

# Reducing Health Inequities through Water, Sanitation, and Hygiene (WASH) Infrastructure

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**Abstract:** *This paper explores the significant health burden caused by poor WASH (Water, Sanitation, and Hygiene) infrastructure, drawing insights from existing literature. It highlights the role of inadequate water and sanitation facilities in exacerbating health inequities, with a focus on vulnerable populations such as children, women, and rural communities. The study examines how poor WASH services contribute to preventable diseases and malnutrition particularly in marginalized groups. It also discusses the interconnections between WASH and broader health outcomes, including maternal and perinatal health, emphasizing the need for improved infrastructure to address these disparities.*

**Keywords:** Water, Sanitation, Hygiene, Health, Inequities

## 1. Introduction

Access to safe water and adequate sanitation is a fundamental social determinant of health, significantly influencing health outcomes and reducing health inequities. These basic services are essential for preventing waterborne diseases such as diarrhea, cholera, and typhoid, which disproportionately affect vulnerable populations, particularly in low-income countries. Poor water and sanitation infrastructure leads to high mortality rates, especially among children under five, and perpetuates cycles of poverty and ill-health. Improving water and sanitation directly supports Sustainable Development Goal (SDG) 6 (Clean Water and Sanitation) by ensuring universal access to safe water and sanitation. It also contributes to SDG 10 (Reduced Inequalities) by addressing disparities in water access, particularly for marginalized groups. The World Health Organization (WHO) advocates for comprehensive WASH (Water, Sanitation, and Hygiene) strategies to improve global access to safe water and hygiene practices. To reduce the burden of waterborne diseases, improve public health, and foster equity by targeting vulnerable populations, WHO promotes policies that address the need for clean drinking water, safe sanitation facilities, and proper hygiene behavior, especially in underserved areas. This paper examines the health burden of poor WASH infrastructure with insights from existing literature. It discusses the impact of water and sanitation on reducing health inequities, particularly on vulnerable groups such as children, women, and rural communities.

## 2. Health Burden of Poor WASH Infrastructure

Unsafe water, sanitation, and hygiene (WASH) practices contribute to significant health losses worldwide. For example, children are particularly vulnerable to diarrheal diseases and malnutrition, while women often face challenges related to menstrual hygiene and safety in accessing sanitation. Rural communities, lacking adequate infrastructure, suffer higher rates of disease and mortality due to poor sanitation. WHO estimates from 2019, reveal that safe WASH could have prevented 1.4 million deaths

and 74 million disability-adjusted life years (DALYs). Nearly 69% of all diarrheal deaths were attributed to inadequate WASH services, resulting in over 1 million deaths. Additionally, 356,000 deaths from acute respiratory infections were linked to poor hand hygiene. These outcomes, including diarrheal diseases, acute respiratory infections, and under nutrition, highlight the critical role of safe WASH facilities in reducing preventable deaths and improving global health outcomes.

Studies have highlighted that access to clean water, proper waste management, and the adoption of hygienic practices are essential components in preventing the spread of viral infection (Seveter and Hochberg, 2016, Opere, 2023). Access to clean water and adequate sanitation services reduces the risk of waterborne diseases like cholera, diarrhea, and dysentery, which are major causes of morbidity and mortality, especially in low-income countries. The study by Opere (2023) examines the public health challenges in Kenya, including the prevalence of infectious viral diseases and the increasing burden of other infectious agents. This research emphasizes the crucial role of sanitation in reducing viral infections, highlighting the importance of access to clean water, effective waste management, and good hygiene practices in mitigating the spread of these diseases. Wolf et. al. (2023) analyzed the disease burden attributable to unsafe WASH across four health outcomes, stratifying the results by region, age, and sex for the year 2019. Their study concluded that an estimated 1.4 million deaths and 74 million disability-adjusted life years (DALYs) could have been prevented through access to safe water, sanitation, and hygiene (WASH). These figures represent 2.5% of global deaths and 2.9% of DALYs from all causes. The attributable fraction of diarrheal disease linked to unsafe WASH was 0.69, while acute respiratory infections accounted for 0.14, and under nutrition contributed 0.10.

## 3. Health Inequities due to Inadequate WASH Infrastructure

Improved access to safe water and sanitation plays a crucial role in reducing disparities in health outcomes by

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preventing waterborne diseases, malnutrition, and poor hygiene practices that disproportionately affect vulnerable groups like children, women, elderly and migrants. Safe water and proper sanitation also contribute to better nutrition, as contaminated water and poor hygiene exacerbate malnutrition and stunting, particularly in children. Mills and Cummings (2016) explore ten key areas, identified through collaboration with the United Nations Children's Fund (UNICEF), where WASH (Water, Sanitation, and Hygiene) interventions can significantly impact public health. These areas include: diarrhea, nutrition, female psychosocial stress, violence, maternal and newborn health, menstrual hygiene management, school attendance, oral vaccine efficacy, and neglected tropical diseases. The paper emphasizes how improving WASH services can play a crucial role in addressing these issues and improving overall health outcomes. Sharma Waddington (2023) conducted a systematic review and meta-analysis to assess the impact of WASH interventions on all-cause and diarrhea-related mortality in low- and middle-income countries (L&MICs), analyzing 35 studies with 48 distinct intervention arms. The results showed significant reductions in all-cause mortality for children under five years: a 34% reduction from improving water availability, 29% from hygiene promotion with accessible water, and 21% from community-wide sanitation. WASH interventions also led to a 45% reduction in diarrhea-related mortality, with the most significant impact seen in communities with the poorest sanitation infrastructure.

