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MCHIP Maternal and Child Health Integrated Program

Maternal and Child Survival Program

Prevention and Control of Pneumonia and Diarrhea

Technical Reference Materials

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Child Survival and Health Grants Program

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Abbreviations

CHWs	community health workers
CLTS	community-led total sanitation
CSHGP	Child Survival and Health Grant Program
DPaT	diphtheria, pertussis, and tetanus
EE	environmental enteropathy
GAPPD	Global Action Plan for Pneumonia and Diarrhea
GAVI	Global Alliance for Vaccines and Immunization
GH	Bureau for Global Health
Hib	*Haemophilus influenzae* type b
HIDN	Office of Health, Infectious Diseases, and Nutrition
HIS	health information system
iCCM	integrated community case management
IMCI	integrated management of childhood illnesses
MCHIP	Maternal and Child Health Integrated Program
MCSP	Maternal and Child Survival Program
MOH	Ministry of Health
ORS	oral rehydration solution
ORT	oral rehydration therapy
PCV	pneumococcal conjugate vaccine
POU	point of use
PVO	private voluntary organization
TRM	Technical Reference Materials
USAID	United States Agency for International Development
WASH	water, sanitation, and hygiene
WHO	World Health Organization

Introduction to the Technical Reference Materials

Technical Reference Materials (TRMs)—products of the United States Agency for International Development (USAID), Bureau for Global Health (GH), and Office of Health, Infectious Diseases, and Nutrition (HIDN)—are guides to help program planners and implementers consider the many elements in a particular technical area of the Child Survival and Health Grants Program (CSHGP). These guides are not an official policy for practice; rather, they are basic, everyday summaries to be used as field reference documents. They also may be accessed in the form of electronic toolkits on the Knowledge for Health website.

TRMs are organized by modules that correspond to the primary interventions and key strategies that are central to CSHGP. Each module covers the essential elements that need to be considered during implementation, provides resources to consult for implementing community-oriented programs and planning interventions, and gives examples of tools most commonly used among CSHGP grantees to collect baseline population-level data.

Modules in TRMs address the following topics:

Technical interventions

- Family planning and reproductive health
- Immunization
- Malaria
- Maternal and newborn care
- Nutrition
- Prevention and control of pneumonia and diarrhea

Cross-cutting strategies

- Social and behavior change
- Health system strengthening
- Monitoring and evaluation
- Quality improvement

Technical specialists in USAID's Collaborating Agency community, CORE Group's working groups, USAID technical staff, and community-oriented practitioners all contribute to updating TRMs. The revision date for TRM modules appear at the bottom of each page. The modules are living documents, and we depend on readers to tell us how useful the information is, the need for additions or amendments, and general comments. This will help us keep the modules alive and responsive to your needs. Please share comments with the Maternal and Child Survival Program (MCSP) at info@mcsprogram.net.

Maternal and Child Health Integrated Program (MCHIP) and MCSP are grateful for the many contributions and reviews by staff in USAID's Bureau for Global Health and many collaborating agencies, CORE Group's working groups, private voluntary organizations (PVOs), and nongovernmental organization partners that use these guides. These reviews provided valuable insight on how to improve them. USAID contributors to this TRM include Malia Boggs, Katherine Farnsworth, Troy Jacobs, and Kerry Ross. Other contributors to this TRM include: Claire Boswell with Independent; Orlando Hernandez, Julia Rosenbaum, Renuka Bery, and Jonathan Annis with WASHplus Project; Serge Raharison, Laban Tsuma, and Jennifer Yourkavitch with MCHIP; Tanvi Monga, Melanie Morrow and Michel Pacque with MCSP; Alfonso Rosales with World Vision and CORE Group's Child Health Working Group; Anne Henderson Siegle with ICFI/CEDARS; Eric

Starbuck and Eric Swedberg with Save the Children; and Alan Talens with World Renew and CORE Group's Child Health Working Group.

Pneumonia and Diarrhea Overview

Pneumonia and diarrhea are diseases of poverty, with the highest burden found among the most vulnerable children in the poorest regions of the world.

UNICEF. 2012. Pneumonia and diarrhea: Tackling the deadliest diseases of the world's poorest children.

Of the 6.6 million children who died in the first 5 years of life in 2012,[i] 26% of them died due to pneumonia and diarrhea (17% and 9%, respectively).[ii] Most of these deaths occurred in children younger than 2 years of age. About 75% of pneumonia- and diarrhea-related deaths occur in Africa and South Asia and are concentrated in 15 high-burden countries.[iii]

According to the World Health Organization (WHO), pneumonia is a form of acute respiratory infection that affects the lungs and is clinically defined as an acute disease episode with cough or difficulty in breathing, combined with fast-breathing with age-specific cut-off values for increased respiratory rate. Cases in children with lower chest indrawing are classified as severe pneumonia. Several infectious agents cause pneumonia, such as viruses, bacteria, and fungi. *Streptococcus pneumoniae* is the most common cause of bacterial pneumonia in children, followed by *Haemophilus influenzae* type b (Hib). The most common viral cause is respiratory syncytial virus.[iv]

Diarrhea is defined as the passage of at least three loose, watery stools in a 24-hour period and may be caused by bacterial, viral, or parasitic organisms. The three clinical types of diarrhea are: (1) acute watery diarrhea (includes cholera), (2) acute bloody diarrhea (dysentery), and (3) persistent diarrhea (≥ 14 days).[v] Diarrhea prevalence is highest among children aged 6–23 months, linked to the age when foods are introduced to children to wean them off breast milk. Although the global mortality rate due to diarrhea has declined in children under 5 years of age, morbidity in this population has changed little over the last 30 years. Recent reductions in child diarrheal disease mortality rates are attributable, in part, to the increased availability and use of oral rehydration solution (ORS) for the prevention and treatment of dehydration due to acute watery diarrhea; however, only one-third of children in developing countries receive ORS during a diarrheal episode.[vi]

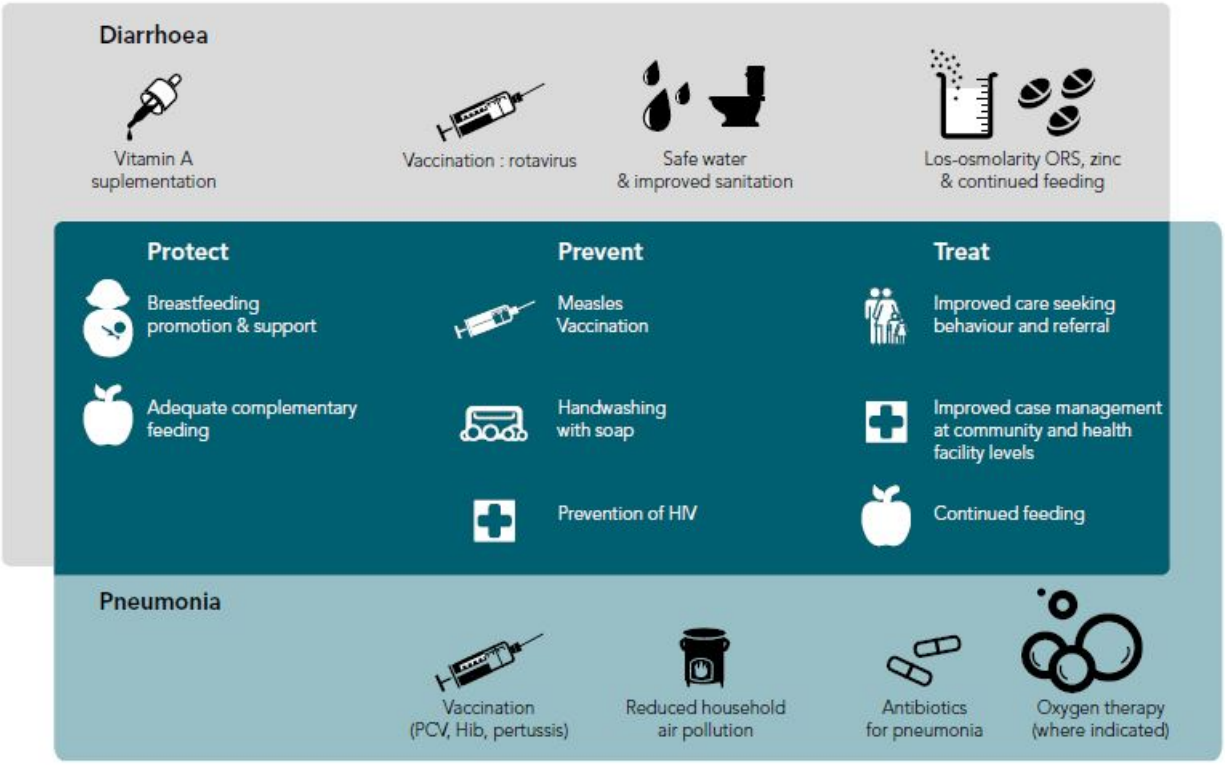
Pneumonia and diarrhea are more likely to occur with unhygienic home environments, undernutrition, suboptimal breastfeeding, poor hygiene, zinc deficiency, and lack of access to essential services.[vii] Pneumonia is also exacerbated by exposure to household air pollution from cooking with solid fuel in open fires or rudimentary cook stoves.[viii] Key prevention efforts include optimal breastfeeding and complementary feeding practices and adequate nutrition, vaccinations, handwashing with soap, safe drinking water, and basic sanitation, among others. For pneumonia, reduction of exposure to household air pollution is also a key prevention effort. Cost-effective and life-saving treatments are available for both diseases. Many of the key interventions work for both pneumonia and diarrhea, and when delivered in an integrated and coordinated manner, carry the potential to save many lives.[ix,x]

Program Design

Dedicated, coordinated, and integrated national and subnational actions for the prevention and control of pneumonia and diarrhea are needed to achieve significant reduction in child mortality.[xi] Interventions are needed to lower disease transmission and severity and to promote access to life-saving treatment when a child becomes sick. Because pneumonia and diarrhea are closely associated and have shared risk factors, interventions, and comorbidities,[xii] a cohesive approach is required to prevent and treat these two diseases.[xiii]

In 2013, WHO and UNICEF released the integrated Global Action Plan for Pneumonia and Diarrhea (GAPPD). The plan promotes practices to protect children from disease, ensures that "every child has access to proven and appropriate preventative and treatment measures,"[xiv] and includes a simple integrated framework to protect, prevent, and treat pneumonia and diarrhea.[xv]

Figure 1. Global Action Plan for Pneumonia and Diarrhea (GAPPD) framework[xvi]



Notes: Haemophilus inluenzae type b (Hib), pneumococcal conjugate vaccine (PCV)

Assessment and Situational Analysis

A successful program that accelerates and sustains progress toward the integrated prevention and control of pneumonia and diarrhea begins with a participatory assessment and situational analysis to generate a holistic understanding of: local needs and priorities; existing nutrition, health, sanitation, preventive, and care-seeking practices; existing cooking practices, including types of stoves and fuels used and the resulting levels of household air pollution generated; local terms for illness; health service quality and coverage; health

information system (HIS) quality and data utilization; private sector and traditional service quality and utilization; existence and functionality of referral systems; community structures; gender norms and household decision-making processes; and vulnerable groups and equity assessment, among others. This assessment needs to take into context the rich experience that countries have had with community use of health commodities and integrated management of childhood illness (IMCI) approaches. This will provide the foundation for a participatory program design that complements, strengthens, and builds on existing activities, local capacities, and opportunities.

