

Extreme Heat Affects Early Childhood Development & Health

For the full paper on which this brief is based, see “Extreme Heat Affects Early Childhood Development and Health: Working Paper No. 1.”

Personal experience, common sense, and scientific evidence all confirm that temperatures are rising across the United States and globally, with record-setting heat waves occurring more frequently and lasting longer than before. Increasing temperatures and heat waves impact every cell and organ system in the human body. And, while the dangers of excessive heat on populations like older people are well recognized, its impacts on pregnancy, infancy, and childhood often get less attention. However, the consequences, including low birth weight, learning loss, and heat-related illnesses, are significant.

Extreme heat affects infants and young children more than most adults because their smaller bodies heat up more quickly, and they have less capacity to release heat via sweating.

The biological systems that regulate body temperature in infants and young children are less developed and, therefore, less efficient. Infants and young children also can't seek out cooler environments or get water to drink without relying on adults. Children and adolescents with chronic health conditions, such as asthma, obesity, or diabetes, are even more susceptible to heat-related illnesses. The effects of heat on infants and young children are influenced by a range of factors that, when combined, influence how they are affected. Chief among these factors is socioeconomic inequalities, which disproportionately impact marginalized racial and ethnic groups. Read more about structural disadvantage and other factors that shape the impact that excessive heat has on a child's health and development in the full [Working Paper](#).

Practical, actionable solutions exist to prevent or minimize these impacts, and many communities, organizations, and nations have already begun implementing them to good effect. More information about existing strategies and solutions can be found below and in our [Heat Policy Action Guide](#).

Heat Has Especially Powerful Effects on Babies and Young Children

During periods of extreme heat, the physiological changes in pregnancy pose additional risks, as heightened metabolism and increased body mass already generate more heat, potentially leading to preterm birth. Elevated temperatures also correlate with increased rates of stillbirth and low birth weight infants, which are linked to long-term health complications. In young children, their reduced capacity to sweat and dissipate excess heat can result in severe consequences, including muscle breakdown, kidney failure, seizures, and even death. In addition to these immediate effects, heat can disrupt development through three distinct pathways:

- **Learning loss:** Heat affects cognitive function and concentration, with studies indicating that optimal classroom temperatures for enhanced performance are 72°F (22°C) or lower. Heat can lead to slower reaction times, difficulty focusing, and disrupted sleep patterns, affecting early childhood cognitive function and learning. Uncomfortably hot classrooms can make students and teachers feel unmotivated, distracted, or irritable, potentially leading to intentional school absences. Fortunately, air conditioning and other cooling methods, such as heat pumps, appear to offset most of the disruptive impacts of heat events on learning, pointing to the effectiveness of cooling as a practical solution that is already widely available in many states, but unfairly distributed by income, ethnicity, and location.
- **Sleep quality:** Getting enough good-quality sleep is essential for healthy growth and development. Evidence shows associations between less sleep in infancy and childhood obesity, and sleep habits in childhood may impact weight well into adulthood. Sleep deficits in infancy also increase the likelihood of experiencing emotional and behavioral challenges in early childhood, disrupted language development, and reduced problem-solving skills. Temperature plays an integral role in sleep quality. As the body prepares for sleep, core body temperature typically decreases, facilitating the onset of sleep. External heat can prevent this, leading to poor sleep and potentially negative outcomes. However, evidence has shown that infant sleep patterns can rebound after heat waves, demonstrating that the negative impacts of a heat wave are not permanent and can be remediated by reducing infants' exposure to heat in the future.
- **Mental and behavioral health:** The brain detects extreme heat as a threat to well-being, which activates the stress response system. Excessive activation of the stress response system during pregnancy and in young children can disrupt the development of healthy emotional regulation circuits in the developing brain. Excessive heat also increases violent crime, conflict, and suicide through a combination of environmental factors and biological changes. Because young children are so powerfully affected by the environments and relationships around them, efforts that reduce the effects of heat in a community can mitigate factors that contribute to the development of mental and behavioral health problems in children.

Effective Strategies Can Create a Multiplier Effect

Strategies that address high temperatures and other aspects of climate change are also strategies that promote the healthy development of children. **The harmful effects of excessive heat must be addressed through strategies directed at three levels:**

1. **Immediate actions** to reduce harm from extreme heat events;
2. **Adapting our services, systems, and infrastructure** to be better positioned to withstand increased heat; and
3. **Addressing the root causes** behind our rapidly heating planet.

Solutions at each level can be implemented through local, county, state, and federal policy, as well as social services, education, and health care. This must be done in consultation with local communities and leaders to address local needs effectively. To address the effects of excessive heat on children, policymakers and community leaders can learn from a range of practical strategies and approaches already demonstrating positive impact in communities throughout the country and the world:

- **Consider where people spend time during pregnancy and childhood.** Childcare programs, K-12 schools, summer programs, homes with young children, and more, should be evaluated for their ability to protect people during pregnancy and childhood from exposure to excessive heat and provide what they need to withstand it. Ensuring cooling options are available during pregnancy should be considered integral to prenatal care.
- **Improve structural cooling options.** New building architecture, retrofitting of older buildings, and urban planning can reduce heat and efficiently use energy. As one example, urban greening campaigns that increase tree canopies and surfaces covered with vegetation can decrease air temperatures and provide shade.
- **Install air conditioning and other cooling mechanisms.** More than \$13 billion is lost per year in lower future earnings due to learning losses from school days that are just 7°F higher than current averages. Yet, the annualized cost of installing and maintaining HVAC systems in all U.S. public schools would be less than one-third of that amount. A range of less power-demanding solutions also exist, from heat sinks to “swamp coolers.”
- **Provide support for affordable, reliable access to the power grid, with particular emphasis on power from sustainable sources.** Getting an air conditioner is no help if it can't be powered or if power is unaffordable. In some areas, pediatricians are helping families document the medical necessity of maintaining access to utilities; health insurance may even pay for utility bills in some states.
- **Develop heat action plans.** Communities and healthcare systems can come together to build community resilience. Heat action plans coordinate local government response with other agencies, healthcare facilities, and community organizations.

To read more about these solutions, see the full paper, “[Extreme Heat Affects Early Childhood Development and Health: Working Paper No. 1](#)” and related [Action Guide for Policy](#).