45	1,155	23	35	5	15	55	MICS 2005
Cambodia	90	32	1,611	50	21	21	38	84	DHS 2005
Cameroon	131	89	3,016	22	13	7	11	77	MICS 2006
Canada	6	2	1,753	–	–	–	–	–	
Cape Verde	29	0	59	–	–	–	–	–	
Central African Republic	173	26	656	47	13	25	48	73	MICS 2006
Chad	209	99	1,985	27b	15b	4b	28b	81b	DHS 2004
Chile	9	2	1,238	–	–	–	–	–	
China	21	365	86,881	–	–	–	–	–	
Colombia	20	18	4,485	39	47	23	42	59	DHS 2005
Comoros	105	2	97	31b	19b	19b	38b	53b	MICS 2000
Congo	127	16	551	39	18	19	41	78	DHS 2005
Cook Islands	15	0	2	–	–	–	–	–	
Costa Rica	11	1	376	–	–	–	–	–	
Côte d'Ivoire	114	79	3,139	45	10	20	50	70	MICS 2006
Croatia	6	0	208	–	–	–	–	–	
Cuba	6	1	613	–	–	–	–	–	
Cyprus	4	0	49	–	–	–	–	–	
Czech Republic	4	0	519	–	–	–	–	–	
Democratic People's Republic of Korea	55	18	1,575	–	–	–	–	–	
Democratic Republic of the Congo	199	554	11,829	42	31	20	35	71	DHS 2007

**TABLE 1** Demographics and diarrhoea treatment indicators (continued)

Country or territory	Under-five mortality rate (per 1,000 live births)	Number of under-five deaths (thousands)	Number of children under five (thousands)	Percentage of children under five with diarrhoea receiving:					Source
				ORT with continued feeding	ORS packet	Recommended homemade fluids	Increased fluids	Continued feeding	
	2008	2008	2008	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	
Denmark	4	0	320	–	–	–	–	–	
Djibouti	95	2	108	33	62	17	51	38	MICS 2006
Dominica	11	0	3	–	–	–	–	–	
Dominican Republic	33	7	1,086	55	41	11	37	86	DHS 2007
Ecuador	25	7	1,392	–	–	–	–	–	
Egypt	23	45	9,447	19	28	3	11	48	DHS 2008
El Salvador	18	2	608	–	58	–	–	–	ONS 2008
Equatorial Guinea	148	3	103	36b	29b	25b	44b	55b	MICS 2000
Eritrea	58	10	811	54b	45b	28b	38b	75b	DHS 2002
Estonia	6	0	73	–	–	–	–	–	
Ethiopia	109	321	13,323	15	20	19	9	44	DHS 2005
Fiji	18	0	87	–	–	–	–	–	
Finland	3	0	291	–	–	–	–	–	
France	4	3	3,870	–	–	–	–	–	
Gabon	77	3	182	44b	25b	17b	63b	60b	DHS 2000
Gambia	106	6	267	38	40	10	53	53	MICS 2006
Georgia	30	2	241	37	40	14	36	60	MICS 2005
Germany	4	3	3,446	–	–	–	–	–	
Ghana	76	55	3,319	29	45	9	34	50	pDHS 2008 MICS 2006
Greece	4	0	532	–	–	–	–	–	
Grenada	15	0	9	–	–	–	–	–	
Guatemala	35	15	2,118	–	34b	10b	48b	–	ONS 2002
Guinea	146	54	1,635	38	33	7	33	71	DHS 2005
Guinea-Bissau	195	12	265	25	23	27	17	44	MICS 2006
Guyana	61	1	69	28	39	16	13	50	MICS 2006-2007
Haiti	72	19	1,252	43	40	44	26	78	DHS 2005-2006
Holy See	–	–	–	–	–	–	–	–	
Honduras	31	6	958	49	56	–	34	75	DHS 2005-2006
Hungary	7	1	486	–	–	–	–	–	
Iceland	3	0	22	–	–	–	–	–	
India	69	1,830	126,642	33	26	20	10	70	DHS 2005-2006
Indonesia	41	173	20,891	54	35	22	30	88	DHS 2007
Iran (Islamic Republic of)	32	46	6,402	–	–	–	–	–	
Iraq	44	41	4,450	64	31	91	23	67	MICS 2006
Ireland	4	0	335	–	–	–	–	–	
Israel	5	1	693	–	–	–	–	–	
Italy	4	2	2,892	–	–	–	–	–	
Jamaica	31	2	255	39	40	–	31	57	MICS 2005
Japan	4	4	5,400	–	–	–	–	–	
Jordan	20	3	750	32	20	9	46	62	DHS 2007
Kazakhstan	30	10	1,384	48	74	18	45	59	MICS 2006
Kenya	128	189	6,540	33b	29b	20b	34b	67b	DHS 2003
Kiribati	48	0	10	–	–	–	–	–	
Kuwait	11	1	249	–	–	–	–	–	
Kyrgyzstan	38	5	547	22	20	5	25	52	MICS 2006
Lao People's Democratic Republic	61	10	776	49	39	30	53	70	MICS 2006
Latvia	9	0	109	–	–	–	–	–	
Lebanon	13	1	323	–	–	–	–	–	