As part of the design process, baseline and background information for the specific country context should also be understood. A review should include relevant Ministry of Health (MOH) policies that outline community health worker (CHW) mandates, strategies, and protocols, including whether CHWs are allowed to treat pneumonia and diarrhea. The review should also include existing technical working groups; HIS processes, indicators, and current coverage estimates; national initiatives for scale-up; national social and behavior change communication campaigns; key implementing partners (e.g., UNICEF, WHO, private voluntary organizations [PVOs], and private sector); and logistic supply chain for needed inputs such as low-osmolarity ORS, zinc, antibiotics (particularly dispersible amoxicillin),[xvii] vitamin A, and vaccines.

The assessment and design phases can lay the groundwork for sustained improvements through these measures:

- Understand the local context to address key constraints and underlying causes.
- Identify existing structures and platforms for delivery and evaluate how they can be strengthened and extended.
- Create a shared vision with key stakeholders through joint program-planning.
- Understand, incorporate, and support positive national policies, protocols, and HIS processes at the community and district levels.
- Include a community HIS component in the design to promote a continuous learning cycle and encourage local ownership of nutrition; water, sanitation, and hygiene (WASH); health gaps; and improvements.
- Understand how linkages with the formal health system (campaigns or outreaches, referral systems, IMCI, etc.) have succeeded or failed in the past as well as which ones are still operational. Depending on local context, this may need to include private and faith-based sectors as well as the public sector for health care delivery.
- Incorporate specific objectives to reach vulnerable children who are at the highest risk of death or severe morbidity from pneumonia and diarrhea.
- Design a monitoring and evaluation plan to include implementation research when indicated so that results can inform existing policies and strategies, such as optimal modes of delivery to reach the people most in need.
- Identify factors influencing the sustainability of anticipated outcomes beyond the life of the project so that interventions are designed with sustainability in mind from the outset.

Key Resources for Program Planning

- WHO, UNICEF. 2013. Planning framework for coordinated approaches for pneumonia and diarrhea. In: WHO, UNICEF. Integrated global action plan for pneumonia and diarrhea. Annex 3.
- CORE Group, Save the Children, BASICS, et al. 2012. Community case management essentials: treating common childhood illnesses in the community; a guide for program managers. 2nd ed.
- USAID, MCHIP. 2011. Considerations for incorporating health equity into program designs: A guide for community-oriented maternal, neonatal, and child health projects.
- USAID, Infant and Young Child Nutrition Project. 2011. The basics: Planning for formative research or infant and young child feeding practices.
- PVO Child Survival Support Program, Johns Hopkins University School of Public Health, USAID, et al. 1998. User's guide for the pneumonia care assessment methods toolbox.
- Environmental Health Project, UNICEF/WES, USAID, et al. 2004. Joint publication 8: The hygiene improvement framework; a comprehensive approach for preventing childhood diarrhea.
- Manoff Group. 2005. Trials of improved practices: Giving participants a voice in program design.
- ICF Macro, MEASURE Evaluation, USAID, et al. 2006. Rapid health facility assessment.
- Keusch GT, Fontaine O, Bhargava A, et al. 2006. Diarrheal diseases. In: Jamison DT, Breman JG, Measham AR, et al., eds. Disease control priorities project: Disease control priorities in developing countries, 2nd edition. Washington, DC: World Bank: Chapter 19.
- Environmental Health Project. 2004. Strategic report 8: assessing hygiene improvement: guidelines for household and community levels. Arlington, VA: Environmental Health Project II (USAID).
- UNICEF, The London School of Hygiene and Tropical Medicine. 1999. Towards better programming. A manual on hygiene promotion. Water, environment and sanitation technical guideline series, no. 6.
- WHO. 2007. Combating waterborne disease at the household level.
- Kremer M, Zwane AP. 2007. Cost-effective prevention of diarrheal diseases: A critical review. working paper number 117. Center for Global Development.

Implementation

The local situation analysis will guide the specific strategy—the *how*—and priority interventions—the *what*—that a program will deliver to improve quality, access and extend coverage, create demand for early care-seeking, and adopt and maintain protective and preventive household practices. The program design will correspond to the identified gaps and opportunities and an organization's available resources, comparative advantages, and negotiated role and responsibilities with the MOH, community, and other key partners. This section will discuss key integrated interventions for accelerated and sustained reduction of pneumonia and diarrhea morbidity and mortality among children under 5 years of age, including protection, prevention, and treatment for the most vulnerable populations. Please consult the Malaria TRM for related information on malaria.

For a rationale for program interventions, refer to the WHO and UNICEF GAPPD.[xviii] This plan shows the evidence of impact that specific interventions have on reducing morbidity and mortality.

Protect

The first component to reduce pneumonia and diarrhea morbidity and mortality among children under 5 years of age is to provide protection by promoting good nutrition and health practices from birth, such as:

- Optimal breastfeeding;
- Adequate complementary feeding; and
- Vitamin A supplementation.

Promote Optimal Breastfeeding and Offer Support

Exclusive breastfeeding during the first 6 months of life is one of the most cost-effective child survival interventions, and it can greatly reduce the risk of a young infant's death due to pneumonia or diarrhea. The antibodies and enzymes found in breast milk boost a child's immune system and protect her or him from illness. **Early, exclusive, and continued breastfeeding** provides a vital foundation for infant and child development and growth. Breastfeeding also can play a critical role during and after illness episodes because the milk is a hygienic, easily digestible source of nutrition that can prevent dehydration, provide emotional comfort, and foster catch-up growth.[xix] Children who are malnourished or who are not breastfed can experience longer and more severe episodes of illness and are more likely to die from the illness. Approximately 40% of infants aged 6 months and younger are exclusively breastfed.[xx] USAID's Nutrition TRM has specific guidance on how to promote breastfeeding and provide support to mothers by creating an enabling environment for this critical nutrition and health protective practice.

> An infant who is not breastfed is 15 times more likely to die from pneumonia and 10.5 times more likely to die from diarrhea than an infant who is exclusively breastfed.
>
> (WHO/UNICEF GAPPD, 2013)

Adequate Complementary Feeding and Micronutrient Intake

Complementary feeding begins when breast milk alone is no longer sufficient to meet the nutritional requirements of an infant; therefore, other foods and liquids are needed along with breast milk. The target age range for complementary feeding is generally considered to be 6–24 months, although breastfeeding can continue beyond 2 years of age (Pan-American Health Organization, 2001).[xxi]

Appropriate complementary feeding adheres to the following conditions, as described in the WHO report of the global consultation on complementary feeding:

- *Timely*—foods are introduced when the need for energy and nutrients exceeds what can be provided through exclusive, frequent breastfeeding.
- *Adequate*—foods provided have sufficient energy, protein, and micronutrients to meet a growing child's nutritional needs.
- *Safe*—foods are stored hygienically and prepared and fed with clean hands using clean utensils, not using bottles and teats.

> Breastfeeding can prevent and shorten the duration of pneumonia.
>
> (WHO Pneumonia Fact Sheet 2014)
>
> Continued and frequent breastfeeding shortens the duration of diarrhea and prevents dehydration and growth-faltering.
>
> (USAID Nutrition TRM)

> Appropriate complementary feeding should be timely, adequate, safe, and responsive.[22]
>
> (WHO, Complementary Feeding: report of the global consultation, 2002.)

- *Responsive*—This condition means that foods are given consistent with a child's signals for appetite and satiety, and meal frequency and feeding method—actively encouraging a child to consume sufficient food using fingers, spoon, or self-feeding—are suitable for the child's age.[xxii]

To restore nutrients and weight lost during illness, a child should eat extra meals until he or she regains lost weight and is growing well. For children younger than 6 months, this means more frequent breastfeeding. For children 6–24 months, this means continued breastfeeding, more frequent feeding, and increased amounts of complementary foods. The message for catch-up feeding or the recovery period is to **give the child one additional meal each day during the 2 weeks after illness**. In addition, a child should take micronutrient supplements that are indicated.[xxiii]

Vitamin A Supplementation

Breast milk is the best source of vitamin A for children under 6 months of age when mothers themselves are not deficient in vitamin A.

(USAID Nutrition TRM)

Adequate levels of vitamin A in children have been found to contribute to a 23% reduction in all-cause mortality. Children with a low vitamin A status are more likely to have a severe clinical course and be at higher risk of death from all categories of diarrhea. Improving vitamin A status can significantly reduce diarrhea-specific mortality. Children 6–59 months of age should receive vitamin A supplementation every 6 months. USAID's Nutrition TRM discusses the specifics for reaching children with vitamin A supplementation and therapeutic doses when indicated.

Children with persistent diarrhea (e.g., diarrhea lasting for 14 days or longer with no signs of dehydration and no severe malnutrition) are at risk of vitamin A deficiency. If they have not received high-dose vitamin A supplementation in the previous 30 days, they should receive one age-appropriate, high-dose supplement of vitamin A.[xxiv] If the child has clinical signs of vitamin A deficiency, including xerophthalmia, treatment protocols, found in the USAID's Nutrition TRM, should be followed.

The *Lancet* 2013 nutrition series also recommends preventive zinc supplementation in children aged 6–59 months.[xxv,1] Zinc treatment given for 10–14 days to a child with diarrhea will reduce the duration and severity of the episode and lower the incidence of diarrhea occurring in the following 2–3 months. Zinc supplementation is discussed further in the treatment section.

