

A Cascade of Impacts: The Many Ways Water Affects Child Development

For the full paper on which this brief is based, see “A Cascade of Impacts: The Many Ways Water Affects Child Development: Working Paper No. 2.”

Water is essential for life. It comprises around 60% of the adult human body and 75% of infants’ bodies.¹ Organs such as the brain, heart, kidney, and lungs are more than threequarters water and require continued hydration to function optimally.² Our bodies need water to dissolve food, absorb nutrients, dissipate heat, distribute blood, protect our brains from physical shocks, and more.^{1,3,4} Children drink more water per pound of body weight than adults, with infants consuming the most water of any age group, whether through breast milk or formula prepared with water.⁵ **Given the body’s near-constant need for water, its availability and quality are critical for child development and lifelong health.**

However, freshwater supplies are increasingly endangered due to extended droughts, largescale farming of water-intensive crops in arid climates, overuse of local water sources, and toxic contamination.⁶ Climate change exacerbates water supply challenges by worsening droughts and floods. Warmer temperatures accelerate evaporation, leading to intense storms that can overwhelm water infrastructure, causing floods that disrupt water treatment and management systems and introduce pollutants into water supplies.^{7,8}

Historical and current policy decisions have created systemic inequities, leading to significant disparities in access to clean water, particularly in Indigenous, rural, and minoritized communities. **New policy, system, and program-level decisions must begin by addressing disparities, ensuring we can increase the availability of safe, clean water for all people, with profound effects on the development, health, and well-being of our children.**^{9,10,11}

How Water Affects Children’s Health, Learning, and Behavior

Young children require more water than adults due to their rapidly developing organs, making them more sensitive to water contaminants like toxic metals, chemicals, viruses, and parasites.¹² Clean water is essential for health during pregnancy—and even before conception.^{14,15} Water is one of the primary ways people are exposed to hormone-disrupting chemicals, and exposure of either biological parent before conception has been linked to a reduced ability to become pregnant and reduced birthweight in their babies, as well as an increased likelihood of long-term health issues for their children.^{16,17} Access to clean water across the lifespan significantly reduces these effects, but water contaminants are just one of many ways water affects development. A range of disruptions in the availability and quality of water can affect child development through multiple pathways, including the ones outlined below.

- **Brain Development:** The brain needs adequate water and nutrients to function properly—even mild dehydration can impair children’s attention and memory.¹⁸ Contaminants in drinking water can disrupt brain development, particularly in early childhood when the brain’s protective membrane is not fully developed, leading to potential long-term cognitive and behavioral issues.^{5,19} Additionally, children’s brain development and mental health can also be affected when there is too much or too little water in the environment around them, such as during flooding or drought, which can cause lasting impacts such as anxiety, depression, and memory deficits.^{20,21,22,23,24}
- **Infections and the Immune System:** Floods can expose children to a variety of pathogens and chemicals, leading to increased rates of infections and gastrointestinal issues.²² Additionally, exposure to certain chemicals in drinking water can suppress immune functioning and increase the risk of chronic diseases.²⁵
- **Nutrition:** Reliable access to clean water is essential for growing, washing, and cooking nutritious foods, with contaminated water leading to lower crop yields and nutritional value.^{26,27} Both droughts and floods can reduce crop production, affecting children’s access to high-quality food.²⁷ Contaminated water can also expose infants and children to harmful substances, emphasizing the importance of water quality for health and nutrition.

To read about specific water contaminants, like lead, plastics, and PFAS, see the section “Protecting Children from Water Contaminants” in the [working paper](#).

Policy Solutions Must Begin by Addressing Disparities

In 2010, the United Nations General Assembly explicitly recognized the human right to affordable and safe drinking water. The US abstained from voting on this resolution and has never recognized the human right to water; instead, water has been treated in the context of property rights.²⁸ This approach often excludes Indigenous people, leading to significant disparities in water access and quality for Native American households.¹⁰ Historical policies like racial “underbunding”—a practice that drew irregular boundaries purposefully excluded communities of color from municipal incorporation—have also excluded communities of color from essential water and sanitation infrastructure investments, leaving them to rely on poor-quality services.²⁹ Additionally, communities with higher proportions of Black and Latine residents often face harmful levels of contaminants in their water due to the placement of manufacturing plants and other facilities near their watersheds.³⁰ Similar zoning decisions have placed low-income populations in disaster-prone areas without sufficient disaster preparedness. Communities across the US and worldwide are also facing unprecedented threats to their clean water supply, and threats such as flooding and droughts are increasing due to climate change.

Policy decisions have contributed to these issues over time, which means new policy decisions can help alleviate them. Addressing threats to the supply of clean water requires mitigating their effects, through targeted public investment in water infrastructure, prioritizing underserved communities, and ensuring transparent fund management, as well as tackling their root causes by reducing fossil fuel consumption. Many community leaders and policymakers are already mobilizing to good effect and should be empowered to continue. Below is a selection of actions through which community leaders and policymakers can have an important impact and act on behalf of children.

- **Improve protections & enforcement at the state & federal levels.** Equal enforcement of national water protection standards is necessary to reduce exposure to contaminants, with regulations informed by community input, research, and healthcare providers. Federal and state agencies, such as the EPA, must be supported in their efforts to protect child health.
- **Make water affordable.** Customers pay water system owners for water services, with privately owned systems typically charging higher rates than municipal ones. Despite the Low-Income Household Water Assistance Program (LIHWAP) helping 1.4 million households maintain water access through September 2023, the program ended in March 2024, highlighting the need for a permanent solution.³¹
- **Support healthy development generally.** While protecting everyone from toxic contaminants is the primary goal, interventions like enriched educational opportunities, supportive relationships, and good nutrition can mitigate the negative effects of exposure to contaminants on child development and health across the lifespan.^{32,33,34,35,36}
- **Make testing & filtering widely available.** Resources such as farm subsidies and SNAP benefits (food stamps) can be used as models to overcome water testing and filtration barriers, with practitioners connecting patients to relevant programs. After disasters like floods, comprehensive water quality testing and financial resources from the EPA can support, and technologies like point-of-use filtration can supplement public systems.^{37,38}
- **Improve the resilience of current water systems with hybrid models of “green” & “gray” infrastructure.** Combining green infrastructure, such as green spaces and bioswales, with gray infrastructure, like updated sewer systems and flood barriers, enhances resilience against storms and flooding, which can better protect children by reducing water pollution and flood risks.^{39,40}
- **Engage in “citizen science.”** In the face of government inaction on water issues, citizen-led action and community-engaged research can be powerful tools. This was demonstrated in Flint, Michigan, where activists and researchers successfully validated concerns about water quality and instigated protective measures.⁴¹

To read more about these solutions and find resources for taking action, see the full paper, [A Cascade of Impacts: The Many Ways Water Affects Child Development: Working Paper No. 2](#), and the related [Children’s Spotlight](#).