

Effects of heat on early childhood

Extreme heat affects us all, but pregnant women and young children are particularly vulnerable. This brief aims to deepen understanding of this issue and propose actionable steps.

Since the 1950s, heatwaves have been steadily increasing in frequency, duration and intensity across the world, causing more deaths globally than any other extreme weather.¹ According to the Intergovernmental Panel on Climate Change (IPCC), a heatwave is a period of abnormally hot weather, lasting from two days to months. However, there is no universal given temperature that defines what is extreme heat. Heatwaves are relative to a location's typical climate: the same meteorological conditions can constitute a heatwave in one place but not in another.

Descriptions of heatwave measurements

Extreme high temperatures:

Where an average of 83.54 or more days a year exceed 35°C

High heatwave frequency:

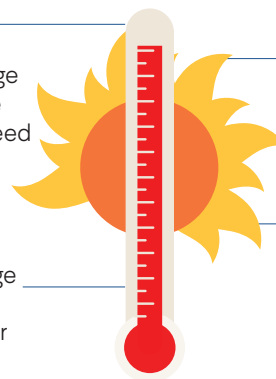
Where an average of 4.5 or more heatwaves occur per year

High heatwave duration:

Where an average heatwave event lasts 4.7 days or longer

High heatwave severity:

Where the average heatwave event is 2°C or more above the local 15-day average



Source: UNICEF (2022)

In recent years, Asia has been particularly affected by heat, having experienced warming that has nearly doubled since the period of 1961-1990.² In April and May 2024, parts of South and South-East Asia experienced intense heat, causing a humanitarian crisis in parts of the region.

3 out of 4 children in South Asia are exposed to extreme heat (compared to 1 in 3 globally).⁷

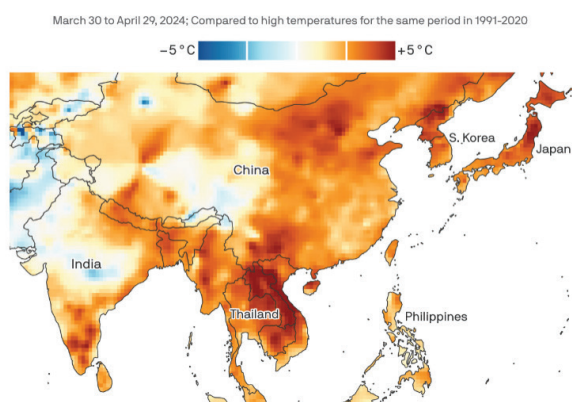


Figure 1: Temperature variations in the region today are higher by up to 5 degrees Celsius, compared to 1991-2020.

Source: *Data: CPC Global Unified Temperature data provided by NOAA PSL; Map: Erin Davis/Axios Visuals*

1. Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) <https://www.ipcc.ch/report/sixth-assessment-report-cycle/>

2. <https://www.unocha.org/publications/report/bangladesh/asia-and-pacific-heatwaves-south-and-south-east-asia-april-2024-17-may-2024>

Young Children Are Extra Vulnerable to Heat

Young children, particularly infants, are less able to regulate their body temperatures compared to adults. Their smaller bodies absorb more heat from the environment,³ and have less capacity to release heat via sweating (the primary mechanism for cooling) as they have underdeveloped sweat glands.⁴ Because of lower proportional cardiac output compared to adults, children adjust to heat changes more slowly.⁵ Extreme heat is also known to be linked to jaundice, neurological dysfunction and dehydration in infants.⁶ It activates the stress response system, which can disrupt the development of healthy emotional regulation circuits in the developing brain.⁷ Furthermore, there is growing evidence that heat exposure may lead to stunting and wasting.^{8,9}

Young children are less able to thermo-regulate themselves. They absorb more heat and are less able to release heat via sweating.



A boy splashes his face with water in a bid to get some relief from the heat during the May 2024 heatwave in Delhi, India. Photo credit: Aman Kanajia (photographer) and Rocket Learning

In addition, young children are reliant upon adults to ask for water or move to cooler environments. A sobering example of this is infants who have died from being left in cars.¹⁰ While there is no systematic collection of vehicular heatstroke childhood fatalities in the region, there are occasional reports of distracted caregivers who have left their infants in cars. In 2023, due to the occurrence of several such deaths, child rights advocates in Malaysia issued a public statement urging a series of preventative interventions.¹¹ Finally, children often spend more time outdoors than adults for play, sports and other activities, putting them at greater risk for heat exposure and injury.