Prevent

The second component in reducing morbidity and mortality due to pneumonia and diarrhea in children under 5 years of age is through disease prevention by:

- Delivering effective vaccinations for measles, Hib, *Streptococcus pneumonia*, pertussis, and rotavirus;
- Washing hands with soap;
- Using safe drinking water;
- Practicing improved sanitation;

[1] Preventive zinc supplementation has been associated with a 19% reduction in morbidity due to pneumonia. Caulfield LE, Black RE. 2004. Zinc deficiency. In: Ezzati M, Lopez AD, Rodgers A, et al., eds. *Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Risk Factors*. Geneva: WHO.

- Reducing household air pollution; and
- Preventing HIV.

Vaccination

> Immunization is a core component of the strategy to reduce the incidence of pneumonia and diarrheal disease from some pathogens.
>
> (GAPPD)

The GAPPD has set an ambitious goal of reaching 90% full-dose coverage for relevant vaccines that reduce the disease burden and deaths caused by pneumonia and diarrhea among children under 5 years of age. Vaccines against the two most common bacterial causes of childhood pneumonia, ***Streptococcus pneumoniae* and Hib**,[2] are included in this target, as well as **rotavirus**, the most common cause of childhood diarrhea. **Measles and pertussis** vaccines are also part of the target because they contribute to significant reductions in childhood illness and death.

Measles, a highly contagious viral infection, remains one of the leading causes of death and disability among young children globally. Different levels of disease severity and death that follow a measles infection usually are caused by measles-related complications, including severe diarrhea, dehydration, and respiratory infections. Routine measles vaccination for children, combined with mass immunization campaigns in countries with high incidence and death rates, are key public health strategies for reducing mortality related to measles, severe diarrhea, and dehydration.[xxvi] **Pertussis** (whooping cough) is also highly contagious and can cause serious illness in infants and children. An estimated 16 million cases of pertussis occur worldwide each year. The diphtheria, pertussis, and tetanus vaccine (DPaT) provides protection against pertussis. It is given in a series of three doses, starting at 2 months of age.[xxvii]

Rotavirus is the most common cause of severe and fatal diarrhea while cholera causes only 1% of severe diarrhea.[xxviii,3] Two brands of safe, effective rotavirus vaccines are licensed for use in immunization programs that have excellent potential to prevent a significant number of rotavirus-related diarrhea cases and deaths. In 2010, WHO issued an official position paper based on a review of epidemiologic data and recommended that infants worldwide be vaccinated against rotavirus. As of mid-2013, 46 countries adopted the vaccine. With support from the Global Alliance for Vaccines and Immunization (GAVI), it is anticipated that many more countries will introduce the vaccine in the coming years. Depending on the particular vaccine manufacturer, either two or three doses of rotavirus vaccine are needed, starting at 2 months of age, and can be given at the same time as other vaccines.[xxix,xxx] WHO views rotavirus vaccine as part of a comprehensive strategy to control diarrheal diseases.

Pneumococcal conjugate vaccine (PCV) protects against *Streptococcus pneumoniae*, the most common bacterial cause of pneumonia in young children. PCV has been shown to be safe and effective and has been

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[2] A recent *Lancet* review of trials involving vaccination found that Hib and PCV vaccination provide an estimated 6% and 18% reduction, respectively, in severe pneumonia. Bhutta ZA, Das JK, Walker N, et al. 2013. Interventions to address deaths from childhood pneumonia and diarrhoea equitably: What works and at what cost? *Lancet*. 381 (9875):1417–1429. doi: 10.1016/S0140-6736(13)60648-0.

[3] A 2010 (http://www.who.int/wer/2010/wer8513.pdf) WHO paper does not provide age-specific data on the burden of disease in children under 5 years of age or on the proportion of diarrheal deaths that could be prevented in children through immunization. Much of the cholera-related mortality is in children under 5 years of age. The position paper recommends a context-specific approach of periodic, mass vaccination campaigns among high-risk groups in cholera-prone areas—in other words, not universal childhood vaccination. Based on a series of analyses, GAVI decided earlier this year not to prioritize oral cholera vaccination.

incorporated into the immunization schedules and protocols in 86 (44%) of WHO's member states.[xxxi] The **Hib vaccine** protects against the second most common bacterial cause of pneumonia. Hib vaccine is now part of the national immunization program in 184 countries and has contributed to significant reductions in Hib incidence.[xxxii,xxxiii] PCV and Hib vaccines are delivered over three doses and need to be given during infancy to have the most protective impact.[xxxiv]

Improved Hygiene and Sanitation Practices

Since most cases of diarrhea are related to problems with water, sanitation, and hygiene (WASH), it is important to promote safe sanitation and good hygiene practices such as handwashing with soap.

The areas where pneumonia and diarrhea morbidity and mortality are elevated are the same areas where there are very poor indicators for access to a clean water source, handwashing with soap at critical times, presence of improved latrines, and safe disposal of infant and child feces. Improved sanitation (safe disposal of human feces), hygiene, and water supply offer numerous health benefits. A series of studies since 1991 clearly established that a 30–50% reduction in diarrheal disease burden can be achieved through improvements in water supply, sanitation, and hygiene.[xxxv,xxxvi,xxxvii] An analysis of 21 controlled field trials related to point-of-use (POU) water treatment and safe water storage at the household level showed a reduction of 42% in diarrheal diseases compared with other groups.[xxxviii] A literature analysis found that **handwashing with soap** alone reduces incidence of diarrhea by over 40%.[xxxix] Jamison et al. suggested that improving sanitation facilities can generate an estimated reduction of 36% in diarrhea incidence across the studies reviewed (2009).[xl] In a study on the impact of sanitation in urban slums in Bangladesh, Buttenheim concluded: "children's toileting matters more than adult toileting behavior in creating a safe, hygienic environment and reducing diarrheal disease" (2009).[xli]

Recent evidence suggests that the primary causal pathway from poor sanitation and hygiene to stunting is not diarrhea as long believed; rather, the pathway is due to a subclinical condition known as environmental enteropathy (EE).[xlii] EE is characterized by the inflammation of the gut or the presence of abnormal gut bacteria (microbes) that prevent proper absorption of nutrients.[xliii,xliv,xlv] Research indicates that EE is a major, if not primary, cause of child stunting and anemia; one study suggests that EE may account for up to 40% of stunting throughout the developing world.[xlvi] Another study concludes, "*the failure of nutritional interventions in the developing world may be attributed to environmental enteropathy.*"[xlvii] Although the exact cause of EE is not clearly understood, evidence suggests that it results from repeated infant exposure to poor environmental health conditions, resulting in constant contact with and ingestion of fecal bacteria, including from chickens and other livestock.[xlviii,xlix] Over time, this constant exposure to fecal contamination and chronic immune stimulation from toxins and microbes decrease the intestine's ability to absorb essential nutrients, creating what is referred to as a "leaky gut." This diversion of energy and nutrients from growth due to gut inflammation and subsequent immune stimulation, leads to malnutrition.[l]

Preventing diarrhea means improving hygiene interventions to block the paths that enable people to come into contact with fecal contamination.[4] Hygiene improvement is a comprehensive approach for preventing childhood diarrhea and acute lower respiratory infections, and it focuses on three key practices:

[4] Through statistical analysis, Cairncross et al. attribute the relative contribution of each WASH practice in reducing diarrhea, justifying the measures for reducing diarrhea. For details, consult: Cairncross S, Hunt C, Boisson S, et al. 2010. Water, sanitation and hygiene for the prevention of diarrhoea. *Int J Epidemiol.* 39 Suppl 1:i193–i205. doi: 10.1093/ije/dyq035.

- Proper handwashing[5] with soap or another effective cleansing agent, such as ash or sand;
- Safe disposal[6] of feces; and
- Treatment and safe storage of household drinking water.

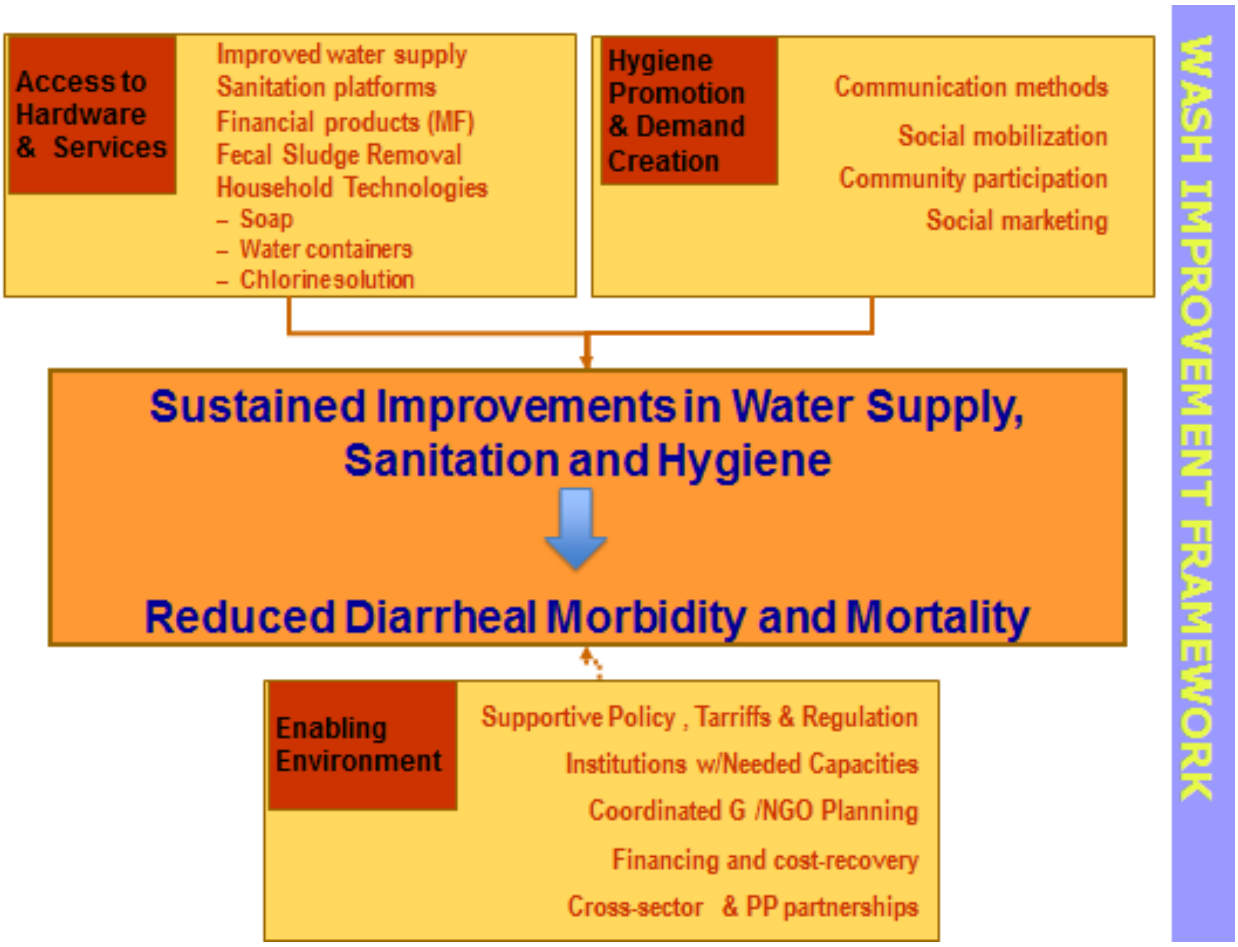
The WASH Improvement Framework (Figure 1[li]) is a tool used to understand and address WASH-related issues, including diarrhea prevention, in any programming environment. The framework, based on lessons learned from years of USAID fieldwork and investigation, illustrates that reducing diarrhea and other WASH-related illnesses requires consistent and correct WASH practices that are supported by sustainable programs. Comprehensive WASH programming that can effectively support the three hygiene-related practices listed above will incorporate the following programs:

