Diarrhoeal diseases

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Key facts

To better understand public health terms included in this Disease Tool (e.g. What is a case definition? or What is an infectious agent?), consult our page on Key concepts on epidemiology.

Importance

Diarrhoeal diseases are the second leading cause of death in children under five years old. They are responsible for killing around 525,000 children every year globally (WHO data from 2017) and a leading cause of malnutrition in children under five years old. Diarrhoeal diseases are often a major concern in emergency situations, where WASH infrastructure may be damaged and access to health services impacted because they are transmitted through the faecal oral route.

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Case definition

A **case definition** is a set of uniform criteria used to define a disease for public health surveillance. It enables public health officials to classify and count cases consistently.

The following are standard case definitions to allow national health authorities to interpret data in an international context. However, during an outbreak case definitions may be adapted to the local context and the Red Cross Red Crescent should use those agreed/established by national health authorities. NB: Consider that during community-based surveillance, ***volunteers*** *should use broad (simplified) case definitions (referred to as community case definitions) to recognize most or all possible cases, provide relevant risk communication and appropriate actions and encourage them to seek care. Other actors such as* ***healthcare workers or investigators*** *studying the cause of a disease, on the other hand, can use more specific case definitions that may require laboratory confirmation.*

- Diarrhoea is defined as three or more loose or liquid stools per day (or more frequent passage than is normal for the individual).
- Frequent passing of formed stools is not diarrhoea, nor is the passing of loose, "pasty" stools by breastfed babies.

WHO case definition source of information here.

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Alert / epidemic threshold

An **alert threshold** is the pre-defined number of alerts that suggest the beginning of a possible disease outbreak and therefore warrant immediate notification.
Epidemic thresholds are the minimum number of cases indicating the beginning of a particular disease's outbreak.

Above the threshold based on historical data.

Risk factors

- Water contaminated with human faeces, for example from sewage, septic tanks and latrines, is a source of infection. Animal faeces also contain microorganisms that can cause diarrhoea.
- Poor personal hygiene and inadequate access to clean water and sanitation facilities.
- Food when prepared or stored in unhygienic conditions. Raw fruits and vegetables that are not appropriately washed. Seafood taken from contaminated water and eaten raw or not sufficiently cooked.
- Unsafe domestic water storage and handling.
- Household members and close neighbours of patients with diarrhoeal disease are often at increased risk in the days immediately following the person's illness if there are difficulties following necessary hygiene measures (e.g. if there is a lack of appropriate sanitation facilities or limited access to potable water).
- Typical at-risk areas include peri-urban slums where minimum requirements of clean water and sanitation are often not met.
- Humanitarian crises can increase the risk of diarrhoeal disease, through disruption of water and sanitation systems, or through the displacement of populations to inadequate and overcrowded camps.

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Attack rate (AR)

The **attack rate** is the risk of getting a disease during a specific time period (such as during an outbreak).

Attack rates will vary from one outbreak to another. In case of an outbreak, consult the latest information provided by health authorities.

The attack rate depends among others on the infectious agent, the settings and the demographic and socioeconomic aspects of the region concerned.

E.g. shigella : median range : 1–33 per cent.

Groups at increased risk of severe illness (most vulnerable)

- Malnutrition: malnourished children are more vulnerable to diarrhoea. Each diarrhoeal episode, in turn, makes their malnutrition even worse.
- Young children under five years old.
- Immunosuppressed persons such as those receiving chemotherapy, transplant recipients or HIV carriers.
- People with chronic diseases such as renal disease, cancer, chronic lung disease, and diabetes.
- Individuals without ready access to rehydration therapy and health services.

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Infectious agent

Infectious agents are bacteria, viruses, fungi, prions and parasites. A disease caused by an infectious agent or its toxic products is defined as an infectious disease.

> Diarrhoeal disease can be caused by virus (*Rotavirus, Adenovirus, Norovirus*), by bacteria (e.g. *Shigella, Cholera, Campylobacter, E. coli, Salmonella, Clostridium difficile*) and protists (*Cryptosporidium, Amoebiasis*).
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> *Rotavirus* and *Escherichia coli (E. coli),* are the two most common infectious agents of moderate-to-severe diarrhoea in low-income countries. Other pathogens such as *Cryptosporidium* and *Shigella* species may also be important. Location-specific causes and age specific pathogens also need to be considered.
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> For more information and user-friendly mapping of the data, please visit: Diarrheal diseases - Our World in Data.