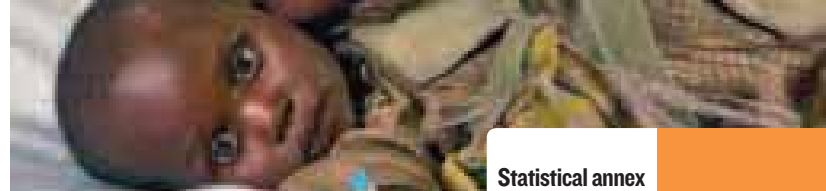


Country or territory	Under-five mortality rate (per 1,000 live births)	Number of under-five deaths (thousands)	Number of children under five (thousands)	Percentage of children under five with diarrhoea receiving:					Source
				ORT with continued feeding	ORS packet	Recommended homemade fluids	Increased fluids	Continued feeding	
	2008	2008	2008	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	
Lesotho	79	5	272	53b	42b	55b	32b	66b	DHS 2004
Liberia	145	20	619	47	53	11	30	67	DHS 2007
Libyan Arab Jamahiriya	17	2	700	–	–	–	–	–	
Liechtenstein	2	0	2	–	–	–	–	–	
Lithuania	7	0	151	–	–	–	–	–	
Luxembourg	3	0	27	–	–	–	–	–	
Madagascar	106	71	3,060	47b	12b	32b	35b	80b	DHS 2003-2004
Malawi	100	56	2,591	27	55	1	9	44	MICS 2006
Malaysia	6	4	2,732	–	–	–	–	–	
Maldives	28	0	27	–	–	–	–	–	
Mali	194	100	2,207	38	14	13	35	77	DHS 2006
Malta	6	0	19	–	–	–	–	–	
Marshall Islands	36	0	6	–	–	–	–	–	
Mauritania	118	12	475	32	20	14	38	48	MICS 2007
Mauritius	17	0	91	–	–	–	–	–	
Mexico	17	36	10,281	–	81b	–	–	–	ONS 1996-1997
Micronesia (Federated States of)	39	0	14	–	–	–	–	–	
Moldova	17	1	200	48	33	–	43	82	DHS 2005
Monaco	4	0	2	–	–	–	–	–	
Mongolia	41	2	229	47	38	30	33	72	MICS 2005
Montenegro	8	0	38	64	16	100	18	64	MICS 2005
Morocco	36	24	3,041	46b	23b	7b	42b	84b	DHS 2003-2004
Mozambique	130	110	3,820	47	46	19	23	75	MICS 2008
Myanmar	98	98	4,629	65b	53b	46b	20b	81b	MICS 2003
Namibia	42	2	277	48	63	21	16	72	DHS 2006-2007
Nauru	45	0	1	68	–	–	–	–	pnDHS 2007
Nepal	51	37	3,535	37	29	–	22	89	DHS 2006
Netherlands	5	1	958	–	–	–	–	–	
New Zealand	6	0	288	–	–	–	–	–	
Nicaragua	27	4	675	49b	50b	54b	39b	70b	DHS 2001
Niger	167	121	3,121	34	18	11	36	69	DHS 2006
Nigeria	186	1,077	25,020	28b	26	17b	20b	71b	pDHS 2008 DHS 2003
Niue	–	–	0	–	–	–	–	–	
Norway	4	0	293	–	–	–	–	–	
Occupied Palestinian Territory	27	4	697	–	–	–	45b	–	ONS 2000
Oman	12	1	293	–	–	–	–	–	
Pakistan	89	465	23,778	37	41	16	21	69	DHS 2006-2007
Palau	15	0	2	–	–	–	–	–	
Panama	23	2	345	–	–	–	–	–	
Papua New Guinea	69	14	950	–	–	–	–	–	
Paraguay	28	4	736	–	24b	43b	46b	–	DHS 1990
Peru	24	15	2,975	60	25	17	60	82	DHS 2004-2006
Philippines	32	73	10,701	76b	47	24b	2b	94b	pnDHS 2008 DHS 2003
Poland	7	3	1,810	–	–	–	–	–	
Portugal	4	0	538	–	–	–	–	–	
Qatar	10	0	77	–	–	–	–	–	
Republic of Korea	5	2	2,292	–	–	–	–	–	

**TABLE 1** Demographics and diarrhoea treatment indicators (continued)

Country or territory	Under-five mortality rate (per 1,000 live births)	Number of under-five deaths (thousands)	Number of children under five (thousands)	Percentage of children under five with diarrhoea receiving:					Source
				ORT with continued feeding	ORS packet	Recommended homemade fluids	Increased fluids	Continued feeding	
	2008	2008	2008	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	
Romania	14	3	1,059	–	–	–	–	–	
Russian Federation	13	20	7,389	–	–	–	–	–	
Rwanda	112	41	1,646	24	21	11	15	74	DHS 2007-2008 DHS 2005
Saint Kitts and Nevis	16	0	2	–	–	–	–	–	
Saint Lucia	13	0	15	–	–	–	–	–	
Saint Vincent and the Grenadines	13	0	9	–	–	–	–	–	
Samoa	26	0	22	–	–	–	–	–	
San Marino	2	0	2	–	–	–	–	–	
Sao Tome and Principe	98	0	23	63	31	17	61	81	MICS 2006
Saudi Arabia	21	12	2,859	–	–	–	–	–	
Senegal	108	49	2,046	43	15	14	39	81	DHS 2005
Serbia	7	1	576	71	17	96	36	75	MICS 2005
Seychelles	12	0	14	–	–	–	–	–	
Sierra Leone	194	43	947	31	68	12	51	40	pDHS 2008 MICS 2005
Singapore	3	0	200	–	–	–	–	–	
Slovakia	8	0	266	–	–	–	–	–	
Slovenia	4	0	94	–	–	–	–	–	
Solomon Islands	36	1	73	76	–	–	–	–	pnDHS 2007
Somalia	200	76	1,611	7	13	9	3	28	MICS 2006
South Africa	67	73	5,200	–	40b	38b	24b	57b	DHS 2003-2004
Spain	4	2	2,373	–	–	–	–	–	
Sri Lanka	15	6	1,784	–	50	–	–	–	pDHS 2006-2007
Sudan	109	138	5,836	56	31	–	26	79	ONS 2006
Suriname	27	0	49	28	44	91	41	49	MICS 2006
Swaziland	83	3	159	22	86	20	26	55	DHS 2006-2007
Sweden	3	0	527	–	–	–	–	–	
Switzerland	5	0	364	–	–	–	–	–	
Syrian Arab Republic	16	10	2,807	34	50	31	35	47	MICS 2006
Tajikistan	64	12	871	22	48	25	22	36	MICS 2005
Thailand	14	14	4,843	46	57	23	7	69	MICS 2005-2006
The former Yugoslav Republic of Macedonia	11	0	112	45	24	63	14	55	MICS 2005
Timor-Leste	93	4	185	–	60b	43b	7b	–	nDHS 2003
Togo	98	20	947	22	10	13	13	67	MICS 2006
Tonga	19	0	14	–	–	–	–	–	
Trinidad and Tobago	35	1	94	–	–	–	–	–	
Tunisia	21	3	780	62	71	16	51	72	MICS 2006
Turkey	22	30	6,543	–	14b	15b	60b	–	DHS 1998
Turkmenistan	48	5	518	25	40	15	39	42	MICS 2006
Tuvalu	36	0	1	–	–	–	–	–	
Uganda	135	190	6,182	39	40	7	20	73	DHS 2006
Ukraine	16	7	2,132	–	–	–	–	–	
United Arab Emirates	8	0	307	–	–	–	–	–	
United Kingdom	6	4	3,601	–	–	–	–	–	
United Republic of Tanzania	104	175	7,566	53	54	20	36	76	DHS 2004-2005
United States	8	35	21,624	–	–	–	–	–	
Uruguay	14	1	249	–	–	–	–	–	
Uzbekistan	38	21	2,576	28	28	36	34	47	MICS 2006





Country or territory	Under-five mortality rate (per 1,000 live births)	Number of under-five deaths (thousands)	Number of children under five (thousands)	Percentage of children under five with diarrhoea receiving:					Source
				ORT with continued feeding	ORS packet	Recommended homemade fluids	Increased fluids	Continued feeding	
	2008	2008	2008	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	2005-2008 <sup>a</sup>	
Vanuatu	33	0	33	43	–	–	–	–	pMICS 2007
Venezuela (Bolivarian Republic of)	18	11	2,911	51b	38b	60b	15b	66b	MICS 2000
Viet Nam	14	21	7,316	65	26	23	41	66	MICS 2006
Yemen	69	57	3,733	48	33	63	60	51	MICS 2006
Zambia	148	77	2,282	56	60	10	34	76	DHS 2007
Zimbabwe	57	21	1,707	47	6	61	32	66	DHS 2005-2006
<b>AFRICA</b>	132	4,475	151,830	35	29	14	25	64	
<b>Sub-Saharan Africa</b>	144	4,371	134,534	37	29	15	27	66	
<b>Eastern and Southern Africa</b>	119	1,635	61,795	33	36	16	20	60	
<b>West and Central Africa</b>	169	2,596	66,795	38	25	14	36	69	
<b>Middle East and North Africa</b>	43	420	46,256	39	32	32	25	61	
<b>ASIA</b>	54	3,665	323,567	40	34	20	18	73	
<b>South Asia</b>	76	2,832	177,453	37	33	20	16	71	
<b>East Asia and Pacific</b>	28	832	146,114	55 c	38 c	23 c	30 c	80 c	
<b>Latin America and Caribbean</b>	23	247	53,618	–	–	–	–	–	
<b>CEE/CIS</b>	23	127	26,561	–	–	–	–	–	
<b>Industrialized countries</b>	6	67	56,038	–	–	–	–	–	
<b>Developing countries</b>	71	8,654	566,411	39 c	33 c	20 c	22 c	69 c	
<b>Least developed countries</b>	129	3,516	122,674	43	39	18	32	69	
<b>World</b>	65	8,757	634,631	39 c	33 c	20 c	22 c	69 c	

**Source:**

Data are from the UNICEF global diarrhoea databases, which include survey data from Demographic and Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS) and other national surveys (ONS).