Sanitation facilities are crucial for women's health, addressing issues like menstrual hygiene, preventing infections, and promoting safety. Lack of access to gender-sensitive sanitation can expose women to health risks and social stigma. Poor WASH infrastructure can negatively affect maternal and perinatal health by exposing mothers to conditions that can lead to complications during pregnancy and childbirth. Augsburg and Rodríguez-Lesmes (2018) in their study on Indian households in slums and peripheral villages explores the impact of sanitation coverage on child health in semi-urban settings. They specifically examine how improvements in sanitation, particularly the use of sanitation technology, affect the growth of children under five. Their findings indicate that improved sanitation coverage significantly contributes to better height growth during early childhood, with the effect being particularly pronounced for girls. Campbell et. al. (2015) identified 77 risk mechanisms linking WASH to health outcomes, including 67 chemical or biological factors and 10 complex behavioral factors affecting maternal and perinatal health.

Socio-economic inequities in WASH infrastructure are often pronounced across the rural-urban divide, with rural areas typically facing greater challenges in accessing clean water, sanitation services, and hygiene facilities. In urban settings, especially in high-income areas, WASH infrastructure tends to be more developed and accessible, with widespread availability of clean water, efficient waste management systems, and modern sanitation facilities. In rural areas, limited access to safe water and sanitation leads to higher exposure to waterborne diseases and poor hygiene practices. This is compounded by infrastructural challenges such as poor road access, lack of funding, and inadequate

local governance to address WASH needs. Women and children in rural areas, particularly in low-income regions, bear the brunt of these inequities due to the need to travel long distances for water, often in unsafe conditions. A recent study by Keleb et. al. (2024) explores this dimension. This study examines the disparities in access to basic sanitation services between rural and urban households in Ethiopia using data from the 2019 Ethiopian Demographic and Health Survey (EDHS). A sample of 8,663 weighted households was analyzed, collected through stratified sampling techniques. The findings reveal significant inequalities in sanitation access, with rural households having substantially lower access compared to urban households. Key factors influencing these disparities were identified as the age and education level of the household head, family size, regional location, and proximity to water sources.

However, even in urban contexts, informal settlements or slums often experience inadequate WASH services, exacerbating health disparities among the urban poor. Slums often have limited access to clean water, relying on shared or unsafe water sources, leading to waterborne diseases like diarrhea and cholera. In India for example, between 2010 and 2020, the proportion of the urban population living in slums shows a decrease from 52% to 49% (data.worldbank.org). Despite this modest decline nearly half of urban residents still face inadequate standards of living. Overcrowded living conditions in these slums intensify the spread of infectious diseases, such as respiratory and skin infections, due to shared sanitation facilities and limited personal space. The lack of gender-sensitive sanitation facilities raise significant safety and dignity concerns for women and girls, hindering effective menstrual hygiene management. Additionally, children in slums face disproportionate impacts from poor sanitation, experiencing higher rates of malnutrition, stunting, and preventable illnesses. Research by Jaiswal (2016) and Augsburg and Rodríguez (2018) has delved into WASH challenges in slums, examining critical issues related to water, sanitation, and hygiene infrastructure and their impact on urban marginalized communities. Wulandari et. al. (2024) examines the current state of water pollution and sanitation in Indonesia, highlighting its health and environmental impacts. A systematic review methodology was employed to ensure rigor and transparency, adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Their study concluded that in Indonesia, inadequate sanitation facilities, such as a lack of safe drinking water and availability of clean and hygienic toilets, are prevalent not only in rural areas but also in peri-urban regions.

#### **4. Discussion**

Programs and policies need to prioritize the development and maintenance of WASH infrastructure in rural, remote, and slum areas where access to clean water and sanitation is limited. Investing in infrastructure in rural areas could involve constructing wells, clean toilets and water supply systems, particularly in regions with the high rates of waterborne diseases. Promotion of gender-sensitive WASH policies and programs designed to address the specific

needs of women and girls can help mitigate gender-based health disparities. These include ensuring availability of safe sanitation facilities that cater to menstrual hygiene needs, improving community sanitation and promoting hygiene education with a focus on schools. Involving local communities in designing and implementing these programs would go a long way to ensure cultural relevance and community ownership and ensure that these initiatives are successful. Peri-urban areas are characterized by rapid population growth, diverse land use, and a mix of urban and rural lifestyles. These areas often experience challenges related to urban expansion, such as inadequate infrastructure, limited access to basic services like water and sanitation. Due to their transitional nature, these regions often lack the formal infrastructure and services found in established urban centers, such as efficient water supply, sewage systems. At the same time peri-urban areas play a critical role in urban development and require targeted policies to address the unique issues stemming from their hybrid nature.

To create awareness about safe hygiene practices, digital media can be a highly effective tool. Platforms like Facebook and Instagram can be used to share engaging content, including infographics, videos, and testimonials, in local languages emphasizing the importance of hygiene practices like handwashing, safe water storage, and sanitation. Digital media ensures a wide reach and allows for innovative, scalable methods to promote hygiene, encouraging positive behavioral shifts across diverse groups.

Addressing disparities from poor WASH infrastructure requires targeted investments in clean water, sanitation, and hygiene services, alongside inclusive policies. Strengthening WASH systems can significantly reduce preventable diseases, improve health outcomes, and promote equity across diverse populations.

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## Online Resources

- 1) <https://www.who.int>