- **Pillar 1: Hygiene promotion and demand creation**—for the adoption and maintenance of key hygiene practices;
- **Pillar 2: Sustainable access to hardware and services—**products, services, and technologies that create physical barriers and block the paths where people come into contact with fecal contamination, facilitating behavior change; and
- **Pillar 3: Enabling environment**—policies, regulations, laws, culture, and finance for program implementation and influence that must be addressed to attain scale, impact, and sustainability.

[5] In this usage, "proper" implies the hand hygiene technique practiced before handling food and after handling fecal matter, including pouring water over hands rather than dipping them in a container.

[6] In this usage, "safe" may require separating human feces from access to human contact and also from environmental contamination. In Bangladesh and other places with high water tables, seepage and floods can take fecal matter out of pits into the environment.

Figure 2. Water, Sanitation, and Hygiene (WASH) Improvement Framework



Notes: nongovernmental organization (NGO); public-private (PP)

WASH Framework Pillar 1: Hygiene Promotion and Demand Creation

Community mobilization is a process for engaging and giving ownership to various influential people, community groups, and other stakeholders to rally for a common cause. Identifying and bringing together influential allies across sectors and from multiple segments of the community help to raise awareness of hygiene promotion programs and create demand for good hygiene. Community mobilization contributes to making these programs more sustainable in the long term. In addition, effective community mobilization can develop or influence social norms about specific practices, thus contributing to widespread cultural acceptance of the behavior. As with all promotion activities, messages should be integrated and harmonized with local health facilities and providers, so they are reinforced with caregivers during the delivery of different types of services. In addition, health workers need support to adopt and demonstrate appropriate hygiene and sanitation messages, including handwashing practices and the presence and use of sanitation facilities at local health facilities.

Social marketing makes use of marketing principles and strategies to achieve social goals, such as better hygiene and sanitation. Social marketing in WASH promotes improved hygiene through marketing of soap, handwashing devices (e.g., tippy taps), sanitation products (e.g., improved latrine models) and services (e.g., fecal sludge management), water storage supplies, and water treatment products. Market studies are necessary

to identify consumers' desires, preferences, and priorities. These market insights are used to inform product design and the development of marketing materials and messaging that speak to target audiences. More advanced WASH social marketing schemes incorporate microfinancing strategies, typically through local microfinance institutions to offer loans to individuals or families to purchase WASH-related products or services. In recent years, **sanitation marketing**[7] has evolved into a vibrant subsector of urban—and, to a lesser extent, rural—sanitation programs. Sanitation marketing may be an important component of any behavior change strategy where services and products are crucial to promote and achieve a desired change. Sanitation marketing programs typically include interventions aimed at influencing multiple factors of a market: producers, distributors, service providers, lenders, and consumers.

Community participation may involve activities such as collectively examining barriers to promoting and adopting hygiene in the community, identifying current practices and problems, designing locally appropriate measures to improve hygiene facilities and practices, or community-based monitoring of progress in achieving behavior change. For example, communities can support diarrhea prevention by producing containers to store and save water, such as tippy taps for handwashing, using local materials; constructing latrines; or participating in school hygiene programs. Community-led total sanitation (CLTS)[lii,liii,liv] and its variations are innovative methodologies for mobilizing communities to completely eliminate open defecation. Communities are coached to conduct their own appraisal and analysis of open defecation and take their own action to become open-defecation free. Communities are empowered to conduct a self-appraisal and analysis of their current sanitation situation and commit to taking collective action to become open-defecation free. At least in some settings, community pressure to eliminate open defecation has been reported to result in the use of highly coercive tactics to which implementers should not be naïve.[lv] In many cases, CLTS has proven most effective when coupled with a marketing program for sanitation, described previously. CLTS requires several steps from pre-triggering to follow-up and certification, and all steps need to be implemented for a more successful program. Follow-up after receiving certification of open-defecation free may be required to support sustainable use of sanitation facilities. A sustainability study assessing Plan International's CLTS programs is online.

Community channels for creating demand include CHWs, community groups and organizations, and health workers in clinics. CHWs, health care providers, and development agents need training to convey messages effectively and negotiate small actions that are doable to achieve sustained behavior change. Communication methods include interpersonal communication, use of mass media, educational materials, counseling, training, and folk channels—such as songs, street dramas, and theater. Incorporating messages about hygiene into other messaging about child health practices, such as breastfeeding and nutrition, also reinforces the importance of hygiene in the prevention of infection and illness.

WASH Framework Pillar 2: Access to Hardware and Services

Large infrastructure projects to improve community access to safe water supply and sanitation are beyond the reach of most child survival interventions funded by USAID. This limitation, however, is no reason to decide against investing in a WASH program. Opportunities exist for a USAID-sponsored WASH health program to partner with other hardware-focused water and sanitation programs or to complement them to provide the requisite, although often overlooked, software components such as hygiene promotion, capacity-building, behavior change communication, advocacy, and other relevant interventions that can help reduce diarrheal

[7] The Water and Sanitation Program, an international partnership, has published a toolkit on sanitation marketing, and UNICEF has published a series of 10 Sanitation Marketing Guidance Notes. SanMark, a community of practice is dedicated to sanitation marketing.

disease. More important, low-tech hardware interventions are available for stand-alone WASH programs and do not require large budgets. To support the adoption and practice of healthy WASH behaviors, products need to meet three criteria; they need to be: 1) accessible, 2) affordable, and 3) aspirational.

Simple, lower-cost improvements can have significant impact on reducing the incidence of diarrhea. These are some examples of hardware improvements:

- Clean water source and water system
- Water treatment, handling and storing technologies as the at the POU
- Household sanitation
- Handwashing infrastructure

Current hardware interventions or approaches are significantly different than the supply-driven strategies of the past; the current focus is on market-based solutions to hardware provision. The intent is to stimulate household investment for the purchase of hardware rather than providing products with a donor or government subsidy. Central to these approaches are affordability strategies, such as engaging in do-it-yourself construction, purchasing and installing in stages and over time, obtaining credit to spread out payments, or lowering costs through design, manufacturing, and logistical efficiencies. For example, the private sector provides or sells appropriate water pumping and delivery technologies to households and communities, and sanitation marketing increases private-sector capacity to provide marketable and profitable sanitation hardware and services. Water storage and treatment technologies, along with soap and simple water-conserving technologies for handwashing, are sold through social marketing approaches.

Water Source and Water System Improvements

Households and communities do not always have access to adequately protected water sources, or they may allow improved sources to fall into disrepair. When environmental conditions are favorable, simple, low-cost hardware solutions or technologies for protecting surface water or extracting from shallow groundwater reservoirs can markedly improve the quality of water used for drinking. These simple solutions, collectively known as self-supply,[8] may include adding low dikes and impermeable liners that prevent surface water from flowing into spring boxes and wells, repairing or adding covers for spring boxes, improving water extraction from shallow wells with appropriate pumps, and periodically shock-chlorinating wells and tanks. Self-supply investments are financed largely by households or end-users themselves. The approach has proven effective at increasing coverage in areas where it is not feasible or cost-effective to develop communal supplies.

Treatment and Safe Storage of Water at the Point of Use (POU)

Water from an improved water source is not necessarily safe to drink. Water may become contaminated during transport from the source, during storage, or during service delivery in the home. Treatment and safe storage or serving of water at the POU are important components of USAID's hygiene improvement programming. Physical or chemical treatment methods, accompanied by storage in an appropriate vessel and proper serving techniques, reduce the risk of waterborne diseases. Recommended POU treatment methods include chlorination, ceramic and sand (bio) filters, solar disinfection (also called SODIS), and boiling. Large-scale adoption of these technologies and their sustained use, other than boiling, continues to be a challenge.

[8] The Rural Water Supply Network is a global thought leader in the area of self-supply. Its website contains numerous documents that describe the approach, including case studies from countries with mature self-supply programs.

Resources for POU Water Treatment

- Macey JT, Quick RE. 2002. World spotlight: The safe water system—a household-based water quality intervention program for the developing world.
- Mintz E, Bartram J, Lochery P, et al. 2001. Not just a drop in the bucket: Expanding access to point-of-use water treatment systems. *Am J Public Health*. 91(10):1565–1570.
- Point-Of-Use Water Disinfection and Zinc Treatment (POUZN) Project. 2007. Best practices in social marketing safe water solution for household water treatment: Lessons learned from population services international field programs
- WHO. Considerations for policy development and scaling-up household water treatment and safe storage with communicable disease prevention efforts

Sanitation

Sanitation programming has evolved from a hardware-first, supply-driven intervention to a demand-driven activity where the objective is not to provide subsidized toilets to as many households as possible but to work with users, the private sector, and government to make available a range of toilets that are affordable, aspirational, and environmentally safe.

Sanitation programs will vary considerably by context. In rural areas, state-of-the-art sanitation programming includes efforts to increase demand for latrines and the supply of products and services needed to meet that demand. Demand can be generated using a comprehensive behavior change strategy that comprises a blend of community mobilization techniques, such as CLTS, communication or mass media campaigns, and household-level interventions led by CHWs. Supply-side activities may include sanitation marketing or the training and equipping of rural masons to assist households install hygienic latrines. In addition to strengthening supply and generating demand, urban and peri-urban sanitation programs also should consider fecal sludge management (safe removal, transport, and disposal of fecal matter from latrines) and shared public facilities, both areas of recent innovation and private sector involvement. Urban sanitation programs often contain strong governance components.