The complete databases (including time series, disparities and detailed source information) are available at: [www.childinfo.org](http://www.childinfo.org). Demographic information is based on the latest estimates from the United Nations Population Division (children under age five) and the Inter-agency Child Mortality Estimation Group (under-five deaths).

'p' refers to preliminary survey report; 'n' refers to national survey report.

Data are as of 15 August 2009.

**Notes:**

(a) Data refer to the most recent year available during the period specified in the column heading.

(b) Data refer to a year or period other than that specified in the column heading.

(c) Excludes China.

**Indicator definitions:**

ORT with continued feeding: Percentage of children aged 0-59 months with diarrhoea in the previous two weeks receiving oral rehydration therapy (ORS packet or recommended homemade fluids or increased fluids) and continued feeding during the diarrhoea episode. Survey data were re-analysed to conform to this indicator definition.

ORS packet: Percentage of children aged 0-59 months with diarrhoea in the previous two weeks receiving at least one ORS packet (either pre-packaged ORS fluids or fluids from an ORS packet) during the diarrhoea episode.

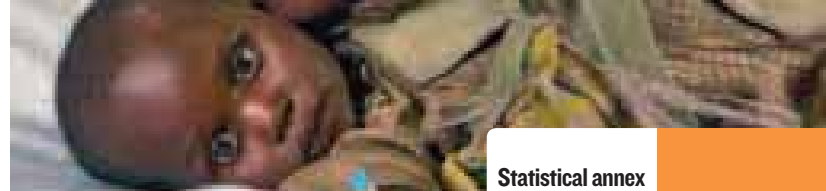
Recommended homemade fluids: Percentage of children aged 0-59 months with diarrhoea in the previous two weeks receiving at least one recommended homemade fluid during the diarrhoea episode. Survey questions should be customized to reflect national guidelines designating a set of appropriate fluids that may be prepared at home. However, most survey data are not collected using customized questions (see section entitled 'Data used in this report' on page 37).

Increased fluids: Percentage of children aged 0-59 months with diarrhoea in the previous two weeks receiving more to drink than usual during the diarrhoea episode.

Continued feeding: Percentage of children aged 0-59 months with diarrhoea in the previous two weeks receiving either the same, more or somewhat less to eat than usual during the diarrhoea episode.

**TABLE 2** Diarrhoea prevention indicators

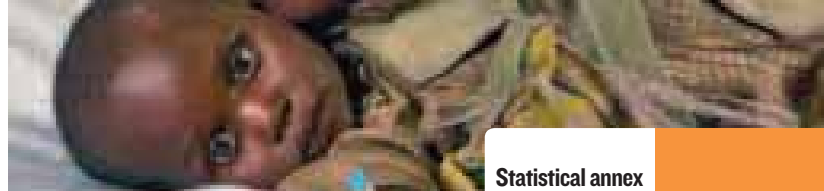
Country or territory	Percentage of population using:							Percentage of children who are:					
	Improved drinking water sources			Improved sanitation facilities			Percentage of one-year-olds immunized against measles	Underweight (moderate and severe)	Stunted (moderate and severe)	Exclusively breastfed	Breastfed with complementary foods	Still breastfeeding	Vitamin A supplementation coverage rate (% full coverage)
	Total	Urban	Rural	Total	Urban	Rural		0-59 months	0-59 months	0-5 months	6-9 months	20-23 months	6-59 months
	2006	2006	2006	2006	2006	2006	2008	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2008 <sup>b</sup>
Afghanistan	22	37	17	30	45	25	75	33 c	59 c	–	29	54	–
Albania	97	97	97	97	98	97	98	6	26	40	69	22	–
Algeria	85	87	81	94	98	87	88	3	15	7	39	22	–
Andorra	100	100	100	100	100	100	98	–	–	–	–	–	–
Angola	51	62	39	50	79	16	79	16 c	29 c	11 d	77 d	37 d	82
Antigua and Barbuda	–	95	–	–	98	–	99	–	–	–	–	–	–
Argentina	96	98	80	91	92	83	99	2 c	8 c	–	–	28	–
Armenia	98	99	96	91	96	81	94	4	18	33	57	15	–
Australia	100	100	100	100	100	100	94	–	–	–	–	–	–
Austria	100	100	100	100	100	100	83	–	–	–	–	–	–
Azerbaijan	78	95	59	80	90	70	66	8	25	12	44	16	90 e
Bahamas	–	98	–	100	100	100	90	–	–	–	–	–	–
Bahrain	–	100	–	–	100	–	99	–	–	34 d	65 d	41 d	–
Bangladesh	80	85	78	36	48	32	89	41	43	43	74	91	97
Barbados	100	100	100	99	99	100	92	–	–	–	–	–	–
Belarus	100	100	99	93	91	97	99	1	4	9	38	4	–
Belgium	–	100	–	–	–	–	93	–	–	–	–	–	–
Belize	–	100	–	–	–	–	96	4	22	10	–	27	–
Benin	65	78	57	30	59	11	61	18	43	43	72	57	52
Bhutan	81	98	79	52	71	50	99	14 d	48 d	–	–	–	–
Bolivia, Plurinational State of	86	96	69	43	54	22	86	–	–	60	81	40	45
Bosnia and Herzegovina	99	100	98	95	99	92	84	1	10	18	29	10	–
Botswana	96	100	90	47	60	30	94	11 d	29 d	34 d	57 d	11 d	–
Brazil	91	97	58	77	84	37	99	2	7	40	70	25 c	–
Brunei Darussalam	–	–	–	–	–	–	97	–	–	–	–	–	–
Bulgaria	99	100	97	99	100	96	96	–	–	–	–	–	–
Burkina Faso	72	97	66	13	41	6	75	–	–	7	50	85	100
Burundi	71	84	70	41	44	41	84	35	–	45	88	–	80
Cambodia	65	80	61	28	62	19	89	28	42	60	82	54	88
Cameroon	70	88	47	51	58	42	80	16	36	21	64	21	–
Canada	100	100	99	100	100	99	94	–	–	–	–	–	–
Cape Verde	–	–	–	–	–	–	96	–	–	60	80	13	–
Central African Republic	66	90	51	31	40	25	62	24	43	23	55	47	68
Chad	48	71	40	9	23	4	23	–	–	2	77	65	0
Chile	95	98	72	94	97	74	92	–	–	–	–	–	–
China	88	98	81	65	74	59	94	6	15	–	32	15	–
Colombia	93	99	77	78	85	58	92	5 c	15 c	47	65	32	–
Comoros	85	91	81	35	49	26	76	–	–	21 d	34 d	45 d	20
Congo	71	95	35	20	19	21	79	11	30	19	78	21	10
Cook Islands	95	98	88	100	100	100	95	–	–	19 d	–	–	–
Costa Rica	98	99	96	96	96	95	91	–	–	15	–	49	–
Côte d'Ivoire	81	98	66	24	38	12	63	16	40	4	54	37	90
Croatia	99	100	98	99	99	98	96	–	–	23 d	–	–	–
Cuba	91	95	78	98	99	95	99	–	–	26	47	16	–
Cyprus	100	100	100	100	100	100	87	–	–	–	–	–	–
Czech Republic	100	100	100	99	100	98	97	–	–	–	–	–	–