3. <https://www.unicef.org/stories/heat-waves-impact-children>

4. Tsuzuki-Hayakawa, Kazuyo, Yutaka Tochihara, and Tadakatsu Ohnaka. "Thermoregulation during heat exposure of young children compared to their mothers." *European journal of applied physiology and occupational physiology* 72.1 (1995): 12-17.

5. Rowland, Thomas. "Thermoregulation during exercise in the heat in children: old concepts revisited." *Journal of Applied Physiology* 105.2 (2008): 718-724.

6. Nakstad, Britt, et al. "How climate change may threaten progress in neonatal health in the African region." *Neonatology* 119.5 (2022): 644-651.

7. Early Childhood Scientific Council on Equity and the Environment (2023). *Extreme Heat Affects Early Childhood Development and Health: Working Paper No. 1*. Retrieved from <https://developingchild.harvard.edu/resources/extreme-heat-affects-early-childhood-development-inbrief/>

8. Blom, Sylvia, Ariel Ortiz-Bobea, and John Hoddinott. "Heat exposure and child nutrition: Evidence from West Africa." *Journal of Environmental Economics and Management* 115 (2022): 102698.

9. Tusting, Lucy S., et al. "Environmental temperature and growth faltering in African children: a cross-sectional study." *The Lancet Planetary Health* 4.3 (2020): e116-e123.

10. McLaren, Catherine, Jan Null, and James Quinn. "Heat stress from enclosed vehicles: moderate ambient temperatures cause significant temperature rise in enclosed vehicles." *Pediatrics* 116.1 (2005): e109-e112.

11. <https://www.thestar.com.my/news/nation/2023/10/26/work-together-to-stop-deaths-of-kids-left-in-cars-says-group>

Impacts on Maternal and Newborn Health

Pregnant women face heightened risks due to increased metabolic heat production required to support fetal growth and the strain from increased body mass.¹² Impacts of extreme heat may manifest as heat-related illness in the pregnant woman as well as affecting the development of the fetus. Exposure to extreme heat in the first trimester may change the genetic makeup of the fetus leaving it less capable of coping with heat stress.¹³

High temperatures may also result in reduced blood flow in the placenta, dehydration and inflammation, which can trigger preterm birth. There is evidence of increased rates of stillbirth¹⁴ during periods of high temperatures, as well as more premature and low birth weight babies, all of which are linked to a greater risk of poor outcomes later in life, including impaired cognition, reduced growth and chronic health issues such as cardiovascular disease and diabetes in adulthood. Newborns have a greater risk of being born with various congenital defects, including congenital heart defects,¹⁵ spina bifida and cranio-facial defects. In Bangladesh, it was found that women delivering on hot days were 14% more likely to have newborns with neonatal illnesses compared to cooler days.¹⁶



