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Water and sanitation for all in a pandemic

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Abstract

Hand hygiene is critical for reducing transmission of communicable diseases, as we are so acutely aware during the COVID-19 pandemic. UNICEF has identified behaviour change and knowledge promotion as top strategies for increasing handwashing during this crisis, while acknowledging that millions of people lack the water necessary for handwashing.

Introduction

An estimated 40% of households globally lack access to basic handwashing facilities[1,2]. A recent cross-cultural study of household water insecurity experiences found that nearly one in four of 6,637 randomly sampled households across 23 sites in 20 low- and middle-income countries (LMICs) were unable to wash their hands in the previous month (Fig. 1)[3,4]. These challenges are not unique to LMICs. Indeed, many poorer families in high-income nations experience similar water, sanitation and hygiene (WASH) problems[5].

In the spotlight of the current COVID-19 pandemic, this Comment explores the challenge of hand hygiene in a changing water world and reflects on the importance of making rapid progress to "ensure availability and sustainable management of water and sanitation for all" (United Nations Sustainable Development Goal (SDG) 6). We contest that solutions to combat the spread of infectious disease, including COVID-19, must consider household water insecurity as a function of water availability, quality and accessibility. Drawing on the latest evidence, we provide recommendations on how to improve human health and well-being during a pandemic by reducing household water insecurity.

Water availability and quality

Although our blue planet is 70% covered by water, only 3% is freshwater (of which ~70% is snow or ice, or otherwise unavailable for human use). Furthermore, available freshwater is unequally distributed geographically in space and time, such that an estimated four billion people experience 'severe water scarcity' for the duration of at least one month every year[6], causing difficulties for handwashing and sanitation. Challenges with availability are projected to become more widespread and acute due to climate change and associated increases in hydrological extremes (such as floods and drought), as well as changed water demand due to population growth, displacement, intensification of agriculture and infrastructure degradation[7].

While it is more obvious how droughts reduce water availability, there is increasing recognition that flooding can reduce the availability of clean water due to, for instance, storm-induced contamination from combined sewerage overflows polluting rivers and groundwater resources. As a result, water may be unsuitable for consumption or hygiene due to contamination by multiple chemical or biological pollutants (for example, pathogens, viruses, bacteria and protozoa) that present immediate risks to health. For example, handwashing with polluted water may increase the risk of contracting enteric infections that can cause diarrhoea[8], which is a proximate driver of undernutrition that can exacerbate a range of morbidities. The majority of the annual 1.7 billion cases of childhood diarrhoeal disease, the second largest cause of death for children under five, are related to poor water quality[9], highlighting the severity of water insecurity consequences. Furthermore, intensive handwashing, especially with contaminated water, can cause skin lesions that serve as conduits for waterborne infectious agents such as bacteria or viruses, as well as chemicals and allergens, to enter the bloodstream[10]. Thus, poor water quality can undermine an individual's ability to resist or recover from infectious disease through numerous pathways.

Water accessibility and competing demands

Even when physically available, there are many challenges for households to access water that include: high cost, dangers involved in acquisition, or physical inability to haul it home due to age, illness, pregnancy or safety concerns[3,11]. These challenges can intensify dramatically as a consequence of mass migration, with displaced people and those affected by conflict lacking access to water and sanitation infrastructure. When water is difficult to access, individuals and families are confronted with challenging decisions about how to use water, such as deciding between purchasing water or purchasing food, irrigating crops or watering animals, or, as the recent COVID-19 pandemic highlights, consuming water or using it for handwashing[11]. Additionally, the time spent fetching water presents multiple opportunity costs, including limited time for income-generating activities, missing school and potentially reduced purchasing power for sanitation products[11].

Many households in the Household Water Insecurity Experiences (HWISE) study (Fig. 1) cited issues with water availability, accessibility and quality as the main barriers to regular handwashing[3]. For example, those living in arid and semi-arid environments experienced perennial water scarcity due to fluctuations in precipitation and groundwater recharge. However, survey results highlighted that the inability to wash hands was not dependent solely on physical hydrological constraints. For instance, Brazil has abundant water resources[12], yet many households there experienced problems with water that limited handwashing ability (Fig. 1). Some households reported that available water was unaffordable or inaccessible due to physical (for example, preferred water source was too far away) and/or social constraints. Elsewhere, handwashing was forgone due to unexpected water shutoffs or contamination, while some households prioritized consumption over hygiene when water supplies were limited[3].