Country or territory	Percentage of population using:							Percentage of children who are:					
	Improved drinking water sources			Improved sanitation facilities			Percentage of one-year-olds immunized against measles	Underweight (moderate and severe) 0-59 months	Stunted (moderate and severe) 0-59 months	Exclusively breastfed 0-5 months	Breastfed with complementary foods		Vitamin A supplementation coverage rate (% full coverage) 6-59 months
	Total	Urban	Rural	Total	Urban	Rural					6-9 months	20-23 months	
	2006	2006	2006	2006	2006	2006	2008	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2008 <sup>b</sup>
Democratic People's Republic of Korea	100	100	100	-	-	-	98	18 c	45 c	65	31	37	98
Democratic Republic of the Congo	46	82	29	31	42	25	67	25	46	36	82	64	85
Denmark	100	100	100	100	100	100	89	-	-	-	-	-	-
Djibouti	92	98	54	67	76	11	73	31 c	33 c	1	23	18	86
Dominica	-	100	-	-	-	-	99	-	-	-	-	-	-
Dominican Republic	95	97	91	79	81	74	79	7	18	9	62	21	-
Ecuador	95	98	91	84	91	72	66	6	-	40	77	23	-
Egypt	98	99	98	66	85	52	92	6	29	53	66	35 c	68 e
El Salvador	84	94	68	86	90	80	95	6 c	19 c	31	-	-	-
Equatorial Guinea	43	45	42	51	60	46	51	16 d	43 d	24 d	-	-	-
Eritrea	60	74	57	5	14	3	95	35 d	44 d	52 d	43 d	62 d	49
Estonia	100	100	99	95	96	94	95	-	-	-	-	-	-
Ethiopia	42	96	31	11	27	8	74	33	51	49	54	88 c	88
Fiji	47	43	51	71	87	55	94	-	-	40	-	-	-
Finland	100	100	100	100	100	100	97	-	-	-	-	-	-
France	100	100	100	-	-	-	87	-	-	-	-	-	-
Gabon	87	95	47	36	37	30	55	8 d	25 d	6 d	62 d	9 d	0
Gambia	86	91	81	52	50	55	91	16	28	41	44	53	28
Georgia	99	100	97	93	94	92	96	2	13	11	35	20	-
Germany	100	100	100	100	100	100	95	-	-	-	-	-	-
Ghana	80	90	71	10	15	6	86	14	28	63	75	44	24
Greece	100	100	99	98	99	97	99	-	-	-	-	-	-
Grenada	-	97	-	97	96	97	99	-	-	39 d	-	-	-
Guatemala	96	99	94	84	90	79	96	18 d	54 d	51 d	67 d	47 d	20
Guinea	70	91	59	19	33	12	64	21	40	48	32	-	94
Guinea-Bissau	57	82	47	33	48	26	76	15	47	16	35	61	66
Guyana	93	98	91	81	85	80	95	10	17	21	34	48	-
Haiti	58	70	51	19	29	12	58	18	29	41	87	35	-
Holy See	-	-	-	-	-	-	-	-	-	-	-	-	-
Honduras	84	95	74	66	78	55	95	8	29	30	69	48	-
Hungary	100	100	100	100	100	100	99	-	-	-	-	-	-
Iceland	100	100	100	100	100	100	96	-	-	-	-	-	-
India	89	96	86	28	52	18	70	43	48	46	57	77	53
Indonesia	80	89	71	52	67	37	83	18	37	32	75	50	86
Iran (Islamic Republic of)	-	99	-	-	-	-	98	-	-	23	68	58	-
Iraq	77	88	56	76	80	69	69	6	26	25	51	36	-
Ireland	-	100	-	-	-	-	89	-	-	-	-	-	-
Israel	100	100	100	-	100	-	84	-	-	-	-	-	-
Italy	-	100	-	-	-	-	91	-	-	-	-	-	-
Jamaica	93	97	88	83	82	84	88	2	4	15	36	24	-
Japan	100	100	100	100	100	100	97	-	-	-	-	-	-
Jordan	98	99	91	85	88	71	95	4 d	12 d	22	66	11	-
Kazakhstan	96	99	91	97	97	98	99	4	17	17	39	16	-
Kenya	57	85	49	42	19	48	90	-	-	13	84	57	27
Kiribati	65	77	53	33	46	20	72	-	-	80 d	-	-	-
Kuwait	-	-	-	-	-	-	99	-	-	12 d	26 d	9 d	-

**TABLE 2** Diarrhoea prevention indicators (continued)

Country or territory	Percentage of population using:							Percentage of children who are:					
	Improved drinking water sources			Improved sanitation facilities			Percentage of one-year-olds immunized against measles	Underweight (moderate and severe)	Stunted (moderate and severe)	Exclusively breastfed	Breastfed with complementary foods	Still breastfeeding	Vitamin A supplementation coverage rate (% full coverage)
	Total	Urban	Rural	Total	Urban	Rural		0-59 months	0-59 months	0-5 months	6-9 months	20-23 months	6-59 months
	2006	2006	2006	2006	2006	2006	2008	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2008 <sup>b</sup>
Kyrgyzstan	89	99	83	93	94	93	99	2	18	32	49	26	99
Lao People's Democratic Republic	60	86	53	48	87	38	52	31	48	26	70	48	-
Latvia	99	100	96	78	82	71	97	-	-	-	-	-	-
Lebanon	100	100	100	-	100	-	53	-	-	27 <sup>d</sup>	35 <sup>d</sup>	11 <sup>d</sup>	-
Lesotho	78	93	74	36	43	34	85	14 <sup>c</sup>	42 <sup>c</sup>	36	79	60	-
Liberia	64	72	52	32	49	7	64	19	39	29	62	47	-
Libyan Arab Jamahiriya	-	-	-	97	97	96	98	4 <sup>d</sup>	21 <sup>d</sup>	-	-	23 <sup>d</sup>	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-	97	-	-	-	-	-	-
Luxembourg	100	100	100	100	100	100	96	-	-	-	-	-	-
Madagascar	47	76	36	12	18	10	81	36	53	67	78	64	97
Malawi	76	96	72	60	51	62	88	15	53	57	89	72	95
Malaysia	99	100	96	94	95	93	95	-	-	29 <sup>d</sup>	-	12 <sup>d</sup>	-
Maldives	83	98	76	59	100	42	97	26 <sup>d</sup>	32 <sup>d</sup>	10 <sup>d</sup>	85 <sup>d</sup>	-	-
Mali	60	86	48	45	59	39	68	27	38	38	30	56	97
Malta	100	100	100	-	100	-	78	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-	94	-	-	31	77	53	-
Mauritania	60	70	54	24	44	10	65	24 <sup>c</sup>	32 <sup>c</sup>	16	72	-	87
Mauritius	100	100	100	94	95	94	98	-	-	21 <sup>d</sup>	-	-	-
Mexico	95	98	85	81	91	48	96	3	16	38 <sup>d</sup>	36 <sup>d</sup>	21 <sup>d</sup>	-
Micronesia (Federated States of)	94	95	94	25	61	14	92	-	-	60 <sup>d</sup>	-	-	-
Moldova	90	96	85	79	85	73	94	3	10	46	18	2	-
Monaco	-	100	-	-	100	-	99	-	-	-	-	-	-
Mongolia	72	90	48	50	64	31	97	5	27	57	57	65	-
Montenegro	98	100	96	91	96	86	89	2	7	19	35	13	-
Morocco	83	100	58	72	85	54	96	9	23	31	66	15	-
Mozambique	42	71	26	31	53	19	77	-	-	37	84	54	83
Myanmar	80	80	80	82	85	81	82	30	41	15	66	67	94
Namibia	93	99	90	35	66	18	73	17	29	24	72	28	-
Nauru	-	-	-	-	-	-	99	5	24	67	65	65 <sup>c</sup>	-
Nepal	89	94	88	27	45	24	79	39	49	53	75	95	93
Netherlands	100	100	100	100	100	100	96	-	-	-	-	-	-
New Zealand	-	100	-	-	-	-	86	-	-	-	-	-	-
Nicaragua	79	90	63	48	57	34	99	6	22	31	76	43	-
Niger	42	91	32	7	27	3	80	36 <sup>c</sup>	47 <sup>c</sup>	4	66	-	92
Nigeria	47	65	30	30	35	25	62	23	41	13	75	32	74
Niue	100	100	100	100	100	100	99	-	-	-	-	-	-
Norway	100	100	100	-	-	-	93	-	-	-	-	-	-
Occupied Palestinian Territory	89	90	88	80	84	69	96	-	-	27	-	-	-
Oman	-	-	-	-	97	-	99	11 <sup>d</sup>	13 <sup>d</sup>	-	91 <sup>d</sup>	73 <sup>d</sup>	-
Pakistan	90	95	87	58	90	40	85	31 <sup>d</sup>	42 <sup>d</sup>	37	36	55	97
Palau	89	79	94	67	96	52	97	-	-	59 <sup>d</sup>	-	-	-
Panama	92	96	81	74	78	63	85	6 <sup>d</sup>	22 <sup>d</sup>	25 <sup>d</sup>	38 <sup>d</sup>	21 <sup>d</sup>	-
Papua New Guinea	40	88	32	45	67	41	54	18 <sup>c</sup>	43 <sup>c</sup>	56	76	72	-
Paraguay	77	94	52	70	89	42	77	3	18	22	60	-	-
Peru	84	92	63	72	85	36	90	6	30	69	-	-	-