Generally, onsite sanitation hardware (toilets) fall into two broad categories based on how the feces are collected—with or without water. Within these categories, toilet designs typically are presented in three distinct pieces: 1) the superstructure that shields the user from view and the elements; 2) the platform or slab that serves as the user interface with the hardware; and 3) the disposal and possibly treatment system. Some basic systems include dry-pit latrines, composting latrines, pour-flush toilets, and septic tanks.
As sanitation marketing has evolved, it has become increasingly popular for suppliers to present latrine options in a tri-page flipbook format that allows consumers to mix and match different superstructure, slab and toilet, and disposal options according to the physical realities of the site, user preferences, and affordability. The flipbook provides information on space requirements, costs, advantages, and disadvantages of each option, including potential environmental impacts.

Individuals who are elderly, sick, or physically challenged may have special needs for safe handling and disposal of their feces because they may find standard latrines or toilets difficult to use. The superstructure and the slab toilet may need to be modified so that less able individuals can access it. For example, the superstructure can be made large enough to accommodate two people so that a caregiver can help people with physical limitations use the facility, including elderly or sick individuals, or people with a disability; or the structure could have hand rails mounted on the walls or a pole installed in front of the toilet or squat hole to

help a person raise or lower himself or herself from the toilet. Individuals who are unable to get out of bed also need help with feces disposal, which may include making a bedpan available and training the care provider on its use, making a simple bedside commode using a chair or stool and bucket, and protecting the linens and bedding material.

Evidence suggests that adoption of toilets will increase if they meet at least three characteristics: 1) are affordable, 2) are in close proximity, and 3) meet the socioeconomic aspirations of consumers.[lvi]

Handwashing

Improving handwashing behavior requires appropriate hardware or enabling technologies. These hardware and technologies fall into four categories that together create a handwashing station: 1) a handwashing device, 2) a cleansing agent, 3) an appropriate water source, and 4) a hand drying option. Air-drying is recommended for most developing country scenarios.

Washing hands with soap can significantly cut the risk of diarrhea from 30–50%37 and respiratory tract infections from 21–45%36.

From: Global Public-Private Partnership for Handwashing

Cleansing agents are soap products typically purchased from local stores or markets. A number of national and international initiatives, including the Global Public-Private Partnership for Hand Washing, focus on making these products more available, affordable, and desirable to consumers. As indicated previously, this may include appealing to non-health-related motivators and sizing and packaging soap into affordable quantities. In areas that are economically and logistically challenged, handwashing programs may promote the use of ash or sand as an alternative agent for cleansing.

Households should also be encouraged to have a designated handwashing station in the home equipped with soap or a soap substitute. A number of devices have been developed that efficiently dispense water for handwashing. Many of these technologies are cheap, lightweight, durable, and can be readily fabricated locally from available materials. Typically, they require refilling no more than twice a day and require a single touch to dispense thin streams of water. Among the best known of these water-saving handwashing technologies is the **tippy tap** that is easily fabricated with discarded plastic bottles, sticks, and string.

Figure 3. Tippy tap illustration

Source: Tippytap.org (Build your own tippy tap)

Mukombe, a term from Zimbabwe, is another name for this technology, and often refers to versions constructed from dry gourds rather than bottles. Other variations include bucket-and-spigot approaches, where the bucket can be a gourd or bottle and the spigot can be factory-fabricated or as simple as a capped ballpoint pen case. Gravity-valve systems involve a heavy cone or ball that covers a hole in the bottom of the container. Touching the ball or cone dislodges it enough to permit water to leak from the hole and onto waiting hands. Another variation is a bucket and dipper system.

The success of tippy taps and commercial marketing of latrines and toilets have facilitated efforts to develop handwashing stations that are attractive and even considered status symbols. USAID-funded initiatives are now designing more robust handwashing devices to be marketed and sold through commercial channels.

In the last few years, efforts have been undertaken to develop aspirational handwashing devices that may be attractive to consumers, enticing them to use the devices more frequently. The Happy Tap has been developed in Southeast Asia and marketed both in Vietnam and Cambodia by Watershed Asia, and the Water and Sanitation Program of the World Bank has spent efforts in developing the *Mrembo* handwashing device in Kenya. Information about the rationale for moving beyond tippy taps and these efforts may be available at the following Internet sources:

Resources for Handwashing

- Biran A. 2011. Enabling technologies for handwashing with soap: A case study on the tippy-tap in Uganda.
- Global Public-Private Partnership for Handwashing. 2014. Handwashing station developed for rural Kenya.
- USAID. 2013. A watershed moment: Bringing a market-based approach to improved handwashing in Vietnam.
- 2014. *Mrembo*/handwashing station for rural Kenyan households. Vimeo website.
- Water, Sanitation, and Hygiene Enterprise Development (Water SHED). 2015. HappyTap related resources.
- Woodburn H. 2014. Moving beyond the tippy tap.

WASH Framework Pillar 3: Strengthening the Enabling Environment

The enabling environment for developing a WASH program includes governmental, social, cultural, financial, and economic support that can take place at national, regional, municipal, or community level to: facilitate program activities; and ensure that these activities are sanctioned and sustained post-project. Supporting the enabling environment typically takes the form of one or more of these activities: policy and regulatory improvement, institutional strengthening, community involvement, financing and cost-recovery, and cross-sector and public-private partnerships. Again, these activities can take place at different levels, ranging from national to community.

Policy improvement involves assessing the adequacy of national policies and supporting new policies that encourage and promote sustainable hygiene improvement. Policy improvement may involve advocacy to influence policy and the creation of norms for construction and sanitation. It also may involve helping governments translate their policies into operational strategies and regulatory statutes.

Institutional strengthening can focus on creating new institutions and helping existing institutions define their mission, roles, and responsibilities and how they will increase their technical competence and train their staff members.

Enabling community engagement means developing local systems, regulations, relationships, and associated capacity to establish, operate, and maintain ongoing activities and advancements in water, sanitation, and hygiene. Engaging the community through interventions such as CLTS and WASH promotion at the household level can generate demand for water, sanitation, and hygiene improvements.

Financing and cost-recovery strategies help local communities devise ways to recover costs. If these interventions can be shown to be viable financially, such as privately owned and operated public sanitary facilities and profit-making water and sanitation utilities run by the urban poor, then financing is easier to obtain. The goal is for user fees to cover the recurrent costs of water supply and sanitation services. If users are

consulted in the design process, then prospects for full-cost recovery of recurrent costs are more likely. Strategies also may address access to financial products (credit and savings) by households that wish to purchase goods and services to improve their hygiene status, typically for capital improvements to household infrastructure such as wells, pumps, and bathrooms. Lending institutions may need to be strengthened to create or improve their capacity to provide microfinancing to households and local providers.

Cross-sector and public-private partnerships bring together different government entities and sectors, such as water supply and sanitation agencies that work together with the health ministry, and support the collaboration between public and private partners. Partnerships between the public sector and manufacturers of soap, water purification, or sanitation products or their components, such as cement for latrine slabs, can expand both the product market and access to these products in the community and promote improved hygiene. Collaboration with other sectors can include non-health sectors that contribute to healthy communities; the health sector can play a leadership and advocacy role in promoting cross-sectoral collaboration.

Following are some examples of how various sectors can help prevent pneumonia and diarrheal disease:

- The *education* sector: USAID, UNICEF, and others can promote a comprehensive WASH-friendly schools approach, integrate hygiene education on food and water safety, and personal and household hygiene into school curricula; provide separate latrines or toilets for boys and girls and hand washing facilities in all schools; promote environmental health clubs; and organize helminthic control efforts against worms.
- The *water and sanitation* sector: Include hygiene improvement and behavior change as components of infrastructure construction programs, and incorporate market-based approaches to help households access services.
- The *municipal and local governmental* sector: Address the provision of public services that include water supply and sanitation governance issues. Municipal and local leaders should understand the WASH Improvement framework as a basis for implementing self-sustaining, high-impact water and sanitation programs.
- The *housing* sector: Provide credit for household water and sanitation improvements, and influence the regulatory environment, such as through building codes and hardware regulations.
- The *private* sector: Manufacture and distribute water disinfection products, safe water storage containers, and soap for handwashing. Train local providers of products and services in the sanitation sector, such as slab manufacturers and latrine installers.

Water System Source Improvements

Households and communities do not always adequately protect water sources or may allow them to fall into disrepair. Simple, low-cost hardware solutions or technologies for protecting surface water and groundwater sources can markedly improve the quality of water. These simple solutions include adding low dikes and impermeable liners that prevent surface water from flowing into spring boxes and wells, repairing or adding covers for the same, improving water extraction from shallow wells with appropriate pumps, and periodically shocking chlorinating wells and tanks. Other improvements can include low-cost treatment of community or neighborhood water supply, such as through sedimentation and chlorination. Improving community infrastructure or facilities can be challenging from an organizational point of view, and facilities require ongoing maintenance and upkeep, adding to the cost, although costs can be shared among users.

Key Resources for WASH Programming

Making Water Safe

- Environmental Health Project (EHP), UNICEF/WES, USAID, et al. 2004. Joint publication 8: The hygiene improvement framework; a comprehensive approach for preventing childhood diarrhea.
- Biosand Filter. 2004. The biosand filter.
- SODIS.
- CDC. 2008. Household water treatment options in developing countries: Flocculant/disinfectant powder.
- Institute of Development Studies (IDS). 2011. Community-led total sanitation: The CLTS approach.
- CDC. 2014. The safe water system.

Handwashing, Tippy Taps, and Enabling Technologies

- CDC. Tippy Taps: A design for simple, economical, and effective handwashing stations.
- World Bank. 2006. The Handwashing handbook: A guide for developing a hygiene promotion program to increase handwashing with soap.

Safe Disposal of Feces

- EcoSan. EcoSan waterless toilet system.
- Institute of Development Studies (IDS). 2011. Community-led total sanitation: The CLTS approach.
- Drewko A. 2007. Resource-oriented public toilets in developing Countries: ideas, design, operation and maintenance for Arba Minch, Ethiopia.
- Water Aid, London School of Hygiene & Tropical Medicine. 2010. Communal toilets in urban poverty pockets: A briefing note.
- USAID, WASHplus. 2012. Integrating sanitation into services for people living with HIV and AIDS.

