

POH 116 WATER, SANITATION AND HYGIENE IN PANDEMICS

Purpose

This topic will introduce learners to appropriate ways of improving water quality, sanitation and hygiene to prevent emerging pandemics threats. It will prepare water and sanitation sector practitioners and other stakeholders to apply One Health approach in improving water quality, sanitation and hygiene in order to reduce the spread of diseases fueled by poor sanitation and hygiene and lack of water or poor water quality.

Safe drinking-water, sanitation and hygiene are crucial to human health and well-being. **WASH** is the combined term for Water, Sanitation, and Hygiene. Adequate WASH is not only a prerequisite to health, but contributes to livelihoods, school attendance and dignity and helps to create resilient communities living in healthy environments.

Drinking unsafe water impairs health through illnesses such as diarrhoea, and untreated excreta contaminates groundwaters and surface waters used for drinking-water, irrigation, bathing and household purposes. Chemical contamination of water continues to pose a health burden both to humans, animals and to plants, whether natural in origin such as arsenic and fluoride, or anthropogenic such as nitrates.

Safe and sufficient WASH plays a key role in preventing numerous NTDs such as trachoma, soil-transmitted helminths and schistosomiasis. Diarrhoeal deaths were reduced by half during the Millennium Development Goal (MDG) period (1990–2015) due to improvements in WASH, where improved water and sanitation provision played a key role.

Objectives

This topic enables learning about:

1. WASH, Pandemics, and the One Health approach
2. The importance of WASH in preventing emerging pandemics
3. WASH principles for safe water, sanitation, and hygiene in disease control

4. The One Health approach in preparing and responding to WASH-related disease outbreaks in households, communities, and vulnerable populations
5. Gender roles and responsibility in preparing and responding to WASH-related disease outbreaks.

Expected learning outcomes

At the end of the topic, learners should be able to:

1. Understand the meanings of WASH, Pandemics, and the One Health approach
2. Explain the importance of WASH in preventing emerging pandemics
3. Apply WASH principles to safe water, sanitation, and hygiene to prepare and respond to pandemics
4. Utilize the One Health approach in preparing and responding to WASH-related disease outbreaks in households, communities, and vulnerable populations
5. Describe the importance of gender roles and responsibility in preparing and responding to WASH-related disease outbreaks.

Contents

- a) Water Sanitation and Hygiene and the One Health approach:** Definition of WASH, Role of the One Health approach in promoting safe water, sanitation and personal hygiene, community water hygiene and environment health; Role of One Health in ensuring food safety, nutrition, and hygiene, human health, animal health and environmental health, and prevention of poor WASH related diseases. Application of One Health in managing water resources and wastes
- b) Pandemics and the One Health approach:** Definition of Pandemics and related terms, what causes Pandemics, what are examples of pandemics and how are they controlled? One Health definition and concepts, what is the One Health approach, application of One Health in promoting water quantity, quality and accessibility and its use in preventing the spread of water sanitation related diseases.

Definitions and Concepts: water; water sources; water treatment; water quality and quantity in preparing and responding to pandemics; water supply, application of WASH in promoting water quantity, quality and accessibility, sanitation; the importance of sanitation in preventing the spread of water-borne diseases; hygiene and promotion; hygiene and gender; hygiene and households; the impact of efficient water hygiene in promoting community and environmental health; role of WASH in ensuring food safety, hygiene and prevention of poor WASH-related diseases. application of WASH principles; excreta management; vector control; solid waste management; WASH in pandemic preparedness; managing water resources and wastes, ways of managing the water chain and sanitation in an integrated manner.

Definitions

WASH is the combined term for Water, Sanitation, and Hygiene. In 2010, the United Nations General Assembly explicitly recognized water and sanitation as human rights making it essential for the full enjoyment of life and all human rights.

Safe drinking-water, sanitation and hygiene are crucial to human health and well-being. Safe WASH is not only a prerequisite to health, but contributes to livelihoods, school attendance and dignity and helps to create resilient communities living in healthy environments. Drinking unsafe water impairs health through illnesses such as diarrhoea, and untreated excreta contaminates groundwaters and surface waters used for drinking-water, irrigation, bathing and household purposes.

Poor sanitation and hygiene increase disease transmission from one person to another, from one animal to another and from animals to humans and vice versa (See Figure 1). Hand hygiene is critical for reducing transmission of communicable diseases, as demonstrated during the COVID-19 pandemic. For this reason, UNICEF has identified behaviour change and knowledge promotion as top strategies for increasing handwashing during similar crises, while acknowledging that millions of people worldwide lack the water necessary for handwashing. Water and sanitation for all during pandemics is therefore advocated (Hannah et al 2020).

Chemical contamination of water continues to pose a health burden, whether natural in origin such as arsenic and fluoride, or anthropogenic such as nitrate. Safe and sufficient WASH plays a key role in preventing numerous NTDs such as trachoma, soil-transmitted helminths and schistosomiasis. Diarrhoeal deaths as a result of inadequate WASH were reduced by half during the Millennium Development Goal (MDG) period (1990–2015), with the significant progress on water and sanitation provision playing a key role.

Evidence suggests that improving service levels towards safely managed drinking-water or sanitation such as regulated piped water or connections to sewers with wastewater treatment can dramatically improve health by reducing diarrhoeal disease deaths

A pandemic is an outbreak of infectious disease that occurs over a wide geographical area and that is of high incidence and prevalence. A pandemic generally affects a significant proportion of the world's population, usually over the course of several months.

Throughout history, there have been many deadly pandemics, but the Black Death and the influenza pandemic of 1918–19 rank among the most lethal. The Black Death, which ravaged Europe between 1347 and 1351 and likely was caused by plague, killed roughly 25 million people. The influenza pandemic of 1918–19, or “Spanish flu,” claimed an estimated 20–40 million lives. A COVID-19 outbreak that was declared a pandemic in 2020 also killed millions of people.

Causes and control of Pandemics

Pandemics can be caused by several factors. For example, in some cases, a new strain or subtype of virus that first emerged in animals jumps to humans and then becomes readily transmissible between humans. In other instances, an existing disease-causing agent mutates, increasing its infectiousness

Pandemics typically slow and come to an end on their own, though the process may be accelerated through effective preventive strategies, such as improved personal hygiene or the development of a vaccine. Some pandemics, however, occur in waves, such that decreased disease activity may be followed by another period of high disease prevalence, thereby prolonging the outbreak.

The concept of One Health has long been recognized nationally, regionally, and globally by many pioneers in public health and veterinary medicine since the 1800s. Several definitions of One Health exist. One Health has been defined by the One Health Commission as “the collaborative effort of multiple health science professions, together with their related disciplines and institutions – working locally, nationally, and globally – to attain optimal health for people, domestic animals, wildlife, plants, and the environment” (One Health Commission, 2016). WHO defines One Health as an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems (WHO, 2022). Historically, One Health has evolved over time (Gibbs and Gibbs, 2012; Gibbs, 2014) and continues to evolve.

Safely managed water, sanitation, and hygiene (WASH) services are an essential part of preventing and protecting human health during infectious disease outbreaks, including the COVID-19 pandemic. One of the most cost-effective strategies for increasing pandemic preparedness, especially in resource-constrained settings, is investing in core public health infrastructure, including water and sanitation systems. Good WASH and waste management practices, that are consistently applied, serve as barriers to human-to-human transmission of the COVID-19 virus in homes, communities, health care facilities, schools, and other public spaces.

Safely managed WASH services are also critical during the recovery phase of a disease outbreak to mitigate secondary impacts on community livelihoods and wellbeing. These secondary impacts—which could include disruptions to supply chains, inability to pay bills, or panic-buying—have negative impacts on the continuity and quality of water and sanitation services, the ability of affected households to access and pay for WASH services and products (for instance, soap, point of use water treatment or menstrual hygiene products) and the ability of schools, workplaces and other public spaces to maintain effective hygiene protocols when they re-open. If not managed, secondary impacts can increase the risk of further spreading water borne diseases, including potential disease outbreaks such as cholera, particularly where the disease is endemic.

According to a WHO/UNICEF technical brief on WASH and waste management for COVID-19:

- Frequent and proper hand hygiene is one of the most important measures that can be used to prevent infection with the COVID-19 virus. WASH services should enable more

frequent and regular hand hygiene by improving facilities and using proven behavior change techniques.

- WHO guidance on the safe management of drinking water and sanitation services applies to the COVID-19 outbreak. Measures that go above and beyond these recommendations are not needed.
- Many co-benefits will be realized by safely managing WASH services and applying good hygiene practices. Such efforts will prevent other infectious diseases, which cause millions of deaths each year.

Areas for WASH Intervention from a One Health perspective

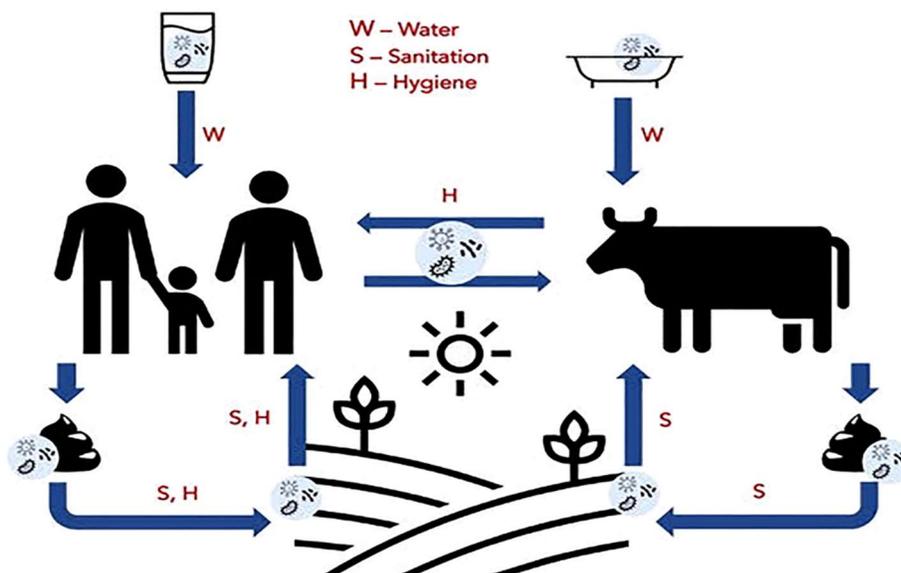


Figure 1 Areas of WASH intervention from a One Health perspective

WASH-RELATED DISEASES

The following are different categories of WASH Related diseases

Water-borne diseases: These are caused by ingestion of water, contaminated by human or animal faeces (excreta) containing pathogens.

Water-washed diseases: These are caused by inadequate use of water for domestic and personal hygiene. Often related to a lack of water.

Water-based diseases: These are infections/infestations that are caused by parasites usually found in aquatic organisms, for example schistosomiasis.

Water-related diseases: These are spread by insect vectors, breeding or living in or around water bodies. The main cause of malaria.

Methods of managing WASH related diseases are interlinked, however they require slightly different types of interventions that fall under the activities of the WASH.

Bradley classification system for WASH-related diseases examples and their interventions		
Category	Example	Intervention
Water-borne	Diarrhoeal disease, cholera, dysentery, typhoid, infectious hepatitis	Improve drinking water quality, prevent causal use of unprotected sources
Water-washed	Diarrhoeal disease, cholera, dysentery, trachoma, scabies, skin and eye infections, pneumonia	Increase water quantity Improve hygiene
Water-based	Schistosomiasis, guinea worm	Reduce need for contact with contaminated water, reduce surface water contamination
Water-related (insect vector)	Malaria, onchocerciasis, dengue fever, Gambian sleeping sickness	Improve surface water management, destroy insect breeding sites, use mosquito netting

Hygiene improvement framework

This comprehensive approach to addressing diarrhoea is designed to **encourage key household behaviours** including safe disposal of faeces, washing hands at the correct times and storing and using safe water for drinking and cooking.

As in most humanitarian interventions this demonstrates the need to have an **integrated approach involving multiple sectors**. It begins with understanding what is appropriate and will be used by the affected population. There is a component of installing the right infrastructure, working with key local actors such as communities and the local authorities to ensure the maintenance of that infrastructure, and communicating with the population to ensure that every

household has access and understands how to use the resources. There are two elements of WASH interventions that can be used during response to epidemics/pandemics:

- i. Provision of Infection Prevention Control (IPC) measures in health care facilities
- ii. Conducting WASH outreach/hygiene promotion campaign in the community

WASH related Environmental health interventions in epidemics include the following:

- i. Improving WASH infrastructure and services for water quantity and quality
- ii. Improving environmental sanitation including excreta disposal and vector control measures.
- iii. Provision of household water treatment and hygiene kits, and
- iv. Conducting relevant campaigns on improving personal hygiene practices (on behaviors and practices that are risks related to the outbreak).

WASH and Gender in epidemics

Women are the major stakeholders in WASH and also in epidemics and Pandemics in caring for the sick. Therefore, to ensure the success of health interventions for WASH, it is important to actively seek women's participation in water supply and sanitation programs, especially when selecting sites, and constructing and maintaining the facilities. Design of water and sanitation systems must consider the understanding of the community, including gender analysis, and security considerations. WASH programs must identify safety and security risks for women and girls that are relevant to water and sanitation systems to ensure the location, design, and maintenance programmes maximize safety and security of women and girls.

WASH and Disabilities in epidemics

Just like women in gender dimensions, disabled persons are major stakeholders in WASH and in epidemics/pandemics because of their restricted movement. To ensure the success of health interventions, it is important to meet the needs of older people and people with disability when designing and implementing WASH interventions. WASH programmes must have a clear understanding of the disabilities within the target population to include specific needs of people with disabilities in terms of access and use of WASH facilities and services.

Advocacy and support to policy development and capacity building of WASH professionals in recognizing and responding to the specific needs of people with disabilities. Effective WASH in school programmes should seek to remove barriers by promoting inclusive designs. Finally, WASH programmes should consult people with disabilities in developing/designing WASH interventions.

Water Supply - Access

Water supply in emergency situations during pandemics or epidemics are usually temporary in nature and in many situations water supply can be challenging. Humanitarian responders need to identify a source of water that can be used to provide the supply. They need to identify how much water each family needs to cover its basic drinking and domestic needs. Finally, they need to design appropriate ways to ensure that supply is provided in the most reliable manner possible. They need to work closely with the communities to ensure the solution proposed is acceptable and sustainable and to ensure that reliable drainage systems exist at all points of water use, re-using water where possible

Key Indicators used to assess water access an epidemics/pandemics

- Average volume of water used for drinking and domestic hygiene per household:
- Maximum number of people using water-based facility:
- Percentage of household income used to buy water for drinking and domestic hygiene:
- Percentage of targeted households who know where and when they will next get their water:

Methods to improve water access to community members during epidemics or pandemics

- Locating water points in areas that are accessible and safe for all, and especially women, children, older people, and people with disabilities.
- All users (incl. women, children, older people, and people with disabilities) should be fully informed of when and where water is available.
- Facilities should be central, accessible, and well-lit in order to contribute to the safety of users.
- Ensure that a minimum of 15 per cent of taps/water pumps are accessible and safe for people with physical, mobility-related and/or visual limitations.
- Make special arrangements at water points (e.g. separate queues) to avoid people with physical disabilities and older people having to stand and queue for long periods

Water supply – quality

- Faecal coliform bacteria indicate the level of human and animal waste contamination of water and the possibility of the presence of other harmful pathogens.
- If any faecal coliforms are present, then water must be treated to avoid spreading disease outbreak. Treatment can take place before distribution and/or at household level.
- Water can be tested for the presence of coliform forming units/ 100ml.

- If there is presence of free residual chlorine in the water, it suggests that the water has been treated and is therefore safe to drink.

Treatment Methods at Household Level

Water treatment and Safe Water Storage methods include:

- i. Boiling.
- ii. Chlorination.
- iii. Solar disinfection.
- iv. Ceramic filtration.
- v. Sand filtration.
- vi. Membrane filtration

Some considerations around Household-Level Water treatments:

- i. It is important to ensure that equipment and training is provided to community workers and the community themselves.
- ii. Ensure regular follow-up, support and monitoring to ensure these treatment methods are being implemented appropriately.
- iii. It is important to select appropriate household treatment based on water quality, local availability, and longevity.

Excreta Management - Access to and use of toilets

- Excreta disposal and management is one of the most important interventions during epidemics/pandemics
- If not done properly, it can potentially cause a disease outbreak.

Environment free from human excreta

- All excreta is safely contained onsite to avoid contamination of the natural, living, learning, working and communal environments
- There are no human faeces present in the environment in which people live, learn and work.
- All excreta containment facilities are sited appropriately and are an adequate distance from any surface or groundwater source.

Access to and use of toilets

- People have adequate, appropriate and acceptable toilets to allow rapid, safe and secure access at all times.

- Ratio of shared toilets should be a minimum of one per 20 people
- Distance between dwelling and shared toilet should be a maximum 50 metres
- Percentage of toilets that have internal locks and adequate lighting.

A toilet is defined as any facility or device that immediately and initially contains excreta and creates the first barrier between people and their waste. The following are toilet types and their functions:

Toilet Type	Detailed functions of the toilet
Plastic Bag	Prevents open defecation but still holds significant health risks. often used as short-term solution at onset of an epidemics due to portability and quick set-up.
Bucket	Prevents open defecation but still holds significant health risks. often used as short-term solution at onset of an epidemics due to portability and quick set-up.
Pit toilet	Hole in the ground, with concrete slab over the top and simple super structure. Does not use water. Only suitable where water table is low.
Ventilated improved pit (VIP) toilet	Improvements made to pit toilet which include ventilation pipe with wire mesh to prevent flies from entering the toilet.
Pour flush toilet	Improved pit toilet which uses water for flushing. Water seal to prevent odour and flies. Connected to twin pit or treatment units such as septic tanks or conventional sewer system.
Elevated toilet	Pit is elevated above ground. (Pour-flush and pit latrines can be elevated).

All the work done regarding the design and construction of water supply and excreta management will be for nothing if the people using them do not manage them in a way that will ensure the barriers to infection are upheld.

- i. Target a small number of risk reduction practices.

- ii. Target specific audiences.
- iii. Identify the motives for changed behaviour.
- iv. Use positive hygiene messages.
- v. Identify the best way to communicate.
- vi. Use a cost-effective mix of communication channels.
- vii. Carefully plan, execute, monitor and evaluate.

Hygiene promotion implementation

- i. People are aware of key public health risks related to water, sanitation and hygiene, and can adopt individual, household and community measures to reduce them.
- ii. Appropriate items to support hygiene, health, dignity and well-being are available and used by the affected people.
- iii. Women and girls of menstruating age, and males and females with incontinence, have access to hygiene products and WASH facilities that support their dignity and wellbeing.

Mode of delivery

Interactive lectures, problem-based learning using interactive tutorials, small group discussions, written assignments, plenary presentations, and case studies; *experiential learning* through independent study and field visits, field works and placements, and online peer discussions using video clips and conferencing. For experiential learning learners will visit water treatment plants, water bodies, abattoirs, livestock farms and sanitation facilities in schools, hospitals and other public places to learn about WASH and how those sites prepare and respond to pandemics.

Instructional materials

Materials: Lecture notes and slides, video clips, Handouts, case studies, Reference materials (Textbooks, journals, policy document guidelines), institutional placements and field visits

Equipment: LCD projectors, laptops, whiteboard, Markers and flipcharts, Printers, internet access for e-resources, mobile phones.

Core reference materials

Bartram, J. Cairncross, S. “Hygiene, sanitation, and water: forgotten foundations of health.” PLoS Med, vol. 7, 2010, e1000367.

Blanchet, K. et al. An Evidence Review of Research on Health Interventions in Humanitarian Crises. LSHTM, Harvard School of Public Health, 2013. www.elrha.org

Campbell, O.M. Benova, L. et al. “Getting the basic rights: the role of water, sanitation and hygiene in maternal and reproductive health: a conceptual framework.” Trop Med Int Health, vol. 20, 2015, pp. 252-67.

Fewtrell, L. Kaufmann, et al. “Water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries: a systematic review and meta-analysis.” Lancet Infectious Diseases, vol. 5, 2005, pp. 42-52. www.thelancet.com

Hannah, D.M., Lynch, I., Mao, F. *et al.* Water and sanitation for all in a pandemic. *Nat Sustain* **3**, 773–775 (2020). <https://doi.org/10.1038/s41893-020-0593-7>

<https://www.spherestandards.org/handbook>. Sphere Association. The Sphere Handbook: Humanitarian Charter and Minimum Standards in Humanitarian Response, fourth edition, Geneva, Switzerland, 2018.

Recommended reference materials

Branz, A. Levine, M. Lehmann, L. Bastable, A. Imran Ali, S. Kadir, K. Yates, T. Bloom, D. Lantagne, D. “Chlorination of drinking water in emergencies: a review of knowledge to develop recommendations for implementation and research needed.” Waterlines, vol. 36, no. 1, 2017. <https://www.developmentbookshelf.com>

<chrome-extension://mhjfbmdgcfjbbpaeojofohoefgihjai/index.html>

Curtis, V. Cairncross, S. “Effect of washing hands with soap on diarrhoea risk in the community: a systematic review.” Lancet Infect Dis, vol. 3, 2003, pp. 275-81.

Gibbs, E.P.J. and Gibbs, P.J. (2012) “The historical, present, and future role of Veterinarians in One Health,” US Fish & Wildlife Publications Paper 441

Gibbs, EPJ. (2014) “The evolution of One Health: a decade of progress and challenges for the future”, Veterinary Record, 174:85-91 doi:10.1136/vr.g143

Global progress report on water, sanitation and hygiene in health care facilities. Fundamentals first. Geneva: World Health Organization, United Nations Children's Fund; 2020 (<https://www.who.int/publications/i/item/9789240017542>).

Guidelines for Safe Disposal of Unwanted Pharmaceuticals in and after Emergencies. WHO, 1999. www.who.int.

Guidelines on Core Components of Infection Prevention and Control Programmes at the National and Acute Health Care Facility Level. WHO, 2016. www.who.int

[http://refhub.elsevier.com/S2352-7714\(21\)00079-3/rf0050](http://refhub.elsevier.com/S2352-7714(21)00079-3/rf0050)

<https://assetify-dai.com/resource-library/pandr-multisectoral-coordination.pdf>

[https://doi.org/10.1016/S2542-5196\(19\)30129-9](https://doi.org/10.1016/S2542-5196(19)30129-9)

<https://doi.org/10.1093/femsle/fny085>

https://gh.bmj.com/content/6/5/e005030?utm_source=trendmd&utm_medium=trendmd&utm_campaign=institutional&utm_content=BMJUK_TMD_CM_2022&utm_term=bmjgh

<https://iwaponline.com/washdev/article/12/3/286/87070/A-One-Health-evaluation-of-water-sanitation-and-hygiene-for-development>

<https://www.who.int/news-room/fact-sheets/detail/sanitation>

[Journal of Water, Sanitation and Hygiene for Development \(2022\) 12 \(3\): 286–301.-](https://doi.org/10.2166/washdev.2022.204)

<https://doi.org/10.2166/washdev.2022.204>

One Health Commission (2016) “One Health Commission: What is One Health?”

https://www.onehealthcommission.org/en/why_one_health/what_is_one_health/

Watson, J.A. Ensink, J.H. Ramos, M. Benelli, P. Holdsworth, E. Dreibelbis, R. Cumming, O.

“Does targeting children with hygiene promotion messages work? The effect of handwashing promotion targeted at children, on diarrhoea, soil-transmitted helminth infections and behaviour change, in low- and middle-income countries.” *Trop Med Int Health*, 2017

WHO (2022). One Health Joint Plan of Action launched and presented by WHO and the Quadripartite partners. <https://www.who.int/news/item/23-12-2022-one-health-joint-plan-of-action-launched-and-presented-by-who-and-the-quadripartite-partners>