Country or territory	Percentage of population using:							Percentage of children who are:					
	Improved drinking water sources			Improved sanitation facilities			Percentage of one-year-olds immunized against measles	Underweight (moderate and severe)	Stunted (moderate and severe)	Exclusively breastfed	Breastfed with complementary foods	Still breastfeeding	Vitamin A supplementation coverage rate (% full coverage)
	Total	Urban	Rural	Total	Urban	Rural		0-59 months	0-59 months	0-5 months	6-9 months	20-23 months	6-59 months
	2006	2006	2006	2006	2006	2006	2008	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2008 <sup>b</sup>
Philippines	93	96	88	78	81	72	92	21	34	34	58	34	86
Poland	-	100	-	-	-	-	98	-	-	-	-	-	-
Portugal	99	99	100	99	99	98	97	-	-	-	-	-	-
Qatar	100	100	100	100	100	100	92	-	-	12d	48d	21d	-
Republic of Korea	-	97	-	-	-	-	92	-	-	-	-	-	-
Romania	88	99	76	72	88	54	97	4d	13d	16	41	-	-
Russian Federation	97	100	88	87	93	70	99	-	-	-	-	-	-
Rwanda	65	82	61	48	51	47	92	18	51	88	69	77	-
Saint Kitts and Nevis	99	99	99	96	96	96	99	-	-	56d	-	-	-
Saint Lucia	98	98	98	-	-	-	99	-	-	-	-	-	-
Saint Vincent and the Grenadines	-	-	-	-	-	96	99	-	-	-	-	-	-
Samoa	88	90	87	100	100	100	45	-	-	-	-	-	-
San Marino	-	-	-	-	-	-	73	-	-	-	-	-	-
Sao Tome and Principe	86	88	83	24	29	18	93	7	29	60	60	18	23
Saudi Arabia	-	97	-	-	100	-	97	-	-	31d	60d	30d	-
Senegal	77	93	65	28	54	9	77	14	19	34	61	42	90
Serbia	99	99	98	92	96	88	92	1	7	15	39	8	-
Seychelles	-	100	-	-	-	100	99	-	-	-	-	-	-
Sierra Leone	53	83	32	11	20	5	60	21	36	11	73	50	12
Singapore	-	100	-	-	100	-	95	3d	4d	-	-	-	-
Slovakia	100	100	100	100	100	99	99	-	-	-	-	-	-
Slovenia	-	-	-	-	-	-	96	-	-	-	-	-	-
Solomon Islands	70	94	65	32	98	18	60	12	33	74	81	67	-
Somalia	29	63	10	23	51	7	24	32	42	9	15	35	100
South Africa	93	100	82	59	66	49	62	-	-	8	49	31	39
Spain	100	100	100	100	100	100	98	-	-	-	-	-	-
Sri Lanka	82	98	79	86	89	86	98	22	18	76	86	83	-
Sudan	70	78	64	35	50	24	79	27	40	34	56	35	67
Suriname	92	97	79	82	89	60	86	7	11	2	34	15	-
Swaziland	60	87	51	50	64	46	95	5	29	32	77	31	44
Sweden	100	100	100	100	100	100	96	-	-	-	-	-	-
Switzerland	100	100	100	100	100	100	87	-	-	-	-	-	-
Syrian Arab Republic	89	95	83	92	96	88	81	9	28	29	37	16	-
Tajikistan	67	93	58	92	95	91	86	15	39	25	15	34	87
Thailand	98	99	97	96	95	96	98	7	16	5	43	19	-
The former Yugoslav Republic of Macedonia	100	100	99	89	92	81	98	2	11	37d	8d	10d	-
Timor-Leste	62	77	56	41	64	32	73	-	-	31	82	35	-
Togo	59	86	40	12	24	3	77	21	27	48	70	-	64
Tonga	100	100	100	96	98	96	99	-	-	62d	-	-	-
Trinidad and Tobago	94	97	93	92	92	92	91	-	-	13	43	22	-
Tunisia	94	99	84	85	96	64	98	-	-	6	61	15	-
Turkey	97	98	95	88	96	72	97	-	-	40	71	26 c	-
Turkmenistan	-	-	-	-	-	-	99	8	19	11	54	37	-
Tuvalu	93	94	92	89	93	84	93	2	10	35	40	51 c	-
Uganda	64	90	60	33	29	34	68	16	38	60	80	54	67
Ukraine	97	97	97	93	97	83	94	-	-	18	55	6	-