Other General WASH Resources

- Environmental Health Project (EHP), UNICEF/WES, USAID, et al. 2004. Joint publication 8: The hygiene improvement framework; a comprehensive approach for preventing childhood diarrhea.
- USAID, Hygiene Improvement Project (HIP). 2010. Hygiene improvement project.
- WASHplus.
- Water and Sanitation for Health Project. 1990. Health benefits from improvements in water supply and sanitation: Survey and analysis of the literature on selected diseases.
- Howard G, Bog C, Goldstein G, et al. 2002. Healthy villages: A guide for communities and community health workers.
- Prüss A, Kay D, Fewtrell L, et al. 2002. Estimating the burden of disease from water, sanitation, and hygiene at a global level. *Environ Health Perspect.* 110(5):537–42.
- Peletz R, Mahin T, Elliott M, et al. 2013. Water, sanitation, and hygiene interventions to improve health among people living with HIV/AIDS: A systematic review. *AIDS.* 27(16):2593–601. doi: 10.1097/QAD.0b013e3283633a5f.
- Curtis V, Schmidt W, Luby S, et al. Hygiene: New hopes, new horizons. *Lancet Infect Dis.* 11(4):312–21. doi: 10.1016/S1473-3099(10)70224-3.

Reduce Household Air Pollution

Overcrowding in homes and particulate air pollution (soot) are also risk factors for pneumonia.[lvii] Evidence suggests a causal association between indoor smoke and childhood pneumonia. An exposure response analysis of participants indicated that a 50% reduction in exposure was significantly associated with a reduced risk of physician-diagnosed pneumonia.[lviii] Decreased household pollution due to improved stoves also has been shown to diminish severe pneumonia.[lix] Cost-effectiveness studies have confirmed the benefits of promoting the use of improved stoves.[lx] WHO will soon release air quality guidelines for household fuel combustion. To achieve these outcomes, interventions to reduce household air pollution must incorporate improved stoves that have been shown to significantly reduce household air pollution and are appealing enough to cooks that they replace, rather than complement, the use of traditional stoves.

Reduction of household air pollution with improved stoves can reduce severe pneumonia.

More efficient, cleaner, and safer energy in the home can save time, reduce fuel costs, and prevent burns.

Prevention of HIV

Children with HIV have greater morbidity and mortality related to pneumonia and diarrheal disease. Not only do children with HIV have a greatly increased risk of bacterial pneumonia, but *Pneumocystis Jiroveci*, *Micobacterium tuberculosis*, *cytomegalovirus*, and gram-negative infections are all important causes of pneumonia in post-neonatal, HIV-positive children.[lxi]

Interventions to delay morbidity and mortality from diarrhea and pneumonia can make a huge contribution to the long-term survival of HIV-infected and HIV-exposed infants and children. Although cotrimoxazole prophylaxis for HIV-infected children has shown to reduce death due to AIDS by 33%, coverage remains unacceptably low at 8%.[lxii]

Treat

Case management of childhood illness involves an integrated treatment package for the diseases that kill the most number of children—diarrhea, pneumonia, and, in applicable geographic areas, malaria. The approach can be implemented in first-level health facilities (IMCI) or as a community-based package (integrated community case management [iCCM]) to help extend the reach of these services to sick children not going to health facilities. The third component of the integrated framework is reaching vulnerable children with effective treatment, for example:

- Improving care-seeking behavior and referral for timely treatment;
    - Caregivers should seek prompt and appropriate care when children exhibit signs and symptoms of acute respiratory infection. Caregivers should provide appropriate treatment for children with diarrhea at the symptoms' onset.[lxiii]
    - Improving integrated case management for childhood illness at the community level (iCCM), first-level health facilities (IMCI), and in referral hospitals; and
    - Ensuring an adequate and consistent supply of needed inputs, such as appropriate antibiotics, low-osmolarity ORS, zinc and vitamin A supplementation, and oxygen therapy, among others.

Improving Case Management: Health Systems Strengthening

The goal of case management is to reduce mortality in children under 5 years by providing early, correct assessment and treatment of the childhood illnesses that are responsible for the greatest mortality burden (diarrhea, pneumonia, and in certain locations, malaria). The following activities are essential as a package for strengthening and extending quality case management of childhood illnesses:

- **Improving skills of health workers**—Appropriate assessment, classification, treatment, counseling, referral, and follow-up for childhood illnesses by health workers and CHWs
- **Improving health system support**—Strengthening health system elements required to maintain facility- and community-level activities, an adequate supply of essential drugs and equipment, effective supervision, regular monitoring and evaluation, referral care (to the extent that it is feasible), and district planning and management
- **Improving family practices and community services**—Prompt recognition of signs of illness and danger signs indicating severe illness, prompt care-seeking from appropriate health providers, and adequate access of sick children to appropriate case management

Improving Skills of Health Workers

From the start, nongovernmental organizations must understand the strengths, weaknesses, opportunities, and challenges of the existing system. Areas to assess include policy guidelines, cost, human resource management and clinical supervision of the quality of care provided, logistics (essential drugs and equipment), monitoring and evaluation, and referral systems. Understanding both government and private drug distribution systems will allow programs to support the provision of low-osmolarity ORS, appropriate antibiotics (particularly dispersible amoxicillin), and other key prevention and treatment inputs most effectively through either or both of these mechanisms. Social marketing of ORS and zinc using private producers and distributors has been successful in many settings, including in Bangladesh, Benin, Ghana, Nepal, and Indonesia.[lxiv]

For effectiveness and sustainability, it is critical that community-based case management activities have the support of decision makers, health care providers, and community members and have strong links to existing health facilities.

(CCM Essentials: a Guide for Program Managers)

Strategies to improve quality of care should include a mechanism for reviewing case management practices of both facility and community-based providers, using direct observation of practice when possible, in addition to record reviews. A system for giving feedback to providers and then solving problems locally using local resources where possible is likely to be more sustainable and effective in the long term. It is particularly important that counseling practice be reviewed and barriers to effective counseling be addressed.

Systems for referral of severely ill children need to be reviewed, and strategies need to be developed for improving referral practices if necessary. In many cases, an assessment of referral practices and barriers to referral will require the collection of both qualitative and quantitative data at health facilities and in communities. The quality of referral care provided also should be reviewed. It is important to assess if oxygen is available for treatment of hypoxia for cases of severe pneumonia. In some cases, referral may be difficult or impossible, and it may be necessary to train first-level health workers to provide care for severe dehydration.

IMCI Protocol for First-Level Primary Care Health Workers

IMCI is practiced in more than 100 countries, including almost all countries in Africa. It allows for an integrated, more systematic "syndromic" approach to manage childhood illness, including treatment of coexisting infections, while at the same time evaluating and protecting growth and development of the child. ICCM works well in low-income countries that have little diagnostic support because it relies on history, signs, and symptoms. Case management training for IMCI is most frequently conducted for first-level health workers based at health facilities (e.g., health posts, health centers, etc.). Training materials for first-level health workers are based on country-specific IMCI-adapted guidelines, which provide health workers with a clear protocol for assessment, classification, and treatment of common childhood illnesses and counseling about home care. The IMCI algorithm also provides guidance on actions if treatment fails or when a referral is needed.[lxv] Many countries are in the process of updating their current IMCI guidelines to incorporate additional measures for newborn care. These new protocols are referred to as integrated management of neonatal and childhood illness (IMNCI). Additional modifications have been made for HIV prevention, care, and treatment in countries where HIV prevalence is an issue (see WHO website for training packages and tools).

It is important to note that caregivers may take sick children to formal or informal private providers who may or may not be regulated or be part of government child survival programs. Formal providers are doctors, nurses, and pharmacists who operate private clinics. Informal providers include drug sellers, shopkeepers, and traditional healers. Numerous studies have demonstrated that health workers at the health facility and community levels, as well as other formal and informal types of providers, can be trained to assess, classify, treat, and refer children.[lxvi] It is important, therefore, to identify and understand where households are seeking care for pneumonia and diarrhea and ensure that formal, informal, public- and private-sector providers receive training, refresher training, and follow-up with supportive supervision to accurately assess, treat, and appropriately refer infants and children with illness.

iCCM Protocol for CHWs and Other Cadres

Inability to provide timely, high-quality treatment by health professionals (i.e., within the critical 24-hour period after the onset of symptoms) is a major reason many low-income countries, especially in sub-Saharan Africa, have persisting problems with reducing mortality in children under 5 years of age. One method for increasing timely access and coverage to address the high burden of pneumonia and diarrhea morbidity and mortality in marginalized areas is community-based case management, which provides health services through CHWs, especially for the most prevalent infectious diseases. Activities of CHWs may include home visitation, appropriate treatment, follow-up, referrals, and community-based sessions for the promotion of key family and community practices, growth promotion, and improved care-seeking practices.[lxvii]

Community-based programs involving CHWs have been proven to be effective in increasing health care access for high-burden populations and should be scaled up.[lxviii] One such program is iCCM; it equips and supports CHWs to treat children for diarrhea, pneumonia, and malaria (in malaria-affected countries) using ORS, zinc, and oral antibiotics—preferably, dispersible amoxicillin and artemisinin-based combination therapy (ACT)—preferably with concomitant use of rapid diagnostic tests for malaria. Easy-to-use dispersible pediatric formulations of medications must be used. In some countries, iCCM also provides an opportunity to assess children for acute malnutrition by

> "Programmatic experience shows that an integrated strategy can be effective in achieving high-treatment coverage and delivering high-quality care to sick children in the community."
>
> (WHO, UNICEF 2012 Joint Statement on iCCM)

measuring the circumference of their mid-upper arms. WHO and UNICEF issued the following joint statement[lxix] in support of iCCM:

> "Community health workers—appropriately trained, supervised and supported with an uninterrupted supply of medicines and equipment—can identify and correctly treat most children with diarrhea, pneumonia and malaria."

In a recent review by the Child Health Epidemiology Reference Group, Theodoratou and colleagues[lxx] estimated that community management of all cases of childhood pneumonia could result in a 70% reduction in mortality from pneumonia in children under 5 years of age. ORS in the home and community setting was estimated to prevent 70–90% of deaths resulting from acute watery diarrhea, and zinc treatment was estimated to decrease diarrhea-related mortality by 11.5%.[lxxi]

WHO and UNICEF's 2012 Joint Statement on iCCM describes the role of CHWs and their relationship to the nearest health facility in providing improved access to timely, appropriate treatment in underserved areas.[lxxii] The following are some recommended steps to promote prompt quality care from CHWs.

Where iCCM programs are implemented, the health system should support training, drug and commodity supply, and supportive supervision of CHWs.