Risks to physical health from a heatwave

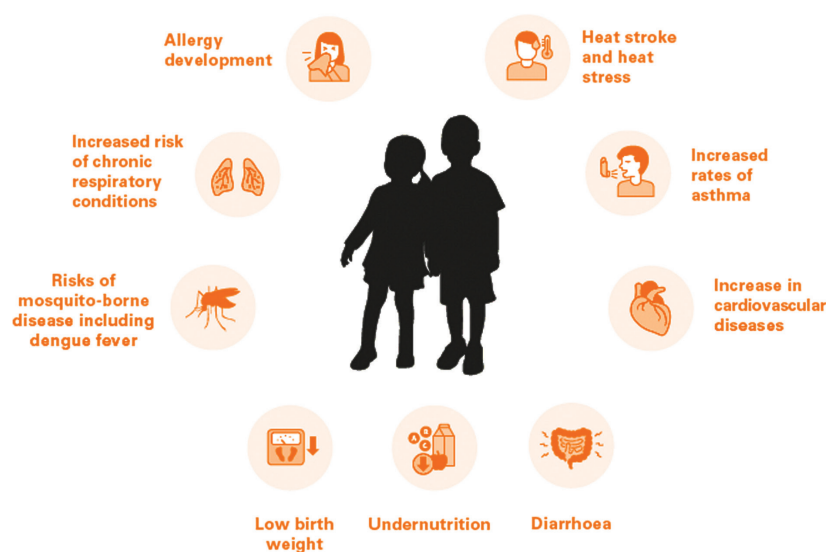


Figure 2: Adapted from Pg 13, United Nations Children's Fund, *The Coldest Year of the Rest of their Lives: Protecting children from the escalating impacts of heatwaves*, UNICEF, New York, October 2022.

12. Chersich, Matthew Francis, et al. "Associations between high temperatures in pregnancy and risk of preterm birth, low birth weight, and stillbirths: systematic review and meta-analysis." *bmj* 371 (2020).

13. Samuels, Louisa, et al. "Physiological mechanisms of the impact of heat during pregnancy and the clinical implications: review of the evidence from an expert group meeting." *International Journal of Biometeorology* 66.8 (2022): 1505-1513.

14. Yang, Hsiao-Yu, Jason Kai Wei Lee, and Chia-Pin Chio. "Extreme temperature increases the risk of stillbirth in the third trimester of pregnancy." *Scientific Reports* 12.1 (2022): 18474.

15. Haghighi, Marjan Mosalman, et al. "Impacts of high environmental temperatures on congenital anomalies: a systematic review." *International journal of environmental research and public health* 18.9 (2021): 4910.

16. Mannan, Ishtiaq, et al., 'Vulnerability of Newborns to Environmental Factors: Findings from community based surveillance data in Bangladesh', *International Journal of Environmental Research and Public Health*, vol. 8, no. 8, August 2011, pp. 3437-3452.

Indirect Impacts of Heat

Apart from the direct impacts of heat-related illnesses, heatwaves also lead to significant indirect impacts on young children and their caregivers, some of which are lifelong.



1. Learning Loss

Heat affects the brain's ability to focus and react. In addition, schools and other learning environments may close during extreme heatwaves. Children perform worse on cognitive and aptitude tests under conditions of high heat. When children are confined indoors, they have reduced opportunities to play, learn and connect to nature, thereby affecting their socio-emotional development.

In April 2024, extreme heat forced the closure of all schools in Bangladesh, affecting 33 million children, as temperatures soared to 42°C. This is the second consecutive year that Bangladesh has been forced to close schools. The worst hit were poor children in rural areas whose families couldn't afford devices like laptops and tablets to facilitate remote learning.



2. Mental and Emotional Distress

Heat leads to increased irritability and aggression. Studies show that violent crimes like murder, aggravated assault and rape, terrorist attacks and mass shootings are more likely when temperatures climb.^{17,18} Children who experience or witness acts of violence have an activated stress response that can cause long-lasting trauma and a decreased sense of physical and psychological safety.¹⁹



3. Sleep

Temperature plays a key role in sleep quality. During a heat wave, infants can take longer to fall asleep, have less sleep, or lesser quality sleep.²⁰ 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.²¹ Sleep disruption can in turn impact caregivers and lead to emotional and behavioral challenges, affecting their ability to provide responsive care under the nurturing care framework.

17. Heo, Seulkee, et al. "A nationwide time-series analysis for short-term effects of ambient temperature on violent crime in South Korea." *Scientific reports* 14.1 (2024): 3210.

18. Tiihonen, Jari, et al. "The association of ambient temperature and violent crime." *Scientific reports* 7.1 (2017): 1-7.

19. <https://developingchild.harvard.edu/guide/a-guide-to-toxic-stress/>

20. Berger, Sarah E., et al. "The impact of extreme summer temperatures in the United Kingdom on infant sleep: Implications for learning and development." *Scientific Reports* 13.1 (2023): 10061.

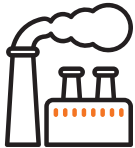
21. Paruthi, Shalini, et al. "Consensus statement of the American Academy of Sleep Medicine on the recommended amount of sleep for healthy children: methodology and discussion." *Journal of clinical sleep medicine* 12.11 (2016): 1549-1561.