**TABLE 2** Diarrhoea prevention indicators (continued)

Country or territory	Percentage of population using:							Percentage of children who are:					
	Improved drinking water sources			Improved sanitation facilities			Percentage of one-year-olds immunized against measles	Underweight (moderate and severe)	Stunted (moderate and severe)	Exclusively breastfed	Breastfed with complementary foods	Still breastfeeding	Vitamin A supplementation coverage rate (% full coverage)
	Total	Urban	Rural	Total	Urban	Rural		0-59 months	0-59 months	0-5 months	6-9 months	20-23 months	6-59 months
	2006	2006	2006	2006	2006	2006	2008	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2003-2008 <sup>a</sup>	2008 <sup>b</sup>
United Arab Emirates	100	100	100	97	98	95	92	–	–	34 <sup>d</sup>	52 <sup>d</sup>	29 <sup>d</sup>	–
United Kingdom	100	100	100	–	–	–	86	–	–	–	–	–	–
United Republic of Tanzania	55	81	46	33	31	34	88	17	44	41	91	55	93
United States	99	100	94	100	100	99	92	1 <sup>d</sup>	3 <sup>d</sup>	–	–	–	–
Uruguay	100	100	100	100	100	99	95	5 <sup>d</sup>	15 <sup>d</sup>	57	35	28	–
Uzbekistan	88	98	82	96	97	95	98	4	19	26	45	38	38
Vanuatu	–	–	–	–	–	–	65	–	–	40	62	32	–
Venezuela (Bolivarian Republic of)	–	–	–	–	–	–	82	–	–	7 <sup>d</sup>	50 <sup>d</sup>	31 <sup>d</sup>	–
Viet Nam	92	98	90	65	88	56	92	–	–	17	70	23	98 <sup>e</sup>
Yemen	66	68	65	46	88	30	62	43	58	12	76	–	–
Zambia	58	90	41	52	55	51	85	15	45	61	93	42	96
Zimbabwe	81	98	72	46	63	37	66	12	33	22	79	40 <sup>c</sup>	–
<b>AFRICA</b>	64	84	51	38	53	29	74	21	40	32	69	49	73
Sub-Saharan Africa	58	81	46	31	42	24	72	23	42	31	70	52	74
Eastern and Southern Africa	59	88	48	34	48	28	77	23	45	42	72	61	75
West and Central Africa	56	77	41	27	37	20	66	22	40	22	70	45	73
Middle East and North Africa	87	94	78	73	87	53	86	14	32	30	60	34	–
<b>ASIA</b>	87	96	82	51	69	41	82	27	36	41	51	53	70 <sup>f</sup>
South Asia	87	94	84	33	57	23	74	42	48	45	55	75	64
East Asia and Pacific	88	96	81	66	75	59	91	11	22	–	45	26	89 <sup>f</sup>
Latin America and Caribbean	92	97	73	78	86	52	93	4	14	41	69	28	–
CEE/CIS	95	99	88	89	94	79	96	–	–	27	53	23	–
Industrialized countries	100	100	98	100	100	99	93	–	–	–	–	–	–
Developing countries	84	94	76	53	71	39	81	23	34	37	58	50	71 <sup>f</sup>
Least developed countries	62	81	55	33	49	27	76	28	45	39	69	67	85
World	87	96	78	62	79	45	83	23	34	37	57	49	71 <sup>f</sup>

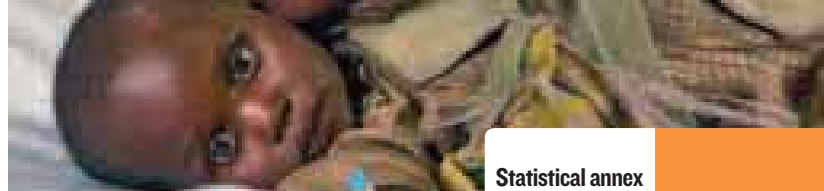
Source: United Nations Children's Fund, *The State of the World's Children 2010* (forthcoming). Data are as of 15 August 2009.

**Notes:**

- (a) Data refer to the most recent year available during the period specified in the column heading.  
 (b) The percentage of children reached with two doses in 2008 is reported as the lower percentage of two coverage points. '0' (zero) indicates that only one dose was delivered in 2008.  
 (c) Data refer to the years or periods other than those specified in the column heading, differ from the standard indicator definition or refer to only part of a country. Such data are included in the calculation of global and regional averages.  
 (d) Data refer to the years or periods other than those specified in the column heading, differ from the standard indicator definition or refer to only part of a country. Such data are not included in the calculation of global and regional averages.  
 (e) Identifies countries with national vitamin A supplementation programmes targeted toward a reduced age range. Coverage figure is reported as targeted.  
 (f) Excludes China.

**Indicator definitions:**

Underweight (moderate and severe): Percentage of children aged 0-59 months who are below minus two standard deviations from median weight for age of the WHO Child Growth Standards published in 2006.  
 Stunting (moderate and severe): Percentage of children aged 0-59 months who are below minus two standard deviations from median height for age of the WHO Child Growth Standards published in 2006.  
 Vitamin A supplementation (full coverage): Percentage of children aged 6-59 months who received 2 doses of vitamin A supplements in 2008.  
 Measles immunization: Percentage of one-year-old children immunized against measles.  
 Improved drinking water: Percentage of the population using improved drinking water sources.  
 Improved sanitation facilities: Percentage of the population using improved sanitation facilities.


**TABLE 3** Use of oral rehydration therapy with continued feeding, by background characteristics

Country or territory	Year	Percentage of children under five with diarrhoea receiving oral rehydration therapy (ORS packet or recommended homemade fluids or increased fluids) with continued feeding										Source
		Total	Gender		Residence		Wealth index quintiles					
			Male	Female	Urban	Rural	Poorest	Second	Middle	Fourth	Richest	
Albania	2000	51	44	62	52	50	55	41	51	48	54	MICS 2000
Albania	2005	50	–	–	–	–	–	–	–	–	–	MICS 2005
Algeria	2006	24	21	27	26	23	19	21	31	30	23	MICS 2006
Armenia	2000	48	47	49	44	52	36	64	28	56	62	DHS 2000
Armenia	2005	59	64	51	62	56	53	58	44	68	78	DHS 2005
Azerbaijan	2000	40	43	37	37	42	40	41	57	31	20	MICS 2000
Azerbaijan	2006	31	33	29	21	41	27	28	42	35	28	DHS 2006
Bangladesh	2004	52	50	55	58	51	41	50	52	57	76	DHS 2004
Bangladesh	2006	49	51	47	52	48	45	47	49	55	55	MICS 2006
Bangladesh	2007	68	71	65	70	68	57	73	70	73	70	DHS 2007
Belarus	2005	54	66	44	53	56	–	59	–	46	–	MICS 2005
Belize	2006	26	–	–	–	20	–	–	–	–	–	MICS 2006
Benin	2001	42	47	37	48	40	41	31	49	46	46	DHS 2001
Benin	2006	42	44	39	43	41	40	44	38	42	47	DHS 2006
Bolivia, Plurinational State of	2000	59	60	58	64	53	51	57	67	63	65	MICS 2000
Bolivia, Plurinational State of	2003	54	57	50	56	52	48	54	55	57	64	DHS 2003
Bosnia and Herzegovina	2000	23	–	–	–	–	–	–	–	–	–	MICS 2000
Bosnia and Herzegovina	2005-2006	53	60	40	42	58	58	63	49	47	47	MICS 2005-2006
Botswana	2000	7	–	–	–	–	–	–	–	–	–	MICS 2000
Burkina Faso	2003	47	49	45	56	46	44	41	46	53	56	DHS 2003
Burkina Faso	2006	42	41	44	52	41	38	41	45	38	53	MICS 2006
Burundi	2000	16	17	14	18	15	15	14	14	19	17	MICS 2000
Burundi	2005	23	24	23	27	23	22	19	20	30	27	MICS 2005
Cambodia	2005	50	51	48	45	51	56	51	52	43	37	DHS 2005
Cameroon	2000	32	35	30	36	31	34	35	27	24	46	MICS 2000
Cameroon	2004	43	42	45	47	41	38	40	46	47	60	DHS 2004
Cameroon	2006	22	20	24	29	18	16	19	24	25	45	MICS 2006
Central African Republic	2000	47	47	46	47	46	42	49	50	45	48	MICS 2000
Central African Republic	2006	47	46	48	52	43	39	44	41	54	55	MICS 2006
Chad	2000	44	46	43	40	48	44	40	45	54	34	MICS 2000
Chad	2004	27	28	27	39	25	10	29	24	30	38	DHS 2004
Colombia	2000	44	44	43	47	38	40	44	45	40	54	DHS 2000
Colombia	2005	39	41	36	40	37	37	41	34	40	47	DHS 2005
Comoros	2000	31	32	30	48	27	31	29	–	–	–	MICS 2000
Congo	2005	39	39	39	40	38	36	38	38	43	45	DHS 2005
Côte d'Ivoire	2000	34	35	33	36	33	31	32	36	37	35	MICS 2000
Côte d'Ivoire	2006	45	44	46	48	43	44	45	38	46	60	MICS 2006
Democratic Republic of the Congo	2001	17	17	15	18	16	17	17	19	15	15	MICS 2001
Democratic Republic of the Congo	2007	42	45	40	41	43	39	41	47	44	40	MICS 2007
Djibouti	2006	33	28	39	32	63	–	–	–	–	–	MICS 2006
Dominican Republic	2000	53	51	55	58	49	53	50	53	51	69	MICS 2000
Dominican Republic	2002	42	41	43	40	44	48	40	35	49	33	DHS 2002
Dominican Republic	2007	55	54	57	58	51	54	58	50	59	57	DHS 2007
Egypt	2000	29	30	27	22	32	32	28	33	23	24	DHS 2000
Egypt	2003	26	26	25	22	28	29	27	26	23	22	DHS 2003
Egypt	2005	27	27	28	23	29	32	28	28	23	21	DHS 2005
Egypt	2008	19	22	16	17	20	21	24	22	12	14	DHS 2008
Equatorial Guinea	2000	36	36	36	34	37	33	38	50	35	28	MICS 2000
Eritrea	2002	54	56	51	67	49	–	–	–	–	–	DHS 2002
Ethiopia	2005	15	15	15	28	14	10	10	17	15	30	DHS 2005