- Make policy changes to:
  - Support the role of CHWs.
  - Authorize the use of antibiotics by trained CHWs.
  - Ensure that the Essential Medicines List includes pediatric formulations for ORS, zinc, and oral antibiotics, particularly dispersible amoxicillin.
- Provide resources to :
  - Provide training in case management, counseling, and referral (such as *Caring for the Sick Child in the Community* and *Community Case Management Essentials: Treating Common Childhood Illnesses in the Community. A Guide for Program Managers*). All case management training should include clinical practice and be followed by supportive supervision.
  - Encourage mentoring, supportive supervision, and data-driven systems for real-time feedback and problem-solving.
  - Strengthen drug supply systems and monitor the use of antibiotics.

Case Management for Pneumonia

The majority of childhood pneumonia in developing countries results from bacterial infections, mostly *Streptococcus pneumoniae* and *Haemophilus influenzae*. Bacterial pneumonia usually causes children to become severely ill, with high fever and rapid breathing. Viral infections, on the other hand, start gradually and worsen over time.[lxxiii] Counting the respiratory rate of infants and young children using a watch or another timing device[9] is the cornerstone of the iCCM protocol in classifying the infant or child as pneumonic. The

[9] Beeping timers can be used to measure respiratory rates. Watches with a second hand may be a decent alternative because CHWs can look at the child only while counting to the cut-off, rather than at both the watch and child while counting for one

respiratory rate has proven to be a relatively sensitive measure of pneumonia.[lxxiv, lxxv] Suspected pneumonia in all children under 5 years of age are defined as having cough and fast or difficult breathing.

If treatment is started promptly, most cases of pneumonia can be effectively and cheaply treated with oral antibiotics. The challenge is getting easy-to-use oral antibiotics, available in pediatric dosages, to all children who need them and then treating them effectively with the right drug, at the right time, while avoiding the use of antibiotics in children who do not need them. Failure to give a correct dose of antibiotics or complete a course of treatment in children with pneumonia will increase the risk of treatment failure and the development of antibiotic resistance; therefore, it is important for health workers to provide effective counseling about the use of antibiotics to caretakers. Counseling about when to return to the health worker, the importance of continued feeding and fluids, and recognition of danger signs are also important. Good health worker communication skills are essential for all effective case management interventions.

Early Care-Seeking—Pneumonia-associated deaths in older infants and children can occur within 2–4 days of the onset of lower respiratory symptoms. Delaying care seeking from an appropriate health provider increases the risk of the child's death. The most important signs of pneumonia in older infants and children are cough with difficult breathing and cough with fast breathing. When chest indrawing is understood and recognized locally, then caretakers also can be educated to promptly seek care for any infant or child with this sign of severe pneumonia.

Pneumonia and Malaria Overlap—The overlapping clinical presentation of pneumonia and malaria is also an important consideration in all areas where childhood infection with malaria is a problem. A proportion of children with fever will also meet a pneumonia case definition (cough or difficulty breathing and fast breathing or chest indrawing), and almost all children who meet a pneumonia case definition also have fever or a history of fever. Treatment of malaria alone may result in death from pneumonia; thus, all malaria protocols for children at the level of the community, drug retailer, and health facility should incorporate or address case management for pneumonia. Low-cost, rapid diagnostic tests for malaria can facilitate a quick diagnosis though further scale-up is needed to make these tests more widely available. Greater utilization of these diagnostic tests can improve the efficiency and effectiveness of care by targeting more expensive malaria treatment to children that only have malaria.

Vulnerable Children—Children who are undernourished, HIV positive, have had measles, live in crowded home environments, or have increased exposure to air pollutants are more vulnerable and experience progression to more severe pneumonia, especially when they have concomitant illnesses like diarrhea or malaria. These illnesses can weaken a child's immune system and respiratory muscles, making it more difficult to clear secretions from their respiratory tracts. Infants under 2 months of age with signs of pneumonia or sepsis are at risk of suffering severe illness and death more quickly than older children and should be immediately referred to a hospital or clinic for treatment.[lxxvi]

WHO Treatment Guidelines—WHO's pneumonia guidelines are for dispersible amoxicillin (recommended dose is 80 mg/kg for 5 days), the equivalent to injectable penicillin, for the treatment of fast-breathing pneumonia in cases with chest indrawing. In settings with low HIV prevalence, the duration of treatment for fast-breathing pneumonia can be reduced to 3 days. All children with fast breathing or lower

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minute; or the CHWs can count for one minute with the watch held close to the child's chest. Digital watches may be more difficult to use in measuring respiratory rates. Refer to UNICEF's UNIPAC catalog: http://www.supply.unicef.dk/catalogue/. (Search for 0845010 Timer, respiration for Acute Respiratory Infection.)

chest indrawing are now classified as having pneumonia; recommended treatment is oral, dispersible amoxicillin administered at home. Only children who have general danger signs (i.e., unable to drink or breastfeed, vomit everything, convulsions, lethargic, or unconscious) or who are HIV positive and have chest indrawing are classified as having severe pneumonia and are referred to a health facility. This approach simplifies the management of childhood pneumonia to facilitate treatment by CHWs in community settings.[lxxvii]

For severe pneumonia in children aged 2–59 months, WHO recommends inpatient treatment with the administration of parenteral ampicillin or penicillin (ampicillin 50 mg/kg; or benzyl penicillin at 50,000 units per kg, by intramuscular/intracoelomic injection every 6 hours for at least 5 days) and gentamicin (7.5 mg/kg, by intramuscular/intravenous, once a day for at least 5 days) as first-line treatment.

Oxygen Therapy for Hypoxemia—Hypoxemia (too little oxygen) is a symptom of severe pneumonia where the pulse oxygen saturation is < 90% (as measured by pulse oximetry), indicating the need for more oxygen. Medical oxygen is in limited supply in developing countries, even at referral sites. It is important to find the most cost-effective avenue for supporting the provision of oxygen therapy when it's indicated for pneumonia treatment.[lxxviii] It is also important to treat symptoms early so that pneumonia is prevented or controlled in early stages because options for referral care are often limited in resource-poor settings.[lxxix]

WHO's IMCI generic algorithm[lxxx] can be found in its IMCI Chart Booklet on page 2. This chart guides health personnel through an algorithm of main symptoms associated with pneumonia assessment, classification, and treatment for children aged 2 months to 5 years.

Case Management for Diarrheal Disease

iCCM treatment guidelines for diarrhea include determining the duration of the diarrheal episode and whether blood is present, assessing and classifying the severity of dehydration, and providing appropriate treatment and counseling or referral based on the type of diarrhea and severity of dehydration. The guidelines also address the management of other illnesses associated with diarrhea, such as measles.

Low-Osmolarity Oral Rehydration Salts and Zinc

ORS remains the most effective strategy for preventing dehydration and treating mild or moderate dehydration in young children with watery diarrhea.[lxxxi,lxxxii] Low-osmolarity ORS is the preferred treatment.[lxxxiii] A number of locally available fluids (grain-based soups and gruels, for example) also have been demonstrated to be effective for preventing and treating dehydration that results from watery diarrhea. Although some countries still promote the use of homemade oral rehydration therapy (ORT), pre-packed ORS is preferred because the correct preparation of fluids like homemade salt-sugar solution can be difficult to understand, leading to errors. As important as having ORS is, equally important is the counseling on how to give it and what the treatment is expected to do for the child.

ORS, and the low-osmolarity formula in particular, is a proven life-saving commodity for treating children with diarrhea.

New treatment compounds are now available in most countries: low-osmolarity ORS is more effective at replacing fluids than the previous ORS formulation; and treatment with zinc decreases the severity and duration of a diarrheal episode and prevents bouts of diarrhea in the 2–3 months that follow. The recommended dose is 20 mg of elemental zinc daily for 10–14 days for children older than 6 months, and 10 mg for 10–14 days for children under 6 months of age.[lxxxiv] Zinc can be administered as a sulfate, gluconate, or acetate, in either a liquid formulation

or a dispersible tablet. The *Lancet* 2013 nutrition series also recommends preventive zinc supplementation in children of 6–59 months of age.[lxxxv] Important additional components of the treatment package are continued feeding, including breastfeeding, during the diarrheal episode and use of appropriate fluids available in the home if ORS is not available.

Many cases of dehydration and diarrhea-associated morbidity and malnutrition can be prevented in the home by using ORS or fluids available at home and proper feeding (breastfeeding and continued feeding) during and after a diarrheal episode. Parents and caregivers must know the danger signs, particularly of dehydration, when professional care is needed to prevent death. Guidelines call for the administration of intravenous fluids for severely dehydrated cases or the referral of severely ill children to higher tier health facility.

Most cases of acute, watery diarrhea can be managed by administering ORS or other effective home fluids and continuing age-appropriate feeding. Antidiarrheal and antibiotic medicines are not effective for managing watery diarrhea and should be discouraged because they are potentially dangerous. Inappropriate use of antibiotics also contributes to antibiotic resistance. Only severely dehydrated children need intravenous therapy. Most severe dehydration is preventable by the early use of oral fluids. Death from acute, watery diarrhea occurs from severe dehydration that may develop rapidly. In a minority of cases involving dysentery or persistent diarrhea, ORT alone will not be sufficient, and additional case management interventions are required.

WHO recommends that all children with diarrhea be treated with zinc and low-osmolarity ORS as soon as possible. Zinc treatment, given for 10–14 days to a child with diarrhea, will reduce the duration and severity of the episode and lower the incidence of diarrhea recurring in the following 2–3 months.

Cholera

Cholera is an acute intestinal infection, caused by the bacterium *Vibrio cholerae*, which produces voluminous, painless, watery diarrhea that can quickly lead to severe dehydration and death without prompt treatment. Cholera is endemic in many developing countries and poses a serious public health threat. Epidemics occur regularly, especially in disaster and refugee settings. Individuals with low immunity, such as malnourished and HIV-positive children, are at greater risk of death if infected. For most cases, ORT alone is sufficient to reduce the otherwise high fatality rate; few cases are so severe that they require treatment with antibiotics. Increasing antibiotic resistance, especially to tetracycline, poses new challenges to treating these severe cases and reducing mortality due to cholera. Improvements in hygiene, water quality at the source and POU, and sanitation are highly effective in preventing and curbing cholera outbreaks, particularly in the wake of natural disasters and among displaced populations.[lxxxvi]

Up to 80% of cholera cases can be successfully treated with ORS.

(WHO, 2014, Cholera Fact Sheet)

Persistent Diarrhea

Infants and children with persistent diarrhea (diarrhea that lasts longer than 14 days) have an increased risk of malnutrition and death. The risk of death is higher if dehydration is present; persistent diarrhea is associated with up to 45% of all deaths due to diarrhea. Antibiotics are not an effective treatment strategy for this condition. The primary management strategy is nutritional, usually with a reduced lactose diet and supplemental micronutrients.