4. Nutrition

Rising temperatures and heat waves contribute to the severity and duration of droughts, adding to crop failure and threatening children's access to food and water. Food insecurity caused by heat waves has severe impacts on child nutrition.²²

In April 2024, a heatwave and accompanying drought caused a mass fish die-off in a reservoir in south Vietnam's Dong Nai province. Farmers also struggled to keep their crops alive.



5. Air Pollution

Excess heat increases the risk of wildfires, therefore increasing the amount of smoke pollution. Studies indicate a significant impact on pregnancy outcomes, with wildfire smoke exposure linked to a 92% increase in premature births, equating to an additional 13,600 premature births annually. During times of elevated temperatures, harmful compounds like ozone and particulate matter are more likely to stay in the air. Within cities, neighborhoods with the highest temperatures tend to have the most polluted air and the highest rates of childhood asthma.²³ Read our air pollution brief at <https://arnec.net/node/466> to learn more about how air pollution affects early childhood development.



6. Vector-Borne disease

The rise in temperatures also facilitates the spread of vector-borne diseases such as malaria and dengue. Dengue is the world's fastest-spreading vector-borne disease.²⁴ Infected mosquitoes thrive in humid environments and stagnant water, conditions that are exacerbated by extreme heat, and mosquito seasons are prolonged when cooling temperatures are delayed. Higher temperatures correlate with increased transmission rates of these diseases, posing additional health risks to children.²⁵

22. Rahman, Md Ashikur, et al. "Nexus between heat wave, food security and human health (HFH): developing a framework for livelihood resilience in Bangladesh." *Environmental Challenges* (2023): 100802.

23. Hoffman, Jeremy S., Vivek Shandas, and Nicholas Pendleton. "The effects of historical housing policies on resident exposure to intra-urban heat: a study of 108 US urban areas." *Climate* 8.1 (2020): 12.

24. Colón-González, Felipe J., et al. "Projecting the risk of mosquito-borne diseases in a warmer and more populated world: a multi-model, multi-scenario intercomparison modelling study." *The Lancet Planetary Health* 5.7 (2021): e404-e414.

25. Zain, Amanda, et al. "Climate change and its impact on infectious diseases in Asia." *Singapore Medical Journal* 65.4 (2024): 211-219.

Why Heatwaves Will Get Worse

On a global level, the increase in heatwaves and other extreme weather patterns can be attributed to climate change. Since the 1800s, human activities have been the main driver of climate change, primarily due to the burning of fossil fuels like coal, oil and gas. Burning fossil fuels generates greenhouse gas emissions that trap the sun's heat and raise temperatures.²⁶ Even though international agreements to curb emissions have been established, the world is still emitting record levels of carbon.

Greenhouse gas emissions

Greenhouse gas emissions¹ include carbon dioxide, methane and nitrous oxide from all sources, including land-use change. They are measured in tonnes of carbon dioxide-equivalents² over a 100-year timescale.

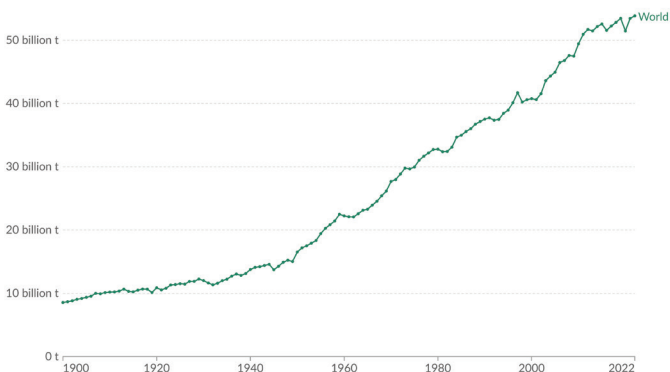


Figure 3: Increase in GHG emissions since 1900. Data source: Jones et al. (2024). Image source:

[OurWorldinData.org/co2-and-greenhouse-gas-emissions](https://ourworldindata.org/co2-and-greenhouse-gas-emissions)

Average temperature anomaly, Global

Global average land-sea temperature anomaly relative to the 1961-1990 average temperature baseline.