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Reservoir / host

A **reservoir of infection** is a living organism or material in or on which an infectious agent lives and/or usually multiplies. Reservoirs include humans, animals and the environment.

A **susceptible host** is a person at risk of being infected. The level of susceptibility depends on age, sex, ethnicity and genetic factors, specific immunity also depends on other factors that affect an individual's ability to resist infection or to limit its ability to cause infection.

A **zoonotic disease** or **zoonosis** is an infectious disease that has jumped from a non-human animal to humans.

> For some infectious agents: only humans (e.g. the most important *rotaviruses*, *Shigella*, etc.).
>
> For other infectious agents: animals and humans (e.g. *E. coli*, *Cryptosporidium*).

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How disease is spread (modes of transmission)

Categorisation of **modes of transmission** varies from one agency to another. In addition, some infectious

agents can be transmitted by more than one mode. A list of modes of transmission can be found in the key concepts to serve as guidance to better understand the diseases included in this website.

> **Faecal oral transmission:** pathogens in faecal particles pass from one person to the mouth of another person through contaminated hands, surfaces, objects, utensils or water. Ingestion of contaminated food and water that have been handled by a person who is shedding the pathogen through the faeces, or sewage getting into the water used for drinking or washing food are both common transmission mode. Flies and other insects can mechanically transfer the organism to food, where the pathogens then multiply to achieve an infective dose.

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Incubation period

This time from when infection occurs to the onset of symptoms is called the **incubation period**. It is a range of days and it can be different for each disease.

> Depends on the agent. For example, less than 48 hours for *rotaviruses*, 3—8 days for *E. coli*, 2—10 days for *Cryptosporidia*, 1—3 weeks for *Shigella*.

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Period of infectiousness

Period of infectiousness is the time interval during which an infected person can transmit the infection to other susceptible persons.

> Depends on the infectious agents
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> - Adults excrete *E. coli* for approximately one week or less; in children it can be longer.
> - Persons infected with *Rotaviruses* shed large quantities of virus in their faeces beginning two days before the onset of diarrhoea and for up to ten days after the onset of symptoms. *Rotavirus* may be detected in the stool of immunodeficient persons more than 30 days after infection.

Clinical signs and symptoms

- Three or more loose or liquid stools over a period of 24 hours.
- Possible stomach pains, fever, nausea and vomiting.
- Severe diarrhoea can cause dehydration, sepsis and death.
- Liquid stools can be watery diarrhoea (lasts several hours or days), and includes cholera, bloody diarrhoea (also called dysentery) and chronic diarrhoea (lasts 14 days or longer).

Other diseases with similar clinical signs and symptoms

Diarrhoeal diseases include cholera, Shigella, Rotavirus, Adenovirus, Campylobacter, E. coli, Clostridium difficile, Salmonella, Cryptosporidium, Amoebiasis, among others.

Diagnosis

- Stool sample for faecal leukocytes test.
- Faecal lactoferrin assays.
- Stool culture *(E. coli, Campylobacter, Shigella, Salmonella, Yersinia*).
- Antigen testing (*Cryptosporidium, Giardia*).
- Toxin testing (C. difficile).

Vaccine or treatment

Please refer to the appropriate local or international guidelines for clinical management. All clinical management including the administration of any treatment or vaccine should be conducted by health professionals.

- Rehydration with Oral Rehydration Solution (ORS): ORS is a mixture of clean water, salt and sugar. It costs a few cents per treatment. ORS is absorbed in the small intestine and replaces the water and electrolytes lost in the faeces. In severe cases intravenous rehydration is necessary.
- Zinc supplementation for children.
- Nutrient-rich foods: the vicious circle of malnutrition and diarrhoea can be broken by continuing to give nutrient-rich foods – including breast milk – during an episode, and by giving a nutritious diet – including exclusive breastfeeding for the first six months of life – to children when they are well.
- If pathogen is bacterium intake of antibiotics.
- In severe dehydration cases hospitalization is required.
- Preventive vaccines are available against *Rotavirus*. Today, they are four oral rotavirus vaccines recommended for use by the World Health Organization (WHO).

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Immunity

There are two types of immunity:
- **Active immunity** results when exposure to an agent triggers the immune system to produce antibodies to that disease.
- **Passive immunity** is provided when a person is given antibodies to a disease rather than producing them through his or her own immune system.

Agent specific.