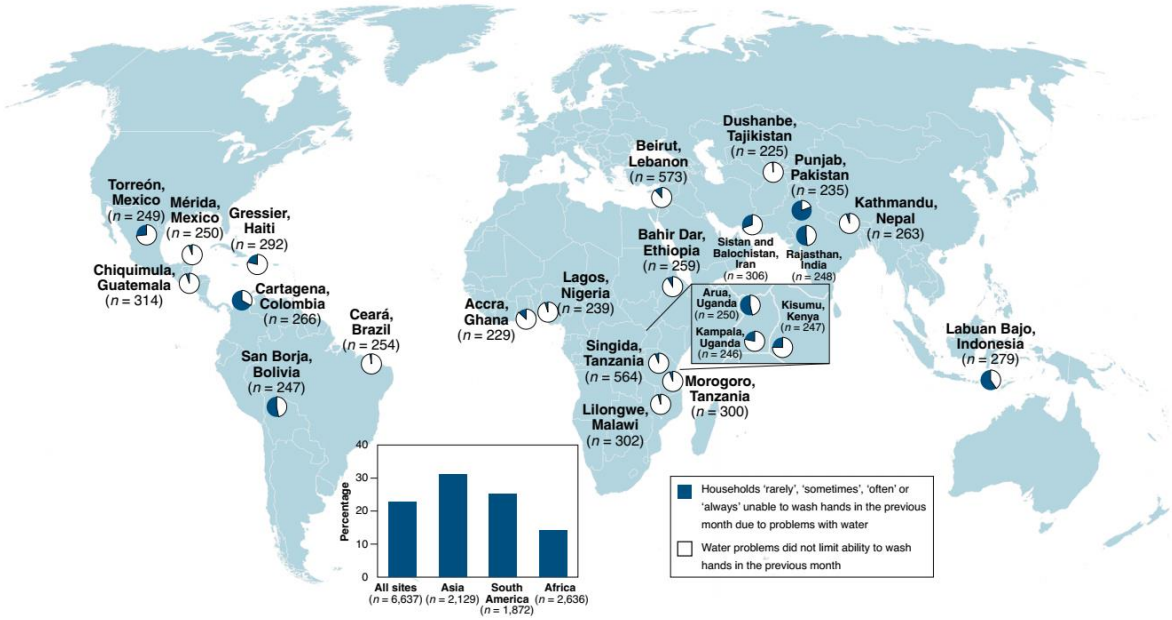

Figure 1. Proportion of households across 23 sites in 20 low- and middle-income countries that were unable to wash their hands in the previous month because of problems with water. Data are from ref. [3] (n = 6,637)

Ways forward

The anticipated inability of many households to follow World Health Organization (WHO) and United Nations Children's Fund (UNICEF) guidelines during the COVID-19 pandemic reveals that major investments in both water infrastructure and water governance are critically needed to manage and provision water to ensure safe handwashing. We propose that strategic developments for reducing water insecurity aim for:

Improving water infrastructure and technologies.

Ensuring source water protection is key. The adage that 'prevention is better than cure' applies here as protecting water sources from degradation is often cheaper and more effective than building storage infrastructure (for example, dams) and remediation post-pollution. Multi-barrier approaches based on adequate water treatment and distribution systems, water testing and training of water managers are proven methods to ensure safe drinking water[13].

This further includes developing technical solutions for the recycling and re-use of domestic wastewater such as rainwater harvesting, the re-use of grey water sources and managed aquiver recharge schemes. These technologies are of particular relevance for areas with low precipitation, strong hydrological seasonality and/or limited natural or infrastructural water storage capacity. Crucial for the success of these schemes are functional transmission and storage infrastructure, rigorous assessment of water quality, multiple-barrier approaches to protect the source water and early end-user engagement[14].

There is a critical demand for improving water infrastructure to reduce water insecurity. While the use of technological solutions such as increased utilization of low-flow taps or sensors to reduce water waste holds great potential, the uptake of such technologies requires solutions for satisfying power demands, initial investment and maintenance costs.

Promoting behavioural change with stakeholders, communities and local leadership.

The current COVID-19 pandemic has increased appreciation for hygiene globally and may serve as an opportunity to change behaviours. Besides awareness of known needs for cultural embeddedness[15], future behavioural change approaches for promoting frequent handwashing may benefit from adopting business strategies, including partnering with existing institutions and leveraging shared ambitions to deliver corporate social responsibility. Even for communities with continuous access to stable water supplies currently, rethinking the value of water (as a multi-purpose resource) and how to use it sustainably is required urgently. Climate change and population projections suggest that current water systems are unlikely to meet future water needs; consequently, household water insecurity is likely to become more prevalent. In that respect, overreliance on commercially bottled water can quickly become self-perpetuating and disincentivize investment in sustainable water infrastructure[16].

Experiences of water pollution, in particular when not detectable visually, increase scepticism about the management of water systems and may cause lasting negative impact on the perceived trustworthiness of water resources. In fact, reports of rural communities not using improved water supplies due to their doubts of provided tap water quality[17] indicate the challenges of building trust alongside securing safe water supplies. As decisions on water management and sanitation development objectives, as well as the allocation of human and financial resources, are often taken or influenced by political and community leaders at all levels, advocating for inclusive solutions across these different levels is essential. Formation of local stakeholder and expert panels is likely to increase objectivity and credibility of findings, as well as improve public perception about and adherence to the recommendations.

Providing water-independent sanitation alternatives.

Fewer than 19% of people in LMICs use soap routinely[18], highlighting the critical need for better sanitation opportunities and education as a driver of behavioural change. However, as revealed by the HWISE study, handwashing opportunities vary across regions (Fig. 1) and probably within households. Hot spots (regions) and hot moments (periods) of insufficient water access, quality or availability for handwashing will be inevitable with climate change. Thus, it is paramount to develop and widely deploy prognostic tools, such as the HWISE Scale, to understand the likelihood of extreme scenarios that require targeted relief operations, such as temporary taps or widespread use of alcohol-based sanitation products when handwashing becomes impossible.

Spatially detailed and explicit global data, such as those generated by the HWISE study[3], are required to enable identification and prioritization of the most-at-risk groups worldwide. While data presented herein focus predominantly on LMICs, it is important to note that many more groups globally are made vulnerable to the negative repercussions of water insecurity — including migratory communities, displaced persons, minority ethnic groups and indigenous communities.

A look ahead

Although this Comment is written in the context of the COVID-19 outbreak, problems with water availability, quality and access are ever-present for many people globally. Water insecurity has consequences for the mental, physical, nutritional and socioeconomic well-being of billions. Never has the urgency of the call for action on SDG 6, to “ensure availability and sustainable management of water and sanitation for all”, been so evident and meaningful to so many people. In light of this pandemic, it is clear that the human right to water for consumption is not being met.

As we consider what must be done to make the SDG 2030 Agenda a reality and better prepare societies for future global health crises, we encourage policymakers and programme implementers to prioritize WASH and consider holistic solutions that address each facet of water insecurity (water availability, quality and accessibility).

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