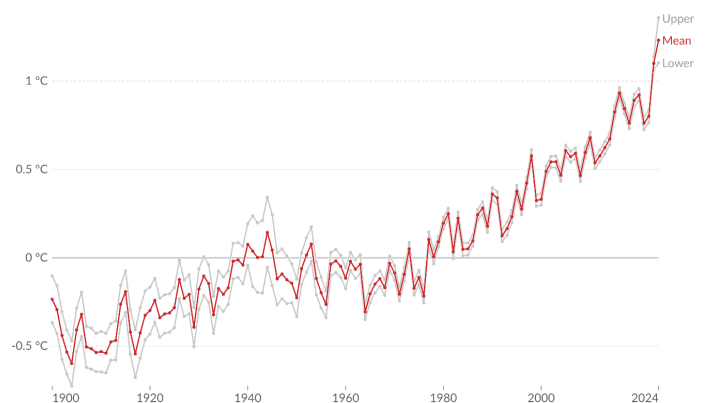


Figure 4: Increase in global temperatures since 1900. Note: The gray lines represent the upper and lower bounds of the 95% confidence interval.

Data source: Met Office Hadley Centre (2024) Image source:

<https://ourworldindata.org/co2-and-greenhouse-gas-emissions>

In cities, the urban heat island (UHI) effect amplifies the impact of rising temperatures from climate change. The UHI can make urban areas significantly hotter than rural areas, and within cities, temperatures can vary enormously depending on tree cover, the amount of heat-absorbing cement, asphalt and other surfaces, the interruption of air flow and the presence and density of residential, commercial, industrial and transport activities.

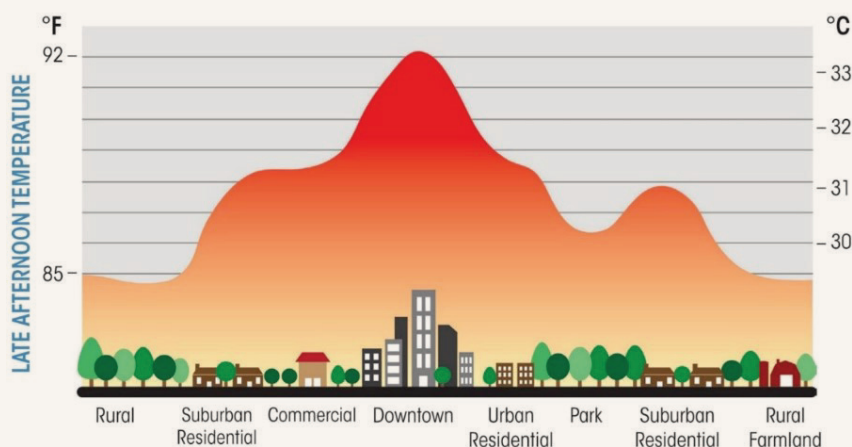


Figure 5: The Urban Heat Island (UHI) Effect. Image Source: <https://ecointelligent.com/2017/04/13/the-urban-heat-island-effect/>

26. <https://www.un.org/en/climatechange/what-is-climate-change>

Satellite data analysis of 100 East Asian cities from 2016 to 2020 reveals that the UHI effect contributes to temperatures up to 2 degrees Celsius warmer than surrounding rural areas within a 10-kilometer radius. In cities like Phnom Penh, Cambodia, the UHI effect results in 23–25 additional heat wave days annually, a number projected to potentially double by 2050 in certain districts.²⁷ The UHI effect is particularly important for Asia, which has the world's most populous and rapidly growing cities. According to the Asian Development Bank, another 1.1 billion people will live in the region's cities in the next 20 years.



In Singapore, the use of large trees along pavements helps provide shade to pedestrians and cool down ambient temperatures. Interventions such as increasing roadside greenery and shade, help to combat the UHI effect.
Credit: Dharmendra Kumar Tiwari / Alamy Stock Photo



A boy cools down with water spray in Dhaka, Bangladesh during a heatwave in May 2024. Across the region, scorching hot temperatures have resulted in heat-related deaths, school closures and withered crops. Credit: md zakirul mazed konok / Alamy Stock Photo

While all of us will be affected by heatwaves, lower-income countries and neighborhoods will bear the biggest burden. Poorer communities often lack access to cooling methods such as air conditioning, ventilation, green spaces, swimming pools and clean water. Likewise, children who are ill or disabled will face more challenges in accessing medical and other services. They will be more affected by heatwaves, leading to more heat-related illnesses and widening existing disparities.