Effective nutritional counseling by health workers is a critical management strategy to relieve cases of persistent diarrhea.

WHO's Recommendations for the Management of Common Childhood Conditions[lxxxvii] includes feeding recommendations for children experiencing persistent diarrhea.

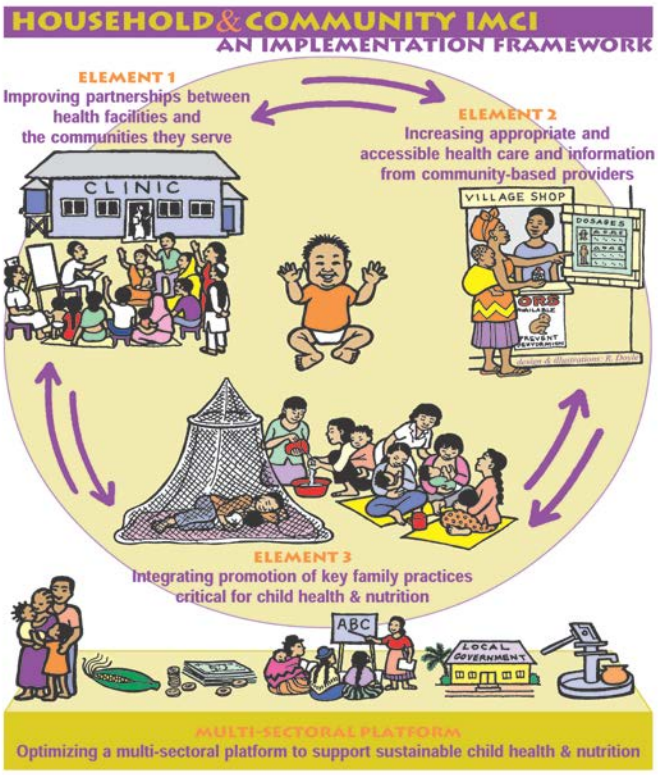
Dysentery (Bloody Diarrhea)

Approximately 10% of diarrheal stool samples from children under 5 years of age contain visible blood. Bloody diarrhea or dysentery represents about 20% of diarrhea-associated deaths in this age group. The *Shigella* species of bacteria are responsible for at least half of all episodes of dysentery, as well as the majority of fatal diarrhea cases. The case-fatality ratio from *Shigella* dysentery in Africa can be as high as 10%. Treatment with an effective antibiotic will reduce the duration of the illness and reduce the risk of serious complications and death. Complications are more frequent in children under 5 years of age, particularly if a child has a recent history of measles or is malnourished. iCCM emphasizes the use of an appropriate antibiotic, increased fluids, continued feeding, and follow-up in 2 days. The antibiotic is changed to a second-line antibiotic if no improvement is seen in 2 days. There is widespread resistance to cotrimoxazole, a common first-line antibiotic, and increasing resistance to nalidixic acid, a common second-line antibiotic. WHO now recommends discontinuing nalidixic acid, even in areas where it is still effective against *Shigella*.[lxxxviii] Based on its safety, efficacy, and reduced cost, ciprofloxacin (a fluoroquinolone) is now the recommended first-line antibiotic for shigellosis.

Improved Care-seeking Behavior, Referral, and Key Family Practices

Improving home case management by caretakers remains an important element in programs because access to health facilities or availability of trained staff is often limited. It is important to educate household members on the importance of early management of illness in children under 5 years of age, especially infants under 2 months of age, to avoid severe, life-threatening complications such as dehydration or hypoxemia. CHWs, in particular, can be effective change agents for improving desirable behaviors and discouraging undesirable ones, which makes these health care workers an integral part of any social marketing strategy. CHWs are well suited to promote treatment with ORS and zinc, exclusive breastfeeding, handwashing, sanitation, and hygiene.[lxxxix]

Figure 4. Implementation framework for community-based integrated management of childhood illness (IMCI)



Source: CORE Group, January 2009

At the household level, caretakers need to recognize symptoms and danger signs early, which include fast-breathing or difficulty breathing and if the child looks unwell, is not eating or drinking, shows lethargy or change in consciousness, vomits everything eaten, or has a high fever; caretakers should **then seek appropriate care**. Some communities may need to address harmful traditional practices. For example,

caretakers often delay seeking care, especially if visits to appropriate health providers are time-consuming or expensive. Communities can play a role in facilitating transport and credit payment schemes at the health facility or with CHWs.

A key element of case management of illness in young children is counseling and follow-up. Careful consideration needs to be given to how health workers and CHWs are trained to counsel effectively, and then counseling needs to be instituted in clinical and community settings. Information must be presented to mothers using appropriate local terms, and formative and qualitative research is important. Following are examples of key home care messages for the management of diarrhea:

The most important life-saving step for a child with symptoms of pneumonia is for caretakers to recognize the danger signs of pneumonia and bring the child to a health care provider for evaluation.

- Give ORS or home fluids.
- Continue age-appropriate feeding during and after the episode.
- Recognize danger signs that indicate a need to return immediately to the health facility, such as vomiting everything, lethargy, or a change in consciousness, not breastfeeding, not eating or drinking.
- Know when to return for follow-up.
- Continue giving zinc treatment once a day for the full 10–14 days.

An important message to deliver about home care is recognizing danger signs of illness. Some signs are non-specific and common to all children with severe illness.

Key Resources for Treatment

- A2Z USAID Micronutrient and Child Blindness Project.
- Center for Private Sector Health Initiatives. 2011. Point-of-Use water disinfection and zinc treatment project (POUZN).
- WHO, 2005. Diarrhoea Treatment Guidelines.
- UNICEF. 2012. Diarrhea.
- WHO. 2005. Pocket book of hospital care for children: Guidelines for the management of common illnesses with limited resources.
- WHO. 2005. The treatment of diarrhea: A manual for physicians and other senior health workers.

Key Resources for IMCI and iCCM

- WHO. 2014. IMCI chart booklet.
- WHO, UNICEF. 2005. Model IMCI handbook: Integrated management of childhood illness.
- WHO, UNICEF. 2011. A training course for community health workers: Caring for the sick child in the community; participant's manual. WHO website.
- WHO, UNICEF. 2012. WHO/UNICEF joint statement: Integrated community case management (iCCM).
- WHO, UNICEF. 2004. Joint statement: Management of pneumonia in community settings.
- WHO, UNICEF. 2006. Management of sick children by community health workers: Intervention models and program examples.
- CCM Central. CCM Central website.

Monitoring and Evaluation

Monitoring for continuous improvement should be at the cornerstone of all data monitoring processes at the community and district levels. Supportive supervision should include monitoring of data quality, joint analysis, and utilization of data to determine next steps or taking corrective action. Feedback and engagement with relevant stakeholders to share results and seek input should be part of the continuous learning process. When possible, a community-based health information system should be incorporated into the program to facilitate local ownership and empowerment for addressing gaps and opportunities related to the nutrition and health of children under 5 years of age and encouraging a continuous learning environment. Following is a list of GAPPD indicators to track.

Hib immunization coverage:	Percentage of children 12–23 months of age who received three doses of Hib vaccine
Measles immunization coverage:	Percentage of children 12–23 months of age who were immunized with measles-containing vaccine
DTP3 immunization coverage:	Percentage of children 12–23 months of age who received three doses of DTP3 vaccine
PCV immunization coverage:	Percentage of children 12–23 months of age who received three doses of PCV
Rotavirus immunization coverage:	Percentage of children 12–23 months of age who received a complete schedule of rotavirus vaccine
Exclusive breastfeeding for 6 months:	Percentage of infants 0–5 months of age who are exclusively breastfed
Continued breastfeeding at 1 year:	Proportion of children 12–15 months of age who are fed breast milk
Complementary feeding:	Percentage of children 6–23 months of age who received a minimum acceptable diet

Vitamin A supplementary coverage:	Percentage of children 6–59 months of age who received two annual doses
Care seeking for pneumonia:	Percentage of children 0–59 months of age with suspected pneumonia taken to an appropriate health provider
Antibiotic treatment for pneumonia:	Percentage of children 0–59 months of age with suspected pneumonia who received appropriate antibiotics
Antiretroviral prophylaxis among HIV-positive pregnant women to prevent vertical transmission of HIV:	Percentage of HIV-infected pregnant women who received antiretroviral drugs to reduce the risk of mother-to-child transmission
Handwashing with soap:	Percentage of households and health care facilities with soap, water, and a handwashing facility
Hygienic sanitation facility:	Percentage of households and health care facilities with a hygienic sanitation facility
Access to improved drinking water:	Percentage of households and health care facilities that report using an improved water source
Use of household water treatment and safe storage:	Percentage of households and health care facilities with an observed treatment method or product (plus water quality testing in a subset of households)
Household air pollution:	Percentage of households using clean fuels for cooking

Special Considerations

Climate Change

> "Climate-change-related alterations in rainfall, surface water availability and water quality could affect the burden of water-related diseases" (Confalonieri, p. 400).[xc]

One potential effect of climate change is an increase in diarrheal disease incidence, most likely occurring in the poorest countries with the weakest health systems.[xci] Increased rainfall can facilitate the transport and dissemination of infectious agents, and temperature affects their growth and survival.[xcii] Studies have shown increased pathogen transmission in rainy seasons.[xciii,xciv] Drainage management is particularly important in crowded communities where blocked drains can cause increased disease transmission.[xcv]

Humanitarian Emergencies

Humanitarian emergencies place children under 5 years of age at increased risk for pneumonia and diarrhea. Crowding, inadequate shelter, and poor access to water and sanitation are some of the risk factors associated with these environments.[xcvi] Often, children in emergency situations are undernourished as a result of shortages and disruptions in the food supply. Further exacerbating the situation is a cessation or collapse of primary health services. Efforts to increase capacity to protect, prevent, and treat pneumonia and diarrhea and prevent outbreaks in emergency settings need to be prioritized.[xcvii]

Urbanization

Millions of poor urban children live in conditions that facilitate the transmission of disease. Overcrowding, unhygienic housing structures and community environments, use of polluting household fuels, lack of access to health services, and low immunization coverage place these children at increased risk for diarrhea and pneumonia, as well exposure to vaccine-preventable outbreaks.[xcviii] Like children in humanitarian emergencies, poor urban children should be given special consideration for accessing prevention and treatment efforts to reduce the burden of pneumonia- and diarrhea-related morbidity and mortality.

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