Randomized controlled trials have shown that both monovalent and pentavalent rotavirus vaccines are

80—90 per cent efficacious against severe rotavirus gastroenteritis (RVGE) in countries with very low, or low child and adult mortality. They are also 40—60 per cent efficacious in countries with high child mortality and high, or very high adult mortality. In most cases, vaccination in infancy provides protection against severe RVGE for at least two years.

Which interventions are most effective for prevention and control?

The following is a list of activities considered for Red Cross Red Crescent volunteers to take part in. It is not an exhaustive list of all prevention and control activities for the specific disease.

- Communicate risks about the disease or epidemic, not only to share information on prevention and mitigation measures, but also to encourage informed decision-making, positive behaviour change and maintenance of trust in the Red Cross Red Crescent response. This includes the identification of rumors, misinformation, and other communications challenges—frequent during health emergencies—to manage them appropriately. Volunteers should use the most context-appropriate communication techniques (ranging from social media to face-to-face interactions).
- Community education and engagement activities to encourage the adoption of protective behaviours:
  - Access to safe water:
    - For prevention: chlorination; filtration; solar disinfection; boiling.
    - When there are confirmed cholera cases: preparation of one per cent chlorine stock solution. Once prepared, the stock (or "mother") one per cent solution can be used to disinfect water.
      - Please follow the IFRC guidelines for *Household water treatment and safe storage in emergencies: A field manual for Red Cross/Red Crescent personnel and volunteers*, available at: https://watsanmissionassistant.org/water/
    - Water storage containers should be protected from contamination and kept clean.
    - If water is trucked, chlorination can be done in the water tanker itself. However, truck operators may refuse to allow chlorination within the metal tanker due to potential corrosion of the tanker. Therefore, when chlorination is not possible at the water source, once delivered water should be treated and stored in a clean container.
- Promote breastfeeding (stand-alone for six months and up to two years in addition to age-based food).
- Promote handwashing with soap at critical times (before breastfeeding, after changing napkins, before cooking, before eating, after using toilets). This includes not only communication and community mobilization activities to promote handwashing with soap practices, but also when possible, providing handwashing stations in public spaces (e.g. markets, schools).
  - Please refer to the *IFRC WASH guidelines for hygiene promotion in emergency operations*, available at: https://watsanmissionassistant.org/emergency-hygiene/
- Safe disposal of faeces (promote the use of improved sanitation facilities).
  - Latrines/toilets should be maintained clean. A handwashing device (with soap and water) must be present nearby the latrines.
  - Where latrines are not in place, faeces should be buried, always at a distance from any body of water.
- Promote food hygiene:
  - Consume properly cooked food.
  - Wash fruits and vegetables carefully. If possible, it is best that vegetables and fruits are peeled.
  - Plates and utensils must be kept clean and off the ground
  - Food must be always covered and protected from flies.
  - All food preparation surfaces must be cleaned.

- Distribution of essential non-food items (NFIs), including soap and water chlorination tablets (if context-appropriate).

Epidemic characteristics and RCRC indicators and targets

The first table below includes data that should be gathered from health authorities and relevant non-governmental actors to understand the progress and characteristics of the epidemic in the specific country and area of intervention. The second table includes a list of suggested indicators that can be used for monitoring and evaluating Red Cross Red Crescent activities; wording of indicators may be adapted to specific contexts. Target values for a specific indicator can vary widely from one context to another and therefore managers should define them based on the specific population, area of intervention and programmatic capacity. Exceptionally, some indicators in this website may include target values when these are globally agreed as a standard; e.g. 80 per cent of individuals who slept under an insecticide-treated net (ITN) the previous night—the normative World Health Organization benchmark for universal coverage with ITNs.

Red Cross Red Crescent activities
Number of volunteers trained on a specific topic (e.g., Epidemic Control for Volunteers (ECV); Community-based surveillance (CBS); WASH training; CBHFA training, etc.) ***Numerator*:** Number of volunteers trained Source of information: Training attendance sheets
Diarrhoeal cases of children under five years detected by volunteers who were encouraged to seek healthcare and who arrived at a health facility **in the target area** *(NB. This indicator requires the implementation of a system in collaboration with the health facility, whereby health workers specifically asked the patient how they heard about the service)* ***Numerator:*** Children under five years who had diarrhoea in a determined period preceding this survey (e.g. two weeks) for whom advice or treatment was sought from a health facility ***Denominator:*** Total number of children under five years with diarrhoea in the same period preceding the survey
Percentage of caretakers with children under five years of age that can correctly identify at least three critical times to wash their hands **in the target area** ***Numerator:*** Number of caretakers with children under five years that correctly identify at least three critical times to wash their hands ***Denominator:*** Total caretakers with children under five years
Percentage of caretakers with children under five years of age that can correctly identify at least three key signs of dehydration **in the target area** ***Numerator:*** Number of caretakers with children under five years that correctly identify at least three key signs of dehydration ***Denominator:*** Total caretakers with children under five years