²⁷. Wellenstein, Anna, et al. "How Can East Asia's City Leaders Rise to the Extreme Urban Heat Challenge?" World Bank Blogs, 21 Dec. 2023, blogs.worldbank.org/en/eastasiapacific/how-can-east-asias-city-leaders-rise-extreme-urban-heat-challenge#:~:text=The%20UHI%20effect%20is%20a,ti me%20because%20of%20climate%20change.

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Spotlight Story

Heat Forces the Closure of Rural Childcare Centers in India

In May 2024, severe heatwaves affected India, with temperatures as high as 50 degrees Celsius. In Lucknow, the capital of the Indian state of Uttar Pradesh, Jaanki, an Anganwadi worker, observed how heat affected the children under her care.

An Anganwadi is a type of childcare center in India, where resources such as electricity and water can be limited. Anganwadi form the backbone of early childhood care in rural India, providing children with age-specific, play-based activities, and supporting physical, cognitive and emotional development. They can also facilitate provision of basic health care services such as oral rehydration salts and medication.

According to Jaanki, climate change in the form of extreme heat, rain and cold has hindered the proper functioning of the Anganwadi. With heatwaves worsening, many children in her village have been reporting sick due to dehydration and heat stroke, resulting in a significant drop in attendance.

In mid-May, the district administration decided to close all Anganwadi centres until the heatwave subsided. While this was done in the interest of health, it had the unintended consequence of preventing children from learning and impeded the ability of their caregivers to attend to other responsibilities. One such caregiver is Seema, a mother of four living in a settlement in Lucknow. Due to the closures, Seema has had to take her youngest child with her to her job as a house maid. Her other three children were left to wander around the home and village. She struggled to focus on her chores in the heat, and her children were not able to get adequate sleep at night. Seema could only pray for the rain to come soon, so that temperatures would go down.



Seema, a mother of four, struggles with daily life during a heatwave.

Photos and story contributed by the Centre for Learning Resources, India. <https://clrindia.org/>

A call to action: What can we do?

Effects of heat on early childhood

We can all play a part in reducing the impacts of heatwaves for children and pregnant women. It will take action at an individual, community, institutional, sub-national and national levels to have a heat-ready society. Key action steps categorized according to these levels are outlined below. Please note that the categorization of actions is a guide, and not meant to be prescriptive. There may be instances where you can do more than what is suggested for your level. Depending on your role and resources, there is plenty that can be done in preparation for, and during, a heatwave.



At the Individual and Family Level



Be prepared

- » Get updated weather information so that you know how hot it is going to be for the day, week and month, and make plans accordingly.
- » Be aware of the signs and symptoms of various heat-related illnesses (see Table A below).
- » Keep an emergency kit at home containing towels (to wet and cool a person suffering from heat effects), oral rehydration salt (ORS) packets and a thermometer. Give ORS mixed into water to anyone with extreme sweating, especially children who might have played outside.

Table A: Symptoms of Heat-Related illnesses

Milder Symptoms	Home Treatment
<ul style="list-style-type: none">» Dry lips, sticky mouth» Excessive thirst» Excessive sweating» Weakness, dizziness» Small blisters, rashes» Slightly elevated temperature» Cramps, usually in arms and legs» Nosebleeds  <p>Infants and young children may also appear irritable and cry. Pregnant women may appear to have cramps in their stomach.</p>	 <p>Cool the person: Bring the person to the coolest part of the house, turning on the air-conditioning or fans if available. Remove excess layers of clothing and apply wet towels or cloth to the skin at head, neck, armpits and groin. If available, apply cold water and ice over the person's body. Hands and feet can be put into containers of cool water. Do not immerse infants and young children into very cold water. Do not point fan at the face, especially with infants.</p> <p>Rehydrate: Supply the person with clean and cool water. If the person has been sweating a lot, mix some oral rehydration salts (ORS) into the water. Breastfeed infants under 6 months to rehydrate them.</p>

Severe Symptoms

- » Confusion, seizures, listlessness
- » Nausea, vomiting
- » Very high temperature (above 40°C) for more than two hours
- » Dark urine
- » Lack of urine
- » Rapid heartbeat
- » No sweat (but skin may be wet and hot)
- » Unconscious, coma

In addition, infants and young children may cry without tears, have sunken eyes and/or forehead, and be extremely irritable.