**TABLE 3** Use of oral rehydration therapy with continued feeding, by background characteristics (continued)

Country or territory	Year	Percentage of children under five with diarrhoea receiving oral rehydration therapy (ORS packet or recommended homemade fluids or increased fluids) with continued feeding										Source
		Total	Gender		Residence		Wealth index quintiles					
			Male	Female	Urban	Rural	Poorest	Second	Middle	Fourth	Richest	
Gabon	2000	44	43	45	46	37	37	42	50	44	45	DHS 2000
Gambia	2000	38	39	36	37	38	34	45	33	38	41	MICS 2000
Gambia	2006	38	39	37	32	40	34	37	43	41	33	MICS 2006
Georgia	2005	37	36	37	41	32	–	–	43	27	–	MICS 2005
Ghana	2003	40	41	39	47	37	35	34	46	35	63	DHS 2003
Ghana	2006	29	29	28	29	28	31	22	21	42	33	MICS 2006
Guatemala	1999	22	19	26	26	20	–	–	–	–	–	MICS 1999
Guinea	2003	44	43	44	39	45	40	48	49	39	38	MICS 2003
Guinea	2005	38	36	39	40	37	32	31	41	43	45	DHS 2005
Guinea-Bissau	2000	23	23	22	22	23	22	25	20	22	25	MICS 2000
Guinea-Bissau	2006	25	28	22	28	24	25	25	24	22	33	MICS 2006
Guyana	2000	40	36	44	35	41	43	50	33	42	18	MICS 2000
Guyana	2006-2007	28	27	30	–	23	–	–	–	–	–	MICS 2006-2007
Haiti	2000	41	40	41	51	36	34	38	35	47	56	DHS 2000
Haiti	2005-2006	43	–	–	–	–	–	–	–	–	–	DHS 2005
Honduras	2005-2006	49	50	48	51	49	45	49	51	53	52	DHS 2005-2006
India	2005-2006	33	34	31	38	31	29	29	31	35	45	DHS 2005-2006
Indonesia	2000	61	–	–	–	–	–	–	–	–	–	MICS 2000
Indonesia	2002-2003	56	53	59	59	53	58	47	59	57	62	DHS 2002-2003
Indonesia	2007	54	56	52	52	56	55	56	58	53	48	DHS 2007
Iraq	2000	54	–	–	–	–	–	–	–	–	–	MICS 2000
Iraq	2006	64	66	61	62	67	–	–	–	–	–	MICS 2006
Jamaica	2000	21	–	–	–	–	–	–	–	–	–	MICS 2000
Jamaica	2005	39	–	–	–	–	–	–	–	–	–	MICS 2005
Jordan	2002	44	43	44	44	43	–	–	–	–	–	DHS 2002
Jordan	2007	32	30	35	31	36	32	30	37	25	35	DHS 2007
Kazakhstan	2006	48	–	–	–	–	–	–	–	–	–	MICS 2006
Kenya	2000	15	16	14	16	12	14	16	14	16	14	MICS 2000
Kenya	2003	33	32	35	36	33	30	31	36	31	40	DHS 2003
Kyrgyzstan	2006	22	16	32	26	21	49	12	14	22	20	MICS 2006
Lao People's Democratic Republic	2000	37	40	34	64	30	30	45	40	43	34	MICS 2000
Lao People's Democratic Republic	2006	49	53	44	–	47	50	40	48	52	–	MICS 2006
Lesotho	2000	29	29	29	33	28	28	32	27	29	28	MICS 2000
Lesotho	2004	53	54	51	47	54	52	51	52	58	56	DHS 2004
Liberia	2007	47	48	46	50	46	40	41	52	53	56	DHS 2007
Madagascar	2000	47	46	48	55	45	44	42	49	53	64	MICS 2000
Madagascar	2003-2004	47	48	46	60	44	42	41	50	50	64	DHS 2003-2004
Malawi	2000	51	50	53	53	51	46	54	50	53	57	DHS 2000
Malawi	2004	54	57	51	68	52	47	53	51	61	63	DHS 2004
Malawi	2006	27	28	25	36	25	24	25	24	29	34	MICS 2006
Mali	2001	45	44	47	56	43	43	45	42	43	61	DHS 2001
Mali	2006	38	38	37	43	37	32	36	40	36	51	DHS 2006
Mauritania	2000-2001	9	9	9	8	10	10	14	8	7	5	DHS 2000-2001
Mauritania	2007	32	32	32	39	28	25	25	37	42	37	MICS 2007
Moldova	2000	52	47	56	45	58	42	68	50	64	32	MICS 2000
Moldova	2005	48	48	49	43	56	43	83	53	37	51	DHS 2005
Mongolia	2000	66	67	64	67	64	59	66	68	66	68	MICS 2000
Mongolia	2005	47	46	48	42	49	47	40	–	–	–	MICS 2005
Montenegro	2005	64	–	–	–	–	–	–	–	–	–	MICS 2005
Morocco	2003-2004	46	43	48	51	41	37	50	45	51	50	DHS 2003-2004