See also:

- For Community Engagement and Accountability (CEA) indicators for activities accompanying ECV actions, please refer to: IFRC *CEA toolkit (Tool 7.1: Template CEA logframe, activities and indicators).* Available at: https://www.ifrc.org/document/cea-toolkit

Impact on other sectors

Sector	Link to the disease
WASH	Primary cause of diarrhoeal diseases includes insufficient access to safe water, insufficient sanitation and hygiene practices.
Food security	Food and water contaminated with human waste can transmit diarrhoeal diseases as well as sharing eating utensils that are contaminated. To avoid this, it is necessary to peel vegetables and fruits, when possible, cook fish and meat thoroughly or wash food with clean water and clean kitchen utensils.
Nutrition	Malnutrition increases the risk for severe diarrhoeal diseases. Diarrhoeal diseases are more likely to spread in places where malnutrition is common, e.g. displacement sites, areas affected by natural disasters, areas impacted by famine, etc.
Shelter and settlements	Functional latrines with appropriate faecal sludge management, handwashing facilities and good waste management are important to decrease transmission risk. Diarrhoeal disease outbreaks are of particular concern in population movement and crowded settings.
Gender and sex	Female children have higher mortality rates from diarrhoeal diseases at ages 1—5 years, despite similar or slightly higher incidence rates in males at those ages. A possible reason might be the greater male mobility going along with higher incidence rates and poorer healthcare for females in some countries.
Education	When schools do not have clean running water or basic toilets, these can add transmission risks in places where there are outbreaks ongoing. Children may then be at risk of getting the disease if attending classes, or at risk of losing on education if staying at home. Importantly, schools and other facilities dedicated to children and youth can offer an important space for them to engage, mobilize and raise awareness around health education issues. With support, trust and appropriate capacity-building, young people can be effective advocates for the adoption of preventive measures during an epidemic and are those best placed to mobilize their peers.

Sector	Link to the disease
Livelihoods	Illness leads to reduction in productivity as people may not be able to work due to disease. This can lead to a loss of income due to the reduction in work activity and to the diversion of resources to seek medical treatment. A systematic literature review from 2020 on the cost of illness for diarrhoea in children under five years of age found that the average cost of illness for diarrhoea was higher than or equal to the entire family's monthly income. Direct medical costs such as medical bills and drugs accounted for 79 per cent of the total direct costs. As a result, expenses related to diarrhoeal diseases can push families into poverty.

Resources:

- Bernadeta Dadonaite, Hannah Ritchie, Max Roser Our world in Data (2019) *Diarrheal diseases*. Available at: https://ourworldindata.org/diarrheal-diseases
- CDC (2019) Chapter 2: Preparing International Travelers. Travelers' health. Available at: https://wwwnc.cdc.gov/travel/yellowbook/2020/preparing-international-travelers/travelers-diarrhea#:~:text=Travelers%E2%80%99%20diarrhea%20%28TD%29%20is%20the%20most%20predictable%20travel-related,depending%20on%20the%20destination%20and%20season%20of%20travel
- Maramraj KK, Subbalakshmi G, Ali MS, Dikid T, Yadav R, Sodha SV, Jain SK, Singh SK. A community-wide acute diarrheal disease outbreak associated with drinking contaminated water from shallow bore-wells in a tribal village, India, 2017. BMC Public Health. 2020 Feb 14;20(1):231. doi: 10.1186/s12889-020-8263-2. PMID: 32059660; PMCID: PMC7023695.
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- Mayo-Wilson, E. Jean A Junior, Aamer Imdad, Sohni Dean, Xin Hui S Chan, Evelyn S Chan, Aneil Jaswal – Cochrane Library (2014)- *Zinc supplementation for preventing mortality, morbidity, and growth failure in children aged 6 months to 12 years of age*. Available at: https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD009384.pub2/full
- World Health Organization (2007) *Addressing sex and gender in epidemic-prone infectious diseases*. Available at: https://www.who.int/csr/resources/publications/SexGenderInfectDis.pdf
- World Health Organization (2017) *Diarrhoeal disease Fact sheets*. Available at: https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease