

## Chapter 6

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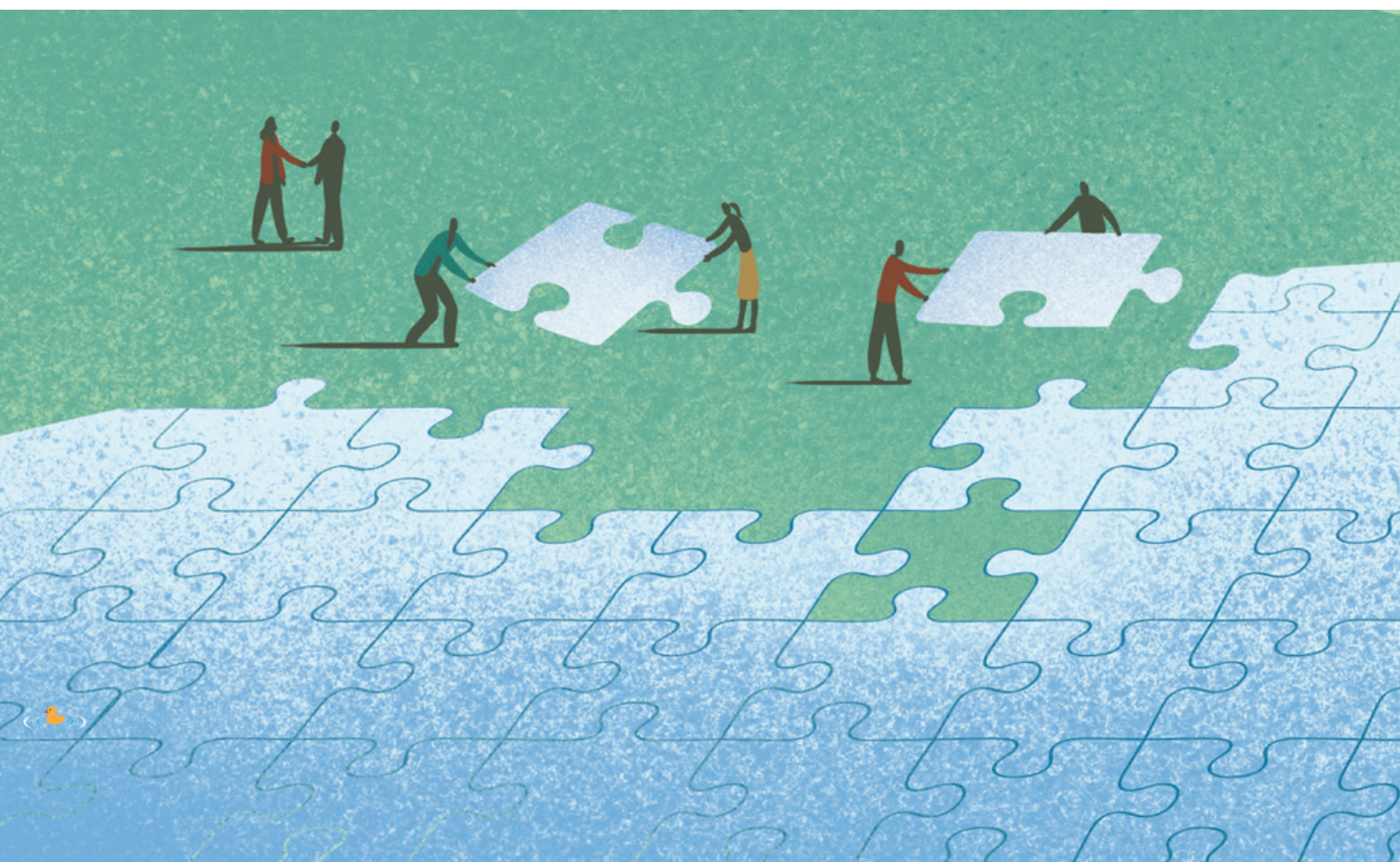
# Health

### WHO

Kate Medicott, Betsy Engebretson, Bruce Gordon, Maggie Montgomery,  
Joanna Esteves-Mills, Jennifer De France, Rick Johnston and Sophie Boisson

### With contributions from:

Xavier Leflaive, Marijn Korndewal and Helen Laubenstein (OECD),  
Sanae Okamoto (UNU-MERIT), and Nidhi Nagabhatla (UNU-CRIS)



## 6.1 WASH and health linkages

Water, sanitation and hygiene (WASH) is crucial for human health and well-being. Global data show that on average, progress needs to be four times faster to meet the promise on safely managed WASH for all by 2030 (WHO/UNICEF, 2020a; 2021a; WHO/UNICEF/World Bank, 2022). WASH and health partnerships are needed to accelerate progress on WASH, and in turn accelerate progress on WASH-related health goals. While there is interdependence between the WASH and health sectors, there are also gaps in coordination and governance stemming from the fact that these sectors are led by different ministries, local authorities, international organizations, non-governmental organizations (NGOs) and private sector actors at all levels. Both areas comprise different disciplines, practitioners, funding streams and institutional arrangements. Therefore, partnerships between WASH and health stakeholders, particularly those that work at the key intersection points as elaborated below, are necessary to optimize and accelerate positive health outcomes, especially among the most vulnerable. As shown in Table 6.1, in 2019, 1.4 million deaths and 74 million disability-adjusted life years (DALYs) were attributable to inadequate WASH globally.

Historically, many health programmes have focused on curative strategies for disease control, such as medication and surgery. However, sustained and cost-effective disease control has proved difficult or impossible without addressing the root causes of disease transmission by preventing, rather than treating, diseases through better WASH services. Partnerships among WASH actors for health outcomes, and between WASH and health programmes, have proven to be an important tool to drive and hold WASH-related diseases down.

**Table 6.1** WASH-attributable disease burden by health outcome, 2019

Health outcome	PAF (95% CI)	Deaths (95% CI)	DALYs (in 1000s) (95% CI)
Diarrhoea	69% (65–72%)	1 035 170 (929 178–1 159 750)	54 590 (50 033–59 562)
Acute respiratory infections	14% (13–17%)	355 533 (319 625–404 826)	16 578 (14 257–19 481)
Undernutrition	10% (9–10%)	7 853 (7 171–8 656)	825 (755–905)
Soil-transmitted helminthiasis*	100%**	2 149 (1 897–2 602)	1 942 (1 862–2 028)
Trachoma	100%**	--	194 (175–219)

Note: PAF (population attributable fraction); CI (confidence interval); DALYs (Disability-Adjusted Life Years).

\* *Ascaris lumbricoides*, *Trichuris trichiura*, hookworms, \*\* Assumes 100% of soil-transmitted helminthiasis and trachoma are linked to inadequate WASH.

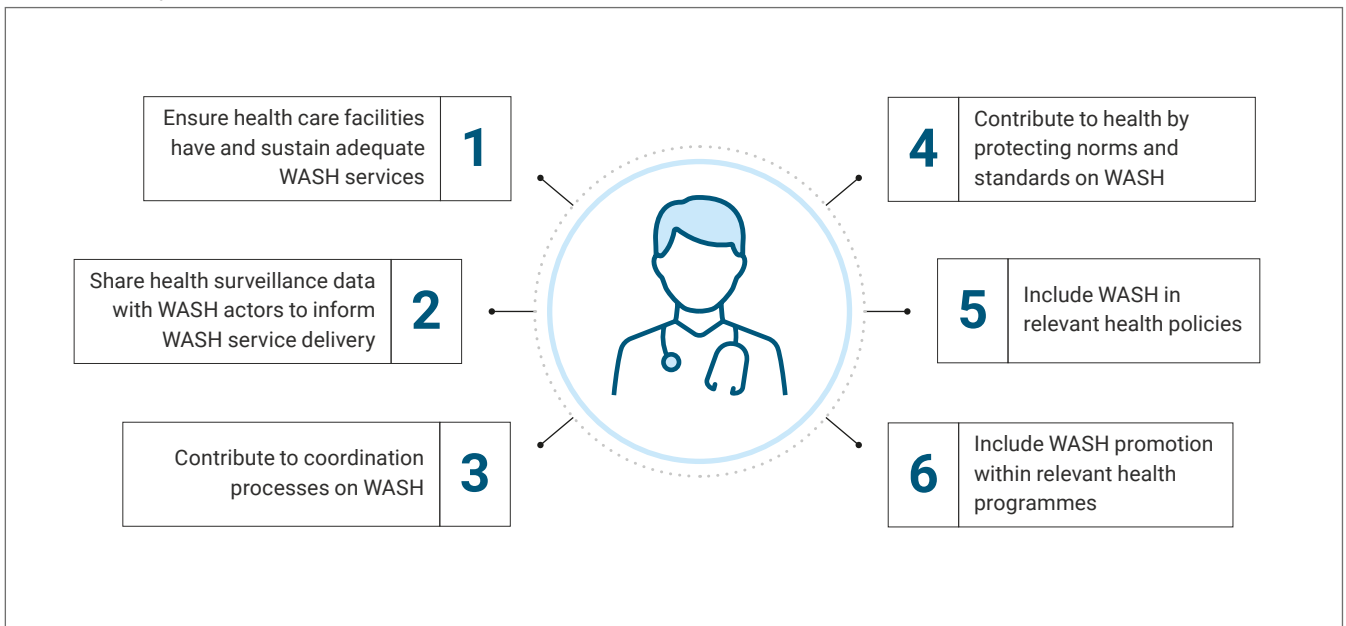
Source: WHO (n.d.).

For WASH–health partnerships to be successful, they need alignment at the scientific and strategic level, and efficiencies at the operational level to allow for focus and meaningful collaboration. Figure 6.1 outlines core functions of the health section in WASH.

Similarly, health sector stakeholders concerned with issues in Figure 6.2 have reasons to engage and partner with WASH.

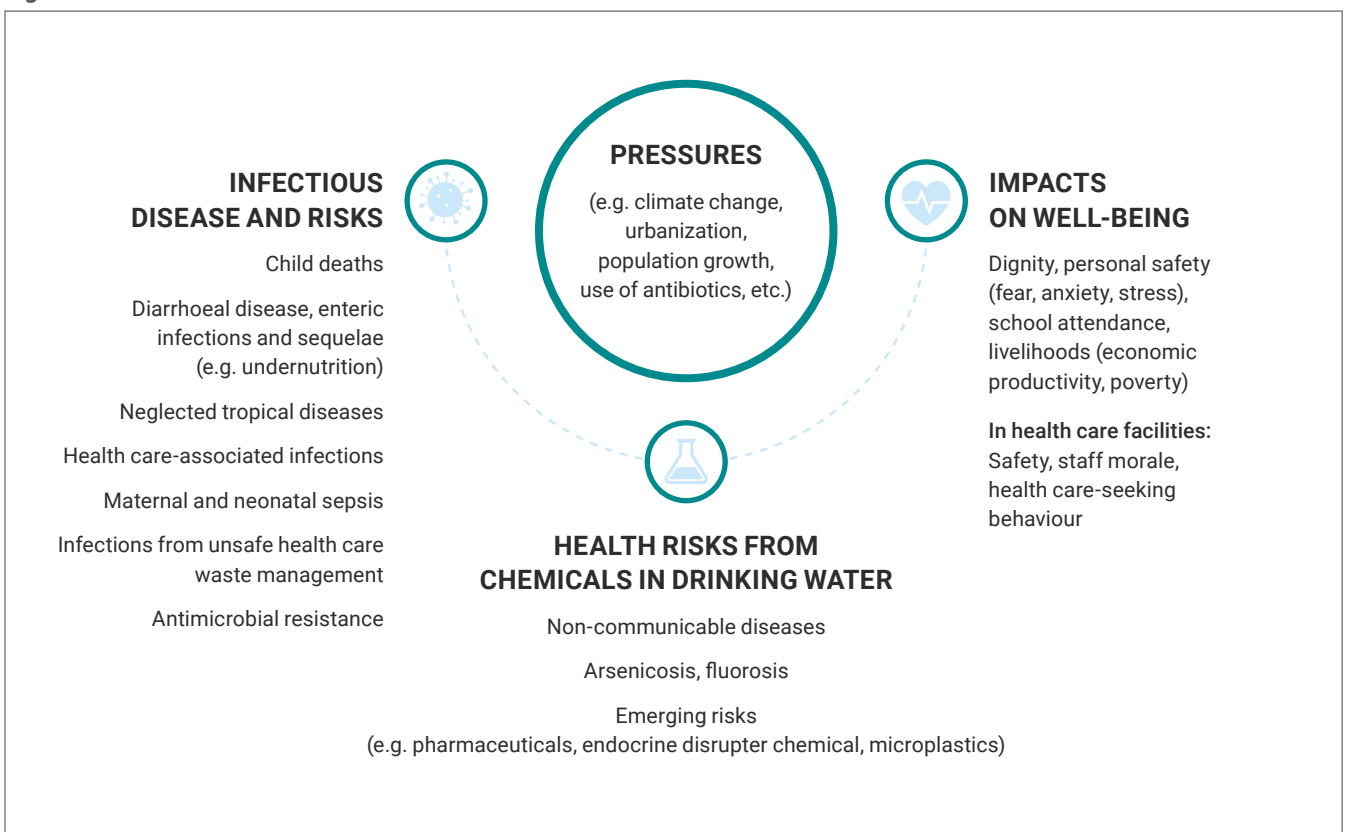
The definition of health extends beyond the absence of disease to also encompass human well-being, which WASH impacts as well. As shown in Figure 6.3, WASH affects antimicrobial resistance (AMR), safety and mental health, food safety and decent work. Working with the health sector is key for achieving the Sustainable Development Goal (SDG) 3 on health. New health risks are emerging from exposure to contaminants of emerging concern (CECs) in water, such as pharmaceuticals, industrial and household chemicals, personal care products, pesticides and manufactured nanomaterials.

**Figure 6.1** Key health sector's functions in WASH



Source: WHO (2019, fig. 2, p. 22).

**Figure 6.2** WASH-related diseases and risks



Source: WHO (2019, fig. 1, p. 2).

**Figure 6.3** Partnerships are key to acceleration on WASH (SDG 6) and progress on many health challenges (SDG 3)

## ACCELERATION

### CHILD SURVIVAL

More children survive and grow up to be healthy adults.

### CHOLERA

Elimination of cholera in 20 countries with recurrent outbreaks and no more uncontrolled outbreaks in fragile settings.

### INTESTINAL WORMS

Achievement of global targets for control of neglected tropical diseases stands a greater chance of being met. Infections are less likely to rebound if drug administration is scaled back.

### HEALTH SERVICES

Less stress on health systems.

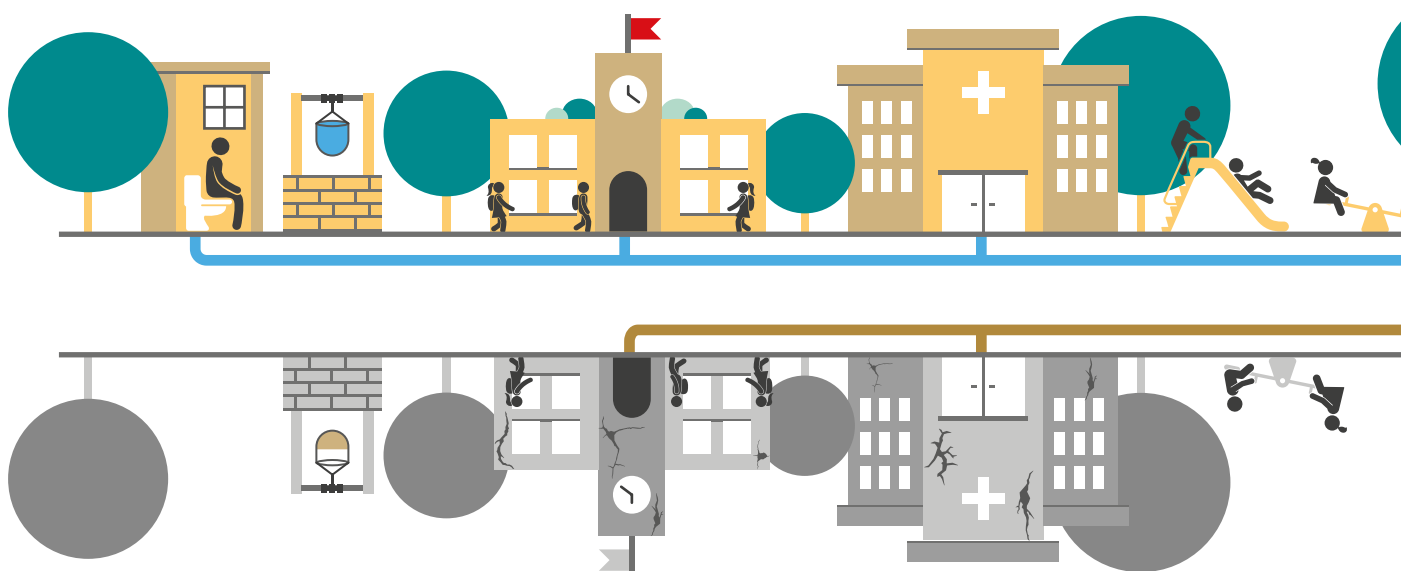
Higher utilization of health services, particularly among women, due to better facilities. Fewer health care-acquired infections.

### POLIO

Polio could become the second human disease in history to be eradicated, freeing humanity from a debilitating virus.

### NUTRITION

Children can realize the full benefits of investment in better nutrition, are less stunted, and learn and achieve more at school.



### CHILD SURVIVAL

Every year 273,000 children will die from preventable diarrhoeal diseases (WHO, n.d.).

### CHOLERA

Outbreaks will continue in hotspots with poor water supply and sanitation. Precious funds will be spent on outbreak response that could be more sustainably spent on safe water and sanitation to fix the underlying cause.

### INTESTINAL WORMS

Regular drug administration will keep infections at bay, but people will continue to be reinfected where open defecation and use of untreated wastewater for irrigation are practiced.

### HEALTH SERVICES

Health services in communities with poor WASH will be burdened with treating preventable infections. Where health centres lack water supply and sanitation and basic hygiene, women will choose not to give birth there and there will be more infections among patients.

### POLIO

The goal of global eradication may remain just out of reach due to re-emergence in areas with poor sanitation.

### NUTRITION

Repeated diarrhoea, caused by unsafe WASH, resulting in poor gut function, will prevent people, especially children, from absorbing the nutrients in food needed to grow and thrive.

## BUSINESS AS USUAL

Source: Adapted from WHO/UNICEF (2020a, pp. 22–23).

### ANTIMICROBIAL RESISTANCE (AMR)

Less antimicrobial use for preventable infections, extending the useful life of the last line of defence antimicrobials. Fewer untreatable WASH-related infections such as drug-resistant typhoid.

### SAFETY AND MENTAL HEALTH

Human dignity and safety will be increased and stress levels reduced, contributing to greater social and economic opportunity and a more equal world.

### FOOD SAFETY

Safe use of wastewater and sludge in agriculture, horticulture and aquaculture can support nutrition and the circular economy and also reduce use of chemical fertilizers and recover some of the cost of sanitation services.

### ENVIRONMENTAL JUSTICE

Communities – particularly those with lower incomes – have a cleaner water environment and healthier neighbourhoods.

### CLIMATE CHANGE

Resilient water and sanitation services protect investments in essential WASH services and ensure systems are better prepared to cope with future shocks.

### DECENT WORK

Millions of new formalized jobs are created that will sustain sanitation services, contribute to the green economy and protect public health.

### RECREATION

Improved WASH services will lead to more opportunities for healthy recreational exercise and well-being, fewer gastrointestinal illnesses, and a cleaner environment with better tourism and greater economic potential.



### ANTIMICROBIAL RESISTANCE (AMR)

Hundreds of millions of doses of antimicrobials will be used each year for infections that could have been prevented with better WASH. Wastewater laden with resistant bacteria will continue to spread AMR.

### SAFETY AND MENTAL HEALTH

Without safe water and sanitation at home, schools and workplaces, people (especially women and girls) will continue to suffer of anxiety, shame and fear while collecting water or trying to find a safe place to urinate, defecate and manage menstrual hygiene.

### RECREATION

Beaches polluted with wastewater will continue to deter or sicken swimmers and damage economies in places that rely on clean water bodies for tourism and sports events.

### FOOD SAFETY

Increasing water scarcity and urbanization will increase demand from peri-urban farms for water and nutrients. Unsafe use of wastewater and sludge will cause outbreaks and an increase in chronic foodborne diseases.

### ENVIRONMENTAL JUSTICE

Poor and marginalized groups, particularly in low-lying areas, will continue to be disproportionately affected by other people's unmanaged faecal sludge and sewage in their water supplies and communities.

### CLIMATE CHANGE

Sanitation systems will become more vulnerable to flooding from storms and sea level rise or may have less water for flushing and conveying sewage. Climate change is also impacting the quantity and quality of source water for drinking water supplies, while extreme events can lead to infrastructure and service disruptions. Even small losses will affect the health of whole communities.

### DECENT WORK

Sanitation workers, especially in the informal sector, will continue to suffer indignity and disease and even death though poor working conditions.



## 6.2 Priority WASH and health partnerships

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*For WASH–health partnerships to be successful, they need alignment at the scientific and strategic level, and efficiencies at the operational level to allow for focus and meaningful collaboration*

Partnerships addressing WASH and health can be found among actors within the WASH sector, as well as among actors working in other sectors. This section highlights some priority WASH partnerships with health actors, focusing on the nature of the partnership and some of the main guiding strategies and tools, complemented with examples of challenges and successes of the partnerships in accelerating change and driving down diseases. All examples given cover major partnerships with collaboration at global, regional and local scales among international organizations, governments, NGOs, private sector actors and citizens, all with strong local leadership.

### 6.2.1 WASH in health care facilities

Fully functioning WASH services in health care facilities (encompassing facilities of all sizes, such as hospitals, in- and out-patient health centres, and clinics) are critical to delivery of safe quality care and for effectively responding to outbreaks and pandemics, including COVID-19. Such services are also essential for creating an environment that supports dignity, equity and human rights, especially for mothers, newborns, children and care providers. Shockingly, major gaps in basic WASH still exist, with 1.8 billion people using health care facilities that lack basic water services and 780 million using facilities with no toilets globally in 2021 (WHO/UNICEF, 2022). The COVID-19 pandemic has exposed gaps in these basic services but also drew attention to the need for greater support for WASH in all settings. A recent price-tag analysis led by the World Health Organization (WHO) also found that costs required to ensure universal access to WASH in health care facilities in least developed countries is modest (US\$6.5–9.6 billion over 10 years) compared to existing government health and WASH spending (Chaitkin et al., 2022).

The provision of WASH in health care facilities is a health sector responsibility. However, until recently it was neglected due to health actors either not accepting the role, not knowing how to develop and maintain WASH services, or being overwhelmed with curative tasks. Partnership with WASH was needed to accelerate and guide progress.

WHO and the United Nations Children’s Fund (UNICEF) lead global efforts with global national and local health and WASH partners on WASH and health care facilities, and are working to improve the situation through three main pillars of work: (i) Global leadership, advocacy and knowledge exchange;<sup>24</sup> (ii) Technical support, tools<sup>25</sup> and country capacity-building; and (iii) Monitoring and accountability of country actions<sup>26</sup> in line with commitments made in the 2019 World Health Assembly Resolution on WASH in health care facilities. In addition, the WHO/UNICEF Joint Monitoring Programme (JMP) provides robust data on WASH services in health care facilities<sup>27</sup> through their data portal and regular reports.

In 2022, a particular focus was given to supporting national WASH and health system actors to unlock key bottlenecks particularly relating to budgets and financing. Focus was also given to further integrate WASH into health systems and quality of care efforts through the Global WASH in Health Care Facility Taskforce and an updated Water and Sanitation for Health Facility Improvement Tool (WASH FIT) package.<sup>28</sup> Over 40 countries are already using WASH FIT and the new, state-of-the-art package will support existing and new facility improvement efforts to address climate resilience, environmental sustainability, gender and equity as part of incremental, risk-based WASH and waste improvements.

<sup>24</sup> For more information, please see: [www.washinhcf.org/](http://www.washinhcf.org/).

<sup>25</sup> For more information, please see: <https://washinhcf.org/wash-fit/>.

<sup>26</sup> For more information, please see: <https://washinhcf.org/country-progress-tracker/>.

<sup>27</sup> For more information, please see: <https://washdata.org/data/healthcare#!/>.

<sup>28</sup> For more information, please see: <https://washinhcf.org/wash-fit/>.

While there has been success in conducting situational analyses, updating standards and setting baselines, with more than 60% of countries reporting progress on these actions, development and implementation of costed country roadmaps and integration of WASH into health systems monitoring and budgeting is still far from optimal (less than 30% of countries) (WHO/UNICEF, 2020b; 2022). Countries like Ghana, Indonesia and the Philippines provide important examples of how developing and implementing national roadmaps, rolling out WASH FIT nationally, and integrating and regularly monitoring WASH in health care facilities as part of wider universal health coverage efforts can be done (WHO/UNICEF, 2020b). Further examples and continued advocacy and leadership at every level are needed to support more widespread and sustainable uptake of this work by the health sector.

### 6.2.2 Neglected tropical diseases

WASH is critical in the prevention and management of many neglected tropical diseases (NTDs) scheduled for intensified control, elimination or eradication by 2030 under the global NTD roadmap. Sanitation in particular plays a key role in preventing diseases such as soil-transmitted helminth infections, schistosomiasis or trachoma, while safe water and hygienic conditions in health facilities and in homes are essential for the management and care of many NTDs (WHO, 2020). Partnerships on WASH are essential to prevent NTDs that are close to elimination from bouncing back when treatment interventions, such as mass drug administration, are eventually scaled back.

The WASH and NTDs partnership includes WHO and its Member States, academia, donors, NGOs (spearheaded by the NGO Network on NTDs (NNN)<sup>29</sup>) and pharmaceutical companies donating medications for treatment of some NTDs. In 2015, the partnership was strengthened with the WASH and NTD Strategy 2015–2020 to guide cross-sectoral collaboration, and for the first time the new 2021–2030 NTD roadmap included specific WASH-related targets to incentivize collaborative action along with an updated WASH and NTD strategy (WHO, 2021a; Boisson et al., 2021). Translating a will to collaborate into concrete action requires tools and sustained effort. The *WASH and Health Working Together* toolkit developed by the NNN with WHO provides tools and a forum to support sustained collaboration (NNN/WHO, 2019).

Phenomenal global progress has been made on the elimination of Guinea worm (or dracunculiasis). Dracunculiasis decreased from an estimated 3.5 million cases in 20 countries in the mid-1980s to just 15 human cases in 2021, driven largely by WASH interventions (WHO, 2022a). Sustained partnerships over this period with health surveillance authorities and clinics enabled targeted support for safe drinking water, using filters to remove worm larvae. Follow-up and care were provided to infected people to ensure wounds would not recontaminate water bodies.

Similarly, the number of people living in districts in which trachoma is a public health problem dropped from 1,517 million in 2002 to 125 million in June 2022 (WHO, 2021b) under the SAFE strategy<sup>30</sup> in which the 'F' and 'E' components cover facial cleanliness and an excreta-free environment (specifically improved access to water and sanitation).

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<sup>29</sup> A global forum for non-governmental organizations working together on NTDs. For more information, please see: [www.ntd-ngonetwork.org](http://www.ntd-ngonetwork.org).

<sup>30</sup> SAFE: Surgery for advanced disease, Antibiotics to clear *C. trachomatis* infection, Facial cleanliness and Environmental improvement to reduce transmission.

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**WASH is critical  
in the prevention  
and management  
of many neglected  
tropical diseases  
(NTDs)**

### 6.2.3 Cholera

In 2015, it was estimated that annually there are 1.3 to 4.0 million cholera cases, affecting 69 countries across the globe (Ali et al., 2015). Cholera continues to disproportionately affect the world's poorest and most vulnerable communities, often occurring in 'hotspots' where access to safely managed water and sanitation is limited. The Global Taskforce on Cholera Control<sup>31</sup> is a collaboration of over 30 WASH and health organizations that seeks to end cholera through a multisectoral approach that includes vaccination, WASH and cholera treatment delivered via coordinated leadership and community engagement. There are a number of tools that guide this work, including frameworks for developing national cholera prevention and control plans, WASH and infection and prevention control standards for cholera in health care facilities, and outbreak response manuals. A number of working groups are developing technical products to support the vaccination, WASH and treatment elements of the partnership, and documenting their implementation.

While cholera deaths have reduced from a peak of almost 1 in 20 cases in the mid-1990s to less than 1 in 500 in 2020, global case numbers have risen dramatically in the past 5–10 years, indicating that global treatment responses are improving while preventive measures are not (WHO, 2021c). This trend indicates that the goals of the global cholera roadmap<sup>32</sup> to eliminate cholera by 2030 in up to 20 countries will be difficult to reach without substantial improvements in WASH services. Vaccination has been used effectively in hotspot locations, but without sustained WASH improvements the disease can easily return as immunity wanes over time. Success in eliminating cholera will require sustained and concerted national efforts to extend and prioritize WASH services to those most in need, in order to address the root causes of outbreaks – and in doing so, such efforts also address key issues around equity, human rights and prevention of other waterborne diseases.

### 6.2.4 Antimicrobial resistance

The world is facing a crisis of AMR, meaning that infections that have been easily treatable since the scientific discovery of antibiotics less than 100 years ago could once again kill. The pipeline of new antimicrobials has all but dried up, and urgent solutions to tackle AMR are needed from a wide range of stakeholders such as policy-makers, engineers and scientists, health care professionals, veterinarians, farmers, donors, NGOs, and private citizens and corporations. Everyone has a role to play (FAO/OIE/WHO, 2020).

Wastewater effluent from all sources including communities, health facilities, plant and animal production, and antimicrobial manufacturing are increasingly recognized as critical components in the fight against AMR. Safe WASH limits the avoidable use of antimicrobials for WASH-preventable infections. Treatment of wastewater from all sectors limits the emergence and spread of AMR in water and soil that has been polluted with untreated wastewater and sludge (FAO/OIE/WHO, 2020; UNEP, 2022).

The response to the AMR crisis has been spearheaded through the One-Health global action plan on antimicrobial resistance (WHO, 2015), developed by WHO in a close tripartite collaboration with the Food and Agriculture Organization of the United Nations (FAO) and the World Organization for Animal Health (OIE). This global action plan was formally endorsed by the General Assembly of the United Nations in 2016 and the United Nations Environment Programme (UNEP) joined in 2022 to more fully embrace the One-Health approach encompassing human, animal and ecological health. A central task of the quadripartite is to support the development and implementation of national policies and actions plans (NAPs) that mobilize national and local-level governments, industry and private sector partners around investments to combat AMR in all sectors.

<sup>31</sup> For more information, please see: [www.gtfcc.org/about-cholera/](http://www.gtfcc.org/about-cholera/).

<sup>32</sup> Roadmap 2030 – Global Task Force on Cholera Control ([www.gtfcc.org](http://www.gtfcc.org)).



Key elements to coordinate and mobilize the partnership are the Inter-Agency Coordination Group (Secretary-General of the United Nations, 2017) and a One-Health global leaders' group on antimicrobial resistance (UNEP, n.d.). Collectively, with world antimicrobial awareness weeks, they have succeeded in raising the profile of environmental dimensions of AMR and the role of the water and waste management across sectors. However, a key challenge remains that the role of WASH and wastewater management are not well understood or well represented in NAPs – the important roles of WASH and wastewater management are often not addressed, or the proposed actions do not align with the major AMR risks within national contexts.

### 6.2.5 Nutrition

The three principal underlying causes of undernutrition are unsuitable or insufficient food intake, poor care practices and disease. These are directly or indirectly related to inadequate access to WASH. Partnerships between WASH and nutrition actors can deliver significant synergies. For example, WASH programmes, often implemented at scale, can enhance the coverage and effectiveness of nutrition interventions to reduce the malnutrition and stunting that affect 22% or 149 million children under the age of five years globally according to estimates for 2020 (WHO, 2021d).

One important global partnership between WASH and nutrition is that between the Scale Up Nutrition (SUN) Movement<sup>33</sup> and Sanitation and Water for All (SWA).<sup>34</sup> This partnership was created in response to recommendations for cross-sectoral collaboration on new analyses, tools, evidence, funding and commitments from the landmark 2015 international Bonn WASH Nutrition Forum.<sup>35</sup> SUN and SWA collaboration focuses on three thematic areas, namely joint advocacy, good practices and research, encapsulated in the joint WASH–nutrition narrative (SWA/SUN, n.d.).

While there is no question about the critical role played by environmental health in shaping children's nutritional outcomes, difficulties in quantifying the impact of WASH on nutrition have sometimes challenged cross-sectoral programmatic collaboration. Most significantly, a series of studies published in 2018–2019 investigating this relationship showed little or no impact of selected WASH interventions on reducing childhood diarrhoea or stunting (Null et al., 2018; Luby et al., 2018; Humphrey et al., 2019; Cumming et al., 2019). The implications of these studies were not always clearly articulated, prompting doubt among some practitioners, researchers and funders on the value of WASH investment for improved nutrition. Strong partnerships and constructive interaction across sectors play a vital role in ensuring the evidence base and its limitations are well understood, creating dialogue on the myriad benefits of co-programming beyond health impacts, and ensuring that co-programming becomes more effective (WHO/UNICEF, 2019).

### 6.2.6 Food safety

Safe water for irrigation, food processing and food hygiene in homes and restaurants is an essential part of protecting human health in food systems, along with risk reduction measures at the farm (e.g. selection of high-growing crops<sup>36</sup> or crops eaten cooked).

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<sup>33</sup> For more information, please see: <https://scalingupnutrition.org/about/what-we-do/priorities/integrating-wash-and-nutrition-actions>.

<sup>34</sup> For more information, please see: <http://sanitationandwaterforall.org/>.

<sup>35</sup> For more information, please see: <https://scalingupnutrition.org/news/wash-nutrition-forum-features-mirror-sessions-inspire-further-collaboration-between-two>.

<sup>36</sup> Refers to crops where the edible portion is high enough on the plant so that it does not come into contact with irrigation water.

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**Safe WASH limits  
the avoidable use  
of antimicrobials  
for WASH-  
preventable  
infections**

Studies looking at multiple pathways of exposure to water- and sanitation-related pathogens have consistently shown uncooked produce as the leading exposure pathway in low and middle-income countries.<sup>37</sup>

The FAO/WHO Codex Alimentarium<sup>38</sup> is the primary international partnership on food safety. Codex fosters consumer trust in the safety and quality of food products by developing international food standards, guidelines and codes of practice for the safety, quality and fairness of food trade. Common risk assessments underpinning global guideline values for chemicals in food and drinking water, including bottled water, form an important aspect of the partnership between the drinking water quality guideline developers, the WASH sector and Codex (WHO, 2022b). Codex and wider partnerships with the agricultural sector also exist for irrigation and food processing water quality.

However, developing partnerships to ensure the safe use of wastewater (both formal and informal use) in agriculture and aquaculture continues to be a significant challenge, due to the highly multisectoral nature of the topic and the gaps in institutional responsibilities, particularly for informal reuse (WHO, 2006; 2016). Stronger collaboration is needed between the water, agricultural and health sectors to develop coherent policy, standards and implementation approaches as demand for wastewater use grows with demands for fresh produce near expanding urban centres, while water scarcity increases due to climate change.

### **6.2.7 Pandemics and public health emergencies**

Experiences with recent and ongoing public health emergencies, including COVID-19, Ebola, Zika and cholera outbreaks, highlight the centrality of WASH in preparedness, readiness, response and recovery efforts. WASH services are needed to help prevent infections of health care workers and patients within health care settings, to allow schools and workplaces to operate more safely, and to help protect communities and families from infections.

While the role of WASH in preventing COVID-19 (including hand hygiene, water supply to enable hand hygiene, and essential water and sanitation services to enable stay-at-home and distancing measures) is indisputable, WHO Strategic Preparedness and Response Plans did not comprehensively address or monitor WASH, and initial investments went disproportionately to other pillars of the response.

Increasingly, though, COVID-19 efforts are being leveraged to strengthen policies, regulations and investments in WASH. The recently established WASH in Public Health Emergency Working Group, co-led by WHO and UNICEF, working with a wide range of WASH and health emergency partners, seeks to consolidate guidance, to strategically address gaps and to engage with health actors. Furthermore, guidance on key WASH interventions for COVID-19 (WHO/UNICEF, 2020c) and more recently on environmental surveillance of SARS-CoV-2 in wastewater (WHO, 2022c) provide evidence-based frameworks from which to take action. COVID-19 exposed the particular lack of investment and services around safe health care waste management (WHO, 2022d). This work can no longer just focus on segregation and safe treatment, but must address the entire waste management chain, including reducing procurement of non-essential personal protective equipment (PPE), seeking products with less and biobased packaging and components, and supporting safe reusable PPE as well as recycling and reverse logistics. Such efforts also align with the new framework that is being put in place to

<sup>37</sup> For more information, please see: [www.sanipath.net/results-dashboard](http://www.sanipath.net/results-dashboard).

<sup>38</sup> For more information, please see: [www.fao.org/fao-who-codexalimentarius/about-codex/en/](http://www.fao.org/fao-who-codexalimentarius/about-codex/en/).

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**Safe water for irrigation, food processing and food hygiene in homes and restaurants is an essential part of protecting human health in food systems**

support countries in implementing the commitments on low-carbon and sustainable health systems that were established at the 26<sup>th</sup> Conference of the Parties (COP 26) to the United Nations Framework Convention on Climate Change (UNFCCC).

Many countries leveraged COVID-19 financing and attention to improve WASH. For example, in Lao PDR, since 2020, the Ministry of Health has mobilized over US\$2 million nationally to implement national green and climate-resilient WASH and energy standards in 62 health care facilities (WASH in Health Care Facilities, n.d.). Funds supported procuring autoclaves, water tanks, hand hygiene stations and other infrastructure as well as to run WASH FIT trainings and deliver ongoing supportive supervision. During a 2021 cholera outbreak in Niger, where increasing terrorist threats and growing food insecurity threatened many households, the work on emergency WASH focused on health care facilities. In response, a national taskforce was established led by the Ministry of Health and involving key WASH and health partners. The WASH FIT roll-out began nationally and efforts focused on cholera hotspots and engaged local community leadership and women's groups to support best hygiene practices and to sustain WASH improvements in health care facilities.

The number of individuals affected by emergencies, encompassing both disasters caused by natural hazards and conflict, is unlikely to decrease in the foreseeable future. Thus, there will be a continued need to implement WASH interventions that are sustainable, that result in health and well-being benefits, and for which there is strong local engagement, understanding and leadership.

### 6.2.8 Hygiene for disease prevention

Hand hygiene is critical to preventing the transmission of infectious diseases. The COVID-19 pandemic highlighted insufficient global coverage of hand hygiene in low- and middle-income countries, persistent lack of political prioritization and chronic underinvestment. Against this backdrop, and given the cross-sectoral nature of the challenge, new collaborative initiatives emerged, including the Hand Hygiene for All global initiative (HH4A) (WHO/UNICEF, 2020d). Launched in June 2020, HH4A aims to work with diverse actors to embed and elevate hand hygiene within existing policies, plans and budgets across relevant sectors, and to support their implementation. It is jointly led by UNICEF and WHO in partnership with international partners, national governments, public and private sectors, and civil society. Core partners include the World Bank, SWA, the International Federation of the Red Cross and the Red Crescent Societies (IFRC), the International Labour Organization (ILO), the London School of Hygiene and Tropical Medicine/Hygiene Hub, the Office of the United Nations High Commissioner for Refugees (UNHCR), the Global Handwashing Partnership and WaterAid.

Other important partnerships include:

- The Hand Hygiene Behaviour Change Coalition (HBCC),<sup>39</sup>
- The Hand Hygiene Market Accelerator (HHMA),<sup>40</sup> and
- The longstanding Global Handwashing Partnership (GHP).<sup>41</sup>

Successes of these partnerships can be seen from the country to the global level. Over 60 national governments have been supported by HH4A partners to develop fully costed roadmaps for universal hygiene coverage. Notable regional efforts include a hygiene

<sup>39</sup> For more information, please see: <https://worldhealthpartners.org/hbcc.php>.

<sup>40</sup> For more information, please see: <https://fr.weforum.org/projects/mobilizing-hand-hygiene-for-all-initiative>.

<sup>41</sup> For more information, please see: <https://globalhandwashing.org/>.

strategy for Southern Africa (SADC, 2021) led by the Southern African Development Community (SADC), and the 'Hand Hygiene for South Asia'<sup>42</sup> partnership (Klaesener-Metzner and Cavill, 2022). At the global level, partnerships facilitate co-developed tools to support country action, such as for example a country costing tool (WHO/UNICEF, 2021b), as well as advocacy efforts of unprecedented scale. A successful example of this is Global Handwashing Day,<sup>43</sup> coordinated each year by GHP. In 2020, the HH4A partnership brought together the individual efforts of veteran hand hygiene champions to equal more than the sum of their parts, securing high-level political commitment<sup>44</sup> and more than doubling the social media reach of 2019.

### 6.2.9 Wastewater monitoring for disease surveillance

Wastewater surveillance can play an important complementary role to diagnostic testing by providing additional evidence to inform disease surveillance and management. An important benefit is that samples from wastewater generate population level data on disease trends that are not susceptible to biases inherent in diagnostic testing. These data can provide valuable insights to public health decision-makers, such as: early warning of increasing cases (including asymptomatic cases); hotspots where testing services and behaviour change interventions should be targeted; vulnerable or isolated communities and events; and known and novel disease variants, among others.

The global polio eradication programme is a well-established form of a health partnership (with wastewater laboratories) using wastewater surveillance as part of a wider surveillance and control approach. Wastewater is monitored for early detection of an outbreak and confirmation of the absence of circulation of wild-type and vaccine-derived poliovirus in a population (WHO, 2003). It is also used in typhoid surveillance (WHO, 2018), at pilot scale for monitoring antimicrobial resistance (WHO, 2021e) and for monitoring illicit drug use, and has also been rapidly scaled up in many settings for COVID-19 (WHO, 2022c).

## 6.3 Emerging areas for partnerships for WASH and health

In addition to the partnerships for WASH and health previously described, working together is also crucial for the following areas.

### 6.3.1 Climate Change

Climate change is leading to shifting WASH-related health risks – particularly for mosquito-borne diseases where larvae breed in water containers and uncontained wastewater. Collaboration between and within institutions needs to be strengthened to integrate disaster and climate risk management into national policies and practices. This would include the clear identification of climate-related risks, the design of specific risk reduction measures and an improved and routine use of climate risk information by planners, engineers and other decision-makers. Protection of human health often depends on efforts by other sectors, such as food and agriculture, energy and urban planning. The active involvement of these sectors in National Adaptation Plans would make them more effective. Another reason for stronger inter-sector collaboration concerns the implementation of climate-resilient water and sanitation safety plans, as many teams from the health sector lack the necessary climate and hydrological experience to access climate data and expertise.

<sup>42</sup> For more information, please see: <https://sanitationlearninghub.org/2022/01/10/hand-hygiene-for-south-asia/>.

<sup>43</sup> For more information, please see: <https://globalhandwashing.org/global-handwashing-day/>.

<sup>44</sup> For more information, please see: <https://globalhandwashing.org/resources/global-handwashing-day-leader-commitments/>.

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**Wastewater surveillance can play an important complementary role to diagnostic testing by providing additional evidence to inform disease surveillance and management**

Climate change has already started influencing the transmission and spread of vector-borne diseases, and its impacts are likely to worsen (Rocklöv and Dubrow, 2020). In response to mosquito/vector-borne disease, new partnerships with climate specialists are needed to better understand how the spatial distribution of vectors (e.g. warmer climates, which are wetter further north and south of the equator) is evolving, and to update WASH strategies for vector control amid this new reality.

### 6.3.2 Contaminants of emerging concern

Chemical pollution in freshwater and drinking water is a threat to human health across the globe (Fuller et al., 2022). CECs are drivers of AMR and several diseases induced by endocrine disruption (Kahn et al., 2020). Partnerships across policy domains that address the life cycle of harmful products and substances are essential to reduce water pollution in order to safeguard human health and aquatic ecosystems. This includes promoting policies on chemical safety, public health, agriculture and food, environment, industry, trade, and waste management (including pharmaceutical disposal) (OECD, 2019; forthcoming). The scientific community has an important role to play in partnerships by developing and promoting state-of-the-art knowledge on the complexities of chemical pollution impacts and potential responses (Brack et al., 2022). Partnerships and coordination between pharmaceutical companies, consumers (patients and agriculture), health care actors (doctors, hospitals, pharmacies) and governments across the life cycle of pharmaceuticals are the most effective approach (OECD, 2019).

Partnerships between the public sector and industry are increasingly established to minimize pollution at source or to finance mitigation measures (OECD, 2022). For example, Extended Producer Responsibility (EPR) schemes transfer the responsibility of environmental impacts of harmful products to the manufacturer. The manufacturer can respond by switching to a less harmful product design, or by financially contributing to, for example, wastewater treatment infrastructure that is needed to break down harmful substances.

### 6.3.3 Mental health and well-being

While the connections between WASH and physical health are well established, the relationship between water and mental health is considerably less well known, and causal relationships between water and mental ill health are difficult to empirically confirm (Wutich et al., 2020). This knowledge gap could be addressed through productive collaboration between the WASH sector and the mental health care community. One option would be to build upon the research and experiences concerning 'ecological grief' and 'climate anxiety' (Nagabhatla et al., 2021; Okamoto and Nagabhatla, 2022).

### 6.3.4 Labour

Workers in the water sector around the world provide an essential public service. Yet, these services all too often come at the cost of the health, safety and dignity of workers, particularly in sanitation – as workers doing toilet cleaning (predominantly women), faecal sludge management and sewer cleaning (predominantly men) are among the most vulnerable workers (World Bank/ILO/WaterAid/WHO, 2019). Their jobs often exist in an informal economy without basic labour protection or rights, and many are consigned to this work through religion or class and face stigma. Many more workers are needed to achieve SDG 6. Partnerships with labour movements are needed to ensure that workers' rights are recognized, and that their working conditions are improved and progressively formalized to safeguard health and decent working conditions, as called for by SDG 8.



## 6.4 Lessons learned and ways forward

Partnerships for WASH and health are diverse and address a wide range of topics. While there have been some successes, collaboration also comes with challenges. It is known that safe WASH is a prerequisite to health, but the health sector often neglects prevention and instead focuses on clinical diagnosis and care, vaccines and medicines. On the other hand, the WASH sector faces pressures and timescales of achieving and sustaining safe water and sanitation services for all, which will ultimately deliver health benefits, but it may not prioritize health objectives directly in planning and delivery of services.

NTD efforts failed to sustainably eliminate disease in unsanitary environments, despite cheap and effective mass drug administration. Cholera, rotavirus, polio and typhoid all have vaccines, but are often lacking the WASH component to effectively sustain disease control and prevent reemergence of outbreaks. Attempts at partnership have clearly been made, but often actors have struggled to organize themselves to optimum effect, in part due to entrenched structures of funding, competing incentives, as well as varied implementation structures and institutional arrangements.

The world is facing serious, emerging challenges such as AMR, increases in zoonotic diseases, pollution by CECs and magnified climate risks. To address these challenges, continued and new partnership among the WASH and health sector will be critical to accelerate progress in existing areas of collaboration and to effectively face new challenges. Moreover, emerging challenges are in need of bold partnerships extending to other sectors, including environment, chemical safety, agriculture, industry, food safety and trade.

## References

- Ali, M., Nelson, A. R., Lopez, A. L. and Sack, D. A. 2015. Updated global burden of cholera in endemic countries. *PLoS Neglected Tropical Diseases*, Vol. 9, No. 6, Article e0003832. doi.org/10.1371/journal.pntd.0003832.
- Boisson, S., Wohlgemuth, L., Yajima, A., Peralta, G., Obiageli, N., Matendehero, S., Baayenda, G., Seife, F., Hamilton, H., Chase, C., Barry, F. B. M., Solomon, A. W. and Velleman, Y. 2021. Building on a decade of progress in water, sanitation and hygiene to control, eliminate and eradicate neglected tropical diseases. *Transactions of The Royal Society of Tropical Medicine and Hygiene*, Vol. 115, No. 2, pp. 185–187. doi.org/10.1093/trstmh/trab001.
- Brack, W., Barcelo Culleres, D., Boxall, A. B. A., Budzinski, H., Castiglioni, S., Covaci, A., Dulio, V., Escher, B. I., Fantke, P., Kandie, F., Fatta-Kassinos, D., Hernández, F. J., Hilscherová, K., Hollender, J., Hollert, H., Jahnke, A., Kasprzyk-Hordern, B., Khan, S. J., Kortenkamp, A., Kümmerer, K., Lalonde, B., Lamoree, M. H., Levi, Y., Lara Martín, P. A., Montagner, C. C., Mougin, C., Msagati, T., Oehlmann, J., Posthuma, L., Reid, M., Reinhard, M., Richardson, S. D., Rostkowski, P., Schymanski, E., Schneider, F., Slobodnik, J., Shibata, Y., Snyder, S. A., Sodr , F. F., Teodorovic, I., Thomas, K. V., Umbuzeiro, G. A., Viet, P. H., Yew-Hoong, K. G., Zhang, X. and Zuccato, E. 2022. One planet: one health. A call to support the initiative on a global science–policy body on chemicals and waste. *Environmental Sciences Europe*, Vol. 34, Article 21. doi.org/10.1186/s12302-022-00602-6.
- Chaitkin, M., McCormick, S., Alvarez-Sala Torreano, J., Amongin, I., Gaya, S., Hanssen, O. N., Johnston, R., Slaymaker, T., Chase, C., Hutton, G. and Montgomery, M. 2022. Estimating the cost of achieving basic water, sanitation, hygiene, and waste management services in public health-care facilities in the 46 UN designated least-developed countries: A modelling study. *The Lancet Global Health*, Vol. 10, No. 6, pp. e840–e849. doi.org/10.1016/S2214-109X(22)00099-7.
- Cumming, O., Arnold, B. F., Ban, R., Clasen, T., Esteves Mills, J., Freeman, M. C., Gordon, B., Guiteras, R., Howard, G., Hunter, P. R. and Johnston, R. B., Pickering, A. J., Prendergast, A. J., Pr uss-Ust n, A., Rosenboom, J. W., Spears, D., Sundberg, S., Wolf, J., Null, C., Luby, S. P., Humphrey, J. H. and Colford, J. M. Jr. 2019. The implications of three major new trials for the effect of water, sanitation and hygiene on childhood diarrhea and stunting: A consensus statement. *BMC Medicine*, Vol. 17, No. 1, pp. 1–9. doi.org/10.1186/s12916-019-1410-x.
- FAO/OIE/WHO (Food and Agriculture Organization of the United Nations/ World Organization for Animal Health/World Health Organization). 2020. *Technical Brief on Water, Sanitation, Hygiene and Wastewater Management to Prevent Infections and Reduce the Spread of Antimicrobial Resistance*. WHO/OIE/FAO. www.who.int/publications/i/item/9789240006416.

- Fuller, R., Landrigan, P. J., Balakrishnan, K., Bathan, G., Bose-O'Reilly, S., Brauer, M., Caravanos, J., Chiles, T., Cohen, A., Corra, L., Cropper, M., Ferraro, G., Hanna, J., Hanrahan, D., Hu, H., Hunter, D., Janata, G., Kupka, R., Lanphear, B., Lichtveld, M., Martin, K., Mustapha, A., Sanchez-Triana, E., Sandilya, K., Schaeffli, L., Shaw, J., Seddon, J., Suk, W., María Téllez-Rojo, M. and Yan, C. 2022. Pollution and health: A progress update. *The Lancet Planetary Health*, Vol. 6, No. 6, pp. E535–E547. doi.org/10.1016/S2542-5196(22)00090-0.
- Humphrey, J. H., Mbuya, M. N. N., Ntozini, R., Moulton, L. H., Stoltzfus, R. J., Tavengwa, N. V., Mutasa, K., Majo, F., Mutasa, B., Mangwadu, G., Chasokela, C. M., Chigumira, A., Chasekwa, B., Smith, L. E., Tielsch, J. M., Jones, A. D., Manges, A. R., Maluccio, J. A. and Prendergast, A. J. 2019. Independent and combined effects of improved water, sanitation, and hygiene, and improved complementary feeding, on child stunting and anaemia in rural Zimbabwe: A cluster-randomised trial. *The Lancet Global Health*, Vol. 7, No. 1, pp. e132–e147. doi.org/10.1016/S2214-109X(18)30374-7.
- Kahn, L., Philippat, C., Nakayama, S. F., Slama, R. and Trasande, L. 2020. Endocrine-disrupting chemicals: Implications for human health. *The Lancet Diabetes and Endocrinology*, Vol. 8, No. 8, pp. 703–708. doi.org/10.1016/S2213-8587(20)30129-7.
- Klaesener-Metzner, N. and Cavill, S. 2022. *Hand Hygiene for South Asia*. The sanitation learning hub. <https://sanitationlearninghub.org/2022/01/10/hand-hygiene-for-south-asia/>.
- Luby, S. P., Rahman, M., Arnold, B. F., Unicomb, L., Ashraf, S., Winch, P. J., Stewart, C. P., Begum, F., Hussain, F., Benjamin-Chung, J., Leontsini, E., Naser, A. M., Parvez, S. M., Hubbard, A. E., Lin, A., Nizame, F. A., Jannat, K., Ercumen, A., Ram, P. K., Das, K. K., Abedin, J., Clasen, T. F., Dewey, K. G., Fernald, L. C., Null, C., Ahmed, T. and Colford, J. M. Jr. 2018. Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Bangladesh: a cluster randomized controlled trial. *The Lancet Global Health*, Vol. 6, No. 3, pp. e302–e315. doi.org/10.1016/S2214-109X(17)30490-4.
- Nagabhatla, N., Okamoto, S. and Bhandari, S. 2021. *The New Normal of 'Climate Grief': Why Mental Health must Feature in Adaptation and Resilience Planning*. United Nations University Institute on Comparative Regional Integration Studies (UNU-CRIS). <https://cris.unu.edu/new-normal-%E2%80%98climate-grief%E2%80%99-why-mental-health-must-feature-adaptation-and-resilience-planning>.
- NNN/WHO (Neglected Tropical Disease NGO Network/World Health Organization). 2019. *WASH and Health Working Together: A 'How-To' Guide for Neglected Tropical Disease Programmes*. Geneva, WHO. [www.who.int/publications/i/item/9789241515009](http://www.who.int/publications/i/item/9789241515009).
- Null, C., Stewart, C. P., Pickering, A. J., Dentz, H. N., Arnold, B. F., Arnold, C. D., Benjamin-Chung, J., Clasen, T., Dewey, K. G., Fernald, L. C. H., Hubbard, A. E., Kariger, P., Lin, A., Luby, S. P., Mertens, A., Njenga, S. M., Nyambane, G., Ram, P. K. and Colford, J. M. 2018. Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Kenya: A cluster randomized controlled trial. *The Lancet Global Health*, Vol. 6, No. 3, pp. e316–e329. doi.org/10.1016/S2214-109X(18)30005-6.
- Okamoto, S. and Nagabhatla, N. 2022. *Climate Change's Impact on Mental Health is Overlooked and Misunderstood – Here's what can be done*. The Conversation, 8 November 2022. <https://theconversation.com/climate-changes-impact-on-mental-health-is-overlooked-and-misunderstood-heres-what-can-be-done-194128>.
- OECD (Organisation for Economic Co-operation and Development). 2019. *Pharmaceutical Residues in Freshwater: Hazards and Policy Responses*. OECD Studies on Water. Paris, OECD Publishing. doi.org/10.1787/c936f42d-en.
- \_\_\_\_\_. 2022. *Background Note: The Implementation of the Polluter Pays Principle*. [www.oecd.org/water/dg-env-economics-of-wfd.htm](http://www.oecd.org/water/dg-env-economics-of-wfd.htm) (Accessed on 4 July 2022).
- \_\_\_\_\_. Forthcoming. *Endocrine Disruption in Freshwater*. OECD Studies on Water. Paris, OECD Publishing.
- Rocklöv, J. and Dubrow, R. 2020. Climate change: An enduring challenge for vector-borne disease prevention and control. *Nature Immunology*, Vol. 21, pp. 479–483. doi.org/10.1038/s41590-020-0648-y.
- SADC (Southern African Development Community). 2021. *SADC Hygiene Strategy 2021–2025*. Gaborone, SADC. <https://globalhandwashing.org/wp-content/uploads/2022/01/SADC-Hygiene-Strategy.pdf>.
- Secretary-General of the United Nations. 2017. *Interagency Coordination Group on Antimicrobial Resistance*. 17 March 2017, New York. [www.un.org/sg/en/content/sg/personnel-appointments/2017-03-17/interagency-coordination-group-antimicrobial-resistance](http://www.un.org/sg/en/content/sg/personnel-appointments/2017-03-17/interagency-coordination-group-antimicrobial-resistance).
- SWA/SUN (Sanitation and Water for All/Scale Up Nutrition Movement). n.d. *WASH-Nutrition Linkages: A Joint Narrative between Sanitation and Water for All and the Scaling Up Nutrition (SUN) Movement*. <https://scalingupnutrition.org/wp-content/uploads/2017/10/WASH-Nutrition-Narrative.pdf>.
- UNEP (United Nations Environment Programme). 2022. *Environmental Dimensions of Antimicrobial Resistance: Summary for Policymakers*. UNEP. [www.unep.org/resources/report/summary-policymakers-environmental-dimensions-antimicrobial-resistance](http://www.unep.org/resources/report/summary-policymakers-environmental-dimensions-antimicrobial-resistance).
- \_\_\_\_\_. n.d. *One Health Global Leaders Group on Antimicrobial Resistance*. UNEP website. [www.unep.org/one-health-global-leaders-group-antimicrobial-resistance](http://www.unep.org/one-health-global-leaders-group-antimicrobial-resistance).
- WASH in Health Care Facilities. n.d. *Country Progress Tracker*. [www.washinhealthcare.org/country-progress-tracker/#country-progress-tracker](http://washinhealthcare.org/country-progress-tracker/#country-progress-tracker).
- WHO (World Health Organization). 2003. *Guidelines for Environmental Surveillance of Poliovirus Circulation*. Geneva, WHO. <https://apps.who.int/iris/handle/10665/67854>.
- \_\_\_\_\_. 2006. *WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater. Volume I Policy and Regulatory Aspects*. Geneva, WHO. [www.who.int/publications/i/item/9241546824](http://www.who.int/publications/i/item/9241546824).
- \_\_\_\_\_. 2015. *Global Action Plan on Antimicrobial Resistance*. Geneva, WHO. [www.who.int/publications/i/item/9789241509763](http://www.who.int/publications/i/item/9789241509763).
- \_\_\_\_\_. 2016. *Sanitation Safety Planning: Manual for Safe Use and Disposal of Wastewater, Greywater and Excreta*. Geneva, WHO. [www.who.int/publications/i/item/9789241549240](http://www.who.int/publications/i/item/9789241549240).
- \_\_\_\_\_. 2018. *Typhoid: Vaccine Preventable Diseases Surveillance Standards*. Geneva, WHO. [www.who.int/publications/m/item/vaccine-preventable-diseases-surveillance-standards-typhoid](http://www.who.int/publications/m/item/vaccine-preventable-diseases-surveillance-standards-typhoid).
- \_\_\_\_\_. 2019. *Water, Sanitation, Hygiene and Health: A Primer for Health Professionals*. Geneva, WHO. [www.who.int/publications/i/item/WHO-CED-PHE-WSH-19.149](http://www.who.int/publications/i/item/WHO-CED-PHE-WSH-19.149).
- \_\_\_\_\_. 2020. *Ending the Neglect to Attain the Sustainable Development Goals: A Road Map for Neglected Tropical Diseases 2021–2030*. Geneva, WHO. [www.who.int/publications/i/item/9789240010352](http://www.who.int/publications/i/item/9789240010352). Licence: CC BY-NC-SA 3.0 IGO.
- \_\_\_\_\_. 2021a. *Ending the Neglect to Attain the Sustainable Development Goals: A Global Strategy on Water, Sanitation and Hygiene to Combat Neglected Tropical Diseases, 2021–2030*. Geneva, WHO. <https://apps.who.int/iris/handle/10665/340240>. Licence: CC BY-NC-SA 3.0 IGO.
- \_\_\_\_\_. 2021b. WHO Alliance for the Global Elimination of Trachoma: Progress report on elimination of trachoma, 2021. *Weekly Epidemiological Record*, Vol. 97, No. 31, pp. 353–364. <https://apps.who.int/iris/handle/10665/361290>.
- \_\_\_\_\_. 2021c. Cholera, 2020. *Weekly Epidemiological Record*, Vol. 96, No. 37, pp. 445–460.

- \_\_\_\_\_. 2021d. *Levels and trends in child malnutrition: key findings of the 2021 edition of the joint child malnutrition estimates*. Geneva, United Nations Children's Fund (UNICEF)/WHO/World Bank. [www.who.int/publications/i/item/9789240025257](http://www.who.int/publications/i/item/9789240025257).
- \_\_\_\_\_. 2021e. *WHO Integrated Global Surveillance on ESBL-Producing E. coli using a "One Health" Approach: Implementation and Opportunities*. Geneva, WHO. [www.who.int/publications/i/item/who-integrated-global-surveillance-on-esbl-producing-e.-coli-using-a-one-health-approach](http://www.who.int/publications/i/item/who-integrated-global-surveillance-on-esbl-producing-e.-coli-using-a-one-health-approach). Licence: CC BY-NC-SA 3.0 IGO.
- \_\_\_\_\_. 2022a. *Dracunculiasis (Guinea-Worm Disease)*. [www.who.int/data/gho/data/themes/topics/dracunculiasis-guinea-worm-disease](http://www.who.int/data/gho/data/themes/topics/dracunculiasis-guinea-worm-disease).
- \_\_\_\_\_. 2022b. *Guidelines for Drinking-Water Quality: Fourth Edition Incorporating the First and Second Addenda*. Geneva, WHO. [www.who.int/publications/i/item/9789240045064](http://www.who.int/publications/i/item/9789240045064). Licence: CC BY-NC-SA 3.0 IGO.
- \_\_\_\_\_. 2022c. *Environmental Surveillance for SARS-COV-2 to Complement Public Health Surveillance – Interim Guidance*. WHO. [www.who.int/publications/i/item/WHO-HEP-ECH-WSH-2022.1](http://www.who.int/publications/i/item/WHO-HEP-ECH-WSH-2022.1).
- \_\_\_\_\_. 2022d. *Global Analysis of Healthcare Waste in the Context of COVID-19: Status, Impacts and Recommendations*. Geneva, WHO. [www.who.int/publications/i/item/9789240039612](http://www.who.int/publications/i/item/9789240039612). Licence: CC BY-NC-SA 3.0 IGO.
- \_\_\_\_\_. n.d. The Global Health Observatory. *Water, sanitation and hygiene: burden of disease*. WHO website. [www.who.int/data/gho/data/themes/topics/topic-details/GHO/water-sanitation-and-hygiene-burden-of-disease](http://www.who.int/data/gho/data/themes/topics/topic-details/GHO/water-sanitation-and-hygiene-burden-of-disease). (Accessed on 28 November 2022)
- WHO/UNICEF (World Health Organization/United Nations Children's Fund). 2019. *Implications of Recent WASH and Nutrition Studies for WASH Policy and Practice*. Position Paper. [www.who.int/publications/m/item/implications-of-recent-wash-and-nutrition-studies-for-wash-policy-and-practice](http://www.who.int/publications/m/item/implications-of-recent-wash-and-nutrition-studies-for-wash-policy-and-practice).
- \_\_\_\_\_. 2020a. *State of the World's Sanitation: An Urgent Call to Transform Sanitation for Better Health, Environments, Economies and Societies*. New York, UNICEF/WHO. [www.who.int/publications/i/item/9789240014473](http://www.who.int/publications/i/item/9789240014473).
- \_\_\_\_\_. 2020b. *Global Progress Report on Water, Sanitation and Hygiene in Health Care Facilities: Fundamentals First*. Geneva, WHO. [www.who.int/publications/i/item/9789240017542](http://www.who.int/publications/i/item/9789240017542).
- \_\_\_\_\_. 2020c. *Water, Sanitation, Hygiene, and Waste Management for SARS-CoV-2, the Virus that causes COVID-19 – Interim Guidance*. WHO/UNICEF. [www.who.int/publications/i/item/WHO-2019-nCoV-IPC-WASH-2020.4](http://www.who.int/publications/i/item/WHO-2019-nCoV-IPC-WASH-2020.4).
- \_\_\_\_\_. 2020d. *Hand Hygiene for All*. WHO/UNICEF. [www.unicef.org/reports/hand-hygiene-for-all-2020#:~:text=The%20Hand%20Hygiene%20for%20All,protect%20their%20health%20and%20environment](http://www.unicef.org/reports/hand-hygiene-for-all-2020#:~:text=The%20Hand%20Hygiene%20for%20All,protect%20their%20health%20and%20environment).
- \_\_\_\_\_. 2021a. *State of the World's Hand Hygiene: A Global Call to Action to Make Hand Hygiene a Priority in Policy and Practice*. New York, UNICEF. [www.who.int/publications/i/item/9789240036444](http://www.who.int/publications/i/item/9789240036444).
- \_\_\_\_\_. 2021b. *Costing Tool for Estimating the Cost of Interventions to Improve Hand Hygiene in Domestic Settings*. Technical document. WHO. [www.who.int/publications/i/item/WHO-HEP-ECH-WSH-2021.3](http://www.who.int/publications/i/item/WHO-HEP-ECH-WSH-2021.3).
- \_\_\_\_\_. 2022. *Progress on WASH in Health Care Facilities 2000–2021: Special Focus on WASH and Infection Prevention and Control (IPC)*. Geneva, WHO/UNICEF. [www.who.int/publications/i/item/progress-on-wash-in-health-care-facilities-2000-2021--special-focus-on-wash-and-infection-prevention-and-control-\(ipc\)](http://www.who.int/publications/i/item/progress-on-wash-in-health-care-facilities-2000-2021--special-focus-on-wash-and-infection-prevention-and-control-(ipc)). Licence: CC BY-NC-SA 3.0 IGO.
- WHO/UNICEF/World Bank (World Health Organization/United Nations Children's Fund/World Bank). 2022. *State of the World's Drinking-Water: An Urgent Call to Action to Accelerate Progress on Ensuring Safe Drinking Water for All*. Geneva, WHO. Licence: CC BY-NC-SA 3.0 IGO.
- World Bank/ILO/WaterAid/WHO. 2019. *Health, Safety and Dignity of Sanitation Workers: An Initial Assessment*. Washington DC, World Bank. <https://openknowledge.worldbank.org/handle/10986/32640>. Licence: CC BY 3.0 IGO.
- Wutich, A., Brewis, A. and Tsai, A. 2020. Water and mental health. *WIREs Water*, Vol. 7, No. 5, e1461. [doi.org/10.1002/wat2.1461](https://doi.org/10.1002/wat2.1461).