Country or territory	Year	Percentage of children under five with diarrhoea receiving oral rehydration therapy (ORS packet or recommended homemade fluids or increased fluids) with continued feeding										Source
		Total	Gender		Residence		Wealth index quintiles					
			Male	Female	Urban	Rural	Poorest	Second	Middle	Fourth	Richest	
Mozambique	2003	47	46	47	57	41	40	42	46	48	60	DHS 2003
Mozambique	2008	47	46	48	51	45	41	45	47	49	55	MICS 2008
Myanmar	2000	48	48	49	70	44	39	42	59	56	63	MICS 2000
Myanmar	2003	65	–	–	–	–	–	–	–	–	–	MICS 2003
Namibia	2000	39	42	36	48	34	31	32	41	42	51	DHS 2000
Namibia	2006-2007	48	48	48	52	45	32	55	48	61	47	DHS 2006-2007
Nepal	2006	37	41	32	39	37	25	36	34	43	57	DHS 2006
Nicaragua	2001	49	52	45	51	47	44	51	47	48	63	DHS 2001
Niger	2000	43	44	42	51	42	48	35	44	34	55	MICS 2000
Niger	2006	34	35	33	47	32	31	31	34	30	46	DHS 2006
Nigeria	2003	28	30	25	32	26	16	23	33	32	53	DHS 2003
Pakistan	2006-2007	37	36	37	38	36	32	36	34	39	45	DHS 2006-2007
Peru	2004-2006	60	61	59	66	53	52	56	60	68	75	DHS 2004-2006
Philippines	2003	76	75	77	81	70	70	77	80	77	83	DHS 2003
Rwanda	2000	20	20	21	31	19	18	17	19	21	29	DHS 2000
Rwanda	2000	16	18	14	22	16	17	14	14	17	28	MICS 2000
Rwanda	2005	24	24	23	30	23	21	18	23	29	31	DHS 2005
Sao Tome and Principe	2000	50	51	49	56	49	36	49	56	55	57	MICS 2000
Sao Tome and Principe	2006	63	62	64	64	62	66	61	61	63	64	MICS 2006
Senegal	2000	34	35	32	39	32	26	32	33	43	41	MICS 2000
Senegal	2005	43	44	40	44	42	40	43	41	46	44	DHS 2005
Serbia	2005	71	73	68	76	64	63	–	–	–	–	MICS 2005
Sierra Leone	2000	39	38	39	37	39	33	42	41	46	29	MICS 2000
Sierra Leone	2005	31	30	33	27	32	36	30	28	31	32	MICS 2005
Somalia	2006	7	7	6	9	6	5	4	7	9	11	MICS 2006
Sudan (north)	2000	38	38	38	43	33	28	35	39	44	45	MICS 2000
Sudan	2006	56	56	56	–	–	53	54	57	63	59	ONS 2006
Suriname	2000	43	–	–	–	–	–	–	–	–	–	MICS 2000
Suriname	2006	28	25	30	26	29	23	31	37	28	31	MICS 2006
Swaziland	2000	25	25	23	26	23	17	33	23	23	30	MICS 2000
Swaziland	2006-2007	22	25	19	19	23	21	29	23	25	15	DHS 2006
Syrian Arab Republic	2006	34	36	32	33	35	37	33	33	31	38	MICS 2006
Tajikistan	2000	29	29	28	16	31	31	27	31	35	14	MICS 2000
Tajikistan	2005	22	23	21	28	20	20	19	13	35	26	MICS 2005
Thailand	2005-2006	46	44	49	42	48	43	56	44	47	45	MICS 2005-2006
The former Yugoslav Republic of Macedonia	2005	45	26	57	61	23	20	61	–	–	–	MICS 2005
Togo	2000	25	24	27	27	25	23	30	22	21	35	MICS 2000
Togo	2006	22	18	26	22	22	19	21	20	24	27	MICS 2006
Tunisia	2006	62	68	55	61	63	–	–	–	–	–	MICS 2006
Turkmenistan	2006	25	32	17	31	22	27	17	16	30	36	MICS 2006
Uganda	2000-2001	29	29	29	34	28	25	26	29	31	41	DHS 2000-2001
Uganda	2006	39	41	38	48	39	39	35	39	43	44	DHS 2006
United Republic of Tanzania	2004-2005	53	53	53	59	52	49	54	52	53	62	DHS 2004-2005
Uzbekistan	2000	33	39	25	30	34	36	45	30	35	19	MICS 2000
Uzbekistan	2006	28	24	–	–	31	–	–	–	–	–	MICS 2006
Venezuela (Bolivarian Republic of)	2000	51	–	–	–	–	–	–	–	–	–	MICS 2000
Viet Nam	2000	24	24	24	30	23	23	31	19	15	31	MICS 2000
Viet Nam	2006	65	63	67	–	65	–	–	–	–	–	MICS 2006
Yemen	2006	48	47	49	50	47	41	50	45	51	54	MICS 2006
Zambia	1999	65	63	67	64	66	57	74	58	64	68	MICS 1999

**TABLE 3** Use of oral rehydration therapy with continued feeding, by background characteristics (continued)

Country or territory	Year	Percentage of children under five with diarrhoea receiving oral rehydration therapy (ORS packet or recommended homemade fluids or increased fluids) with continued feeding										Source
		Total	Gender		Residence		Wealth index quintiles					
			Male	Female	Urban	Rural	Poorest	Second	Middle	Fourth	Richest	
Zambia	2001-2002	48	51	45	51	47	43	47	48	52	54	DHS 2001-2002
Zambia	2007	56	55	57	59	55	53	57	51	57	65	DHS 2007
Zimbabwe	2005-2006	47	48	46	59	43	39	45	51	48	61	DHS 2005-2006

**Source:**

Data are from the UNICEF global diarrhoea databases, which include survey data from Demographic and Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS) and other national surveys (ONS).

Note that these data do not appear in most final DHS reports. Instead, data from these surveys have been re-analysed to conform to the definition of this indicator.

The complete diarrhoea treatment databases (including time series, disparities and detailed source information for other treatment indicators) are available at: [www.childinfo.org](http://www.childinfo.org).

Data are as of 15 August 2009.

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**D**iarrhoea remains the second most common cause of death among children under five globally. Nearly one in five child deaths – about 1.5 million each year – is due to diarrhoea. It kills more young children than AIDS, malaria and measles *combined*.

This report puts forward a new, 7-point plan for comprehensive diarrhoea control. The plan includes a treatment package to significantly reduce child deaths due to diarrhoea, and a prevention package to make a lasting reduction in the diarrhoea burden for years to come. But intensified efforts on both fronts must begin right away.

Did you know?

Oral rehydration therapy and continued feeding is a life-saving treatment, which only 39 per cent of children with diarrhoea in developing countries receive. Limited data show little progress since 2000.

Zinc tablets are still largely unavailable in most developing countries, although their effectiveness in reducing the severity and duration of diarrhoea episodes is well known.

Immunization against rotavirus, which results in an estimated 40 per cent of hospital admissions due to diarrhoea among children under five, is urgently needed worldwide, especially in Africa and Asia.

Safe water, adequate sanitation and proper hygiene are too often forgotten foundations of good health. Handwashing with soap alone could potentially reduce the number of diarrhoea cases by over 40 per cent.

Breastfeeding is critical to both the prevention and treatment of diarrhoea. Infants who are exclusively breastfed for the first six months of life and continue to be breastfed until two years of age and beyond develop fewer infections and have less severe illnesses, including diarrhoea.

Vitamin A supplementation has been shown to significantly reduce child deaths, mostly from diarrhoea and measles.



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