Pregnant women may have extreme nausea, early contractions, swelling of body parts and severe muscle cramping.

Medical Emergency

Call an emergency ambulance or take them to the hospital immediately.



While waiting for the ambulance, conduct home treatment as described above.



Stay cool and hydrated

- » Avoid going outside in the middle of the day when it is hottest.
- » Keep your home cool by closing curtains during the hottest parts of the day, and opening windows at night to cool the house. Consider coating or painting roofs with a light colored reflective paint.
- » Carry a water bottle with you when you are on the move, and drink plenty of fresh, clean water at regular intervals.
- » Choose water or traditionally recommended drinks (for example, Nimbu Pani in India and Pandan in Malaysia) for rehydration over coffee, tea or soft drinks. Caffeine, alcohol and sugar can affect sleep and well-being.
- » Lactating mothers should continue breastfeeding throughout the hot season. Make sure that breastfed infants are not supplemented with water during this time.
- » Use electric fans only when temperatures are below 40 °C / 104 °F. In temperatures above 40 °C / 104 °F, fans will heat the body.



Lactating mothers should continue to breastfeed their infants and young children. Infants who are exclusively on breastmilk should not be supplemented with water. Image source: Shutterstock



Protect yourself from the heat

- » If you must be outside, stay in the shaded areas, or create your own shade with umbrellas and wide brimmed hats.
- » Bring along and use cooling gear like fans and mist-sprays when possible.
- » Seek cool and shaded places whenever possible. If available, you may use fans and air conditioning.
- » Carry a water bottle and small towel so you can cool down by placing a wet towel on your neck.
- » Check in on your children regularly and encourage them to stay hydrated. Be aware that every child is different; some may be fine whilst others need more attention.
- » Dress in loose, light-weight and light-colored clothing that covers the skin. Cotton is ideal during hot weather to help reduce heat rashes and absorb sweat.

At the Institutional Level

Outside of their homes, children spend most of their time at day care centers or schools. Here are some steps that these institutions and others can follow for heat wave preparedness:²⁸

- » Ensure classrooms and indoor spaces have sufficient cooling appliances, i.e., cooling fans or air conditioning.
- » Consider coating or painting roofs with reflective, light-colored surfaces.
- » Ensure that center staff and caregivers are trained in heat safety and can identify heat stress symptoms.
- » Integrate heatwave preparedness into curriculums by providing young children with age-appropriate materials on the importance of hydration and the dangers of extreme heat.

Allow for frequent hydration breaks.
- » Adapt green roofs and community gardens by creating shaded play areas specifically designed for young children. These could include sandboxes, splash pads, and shaded benches for parents, turning these spaces into safe, cool areas where families can gather during heatwaves.
- » During a severe heat wave, establish first aid stations with towels, drinking water, ORS packets and thermometers.
- » Provide more water stations on the premises and especially near outdoor play areas.
- » Provide shade at key outdoor areas.
- » Outdoor activities should be postponed during extreme heat and heatwave conditions.
- » Shift outdoor play time and exercise hours to cooler times of the day.
- » Allow for or make mandatory looser school uniforms for spring and summer seasons – cotton clothing, hats, breathable footwear and no ties or jackets.
- » Include family-focused heat safety workshops that educate parents on how to recognize heat stress symptoms in young children, ensure proper hydration, and plan activities that avoid peak heat times.

28. Adapted from Protecting Children from Heat Stress: A technical note UNICEF. 2023.

At the District or City Level

» Run a campaign²⁹ to raise awareness, provide education and resources on how to handle heatwaves.

» Develop a heat action plan with an early warning and notification system, linking it to preparedness and response activities, with a focus on early childhood development and health care settings like schools and hospitals. See figure below for a framework of such a plan, which can be developed at a community, sub-national or national level.

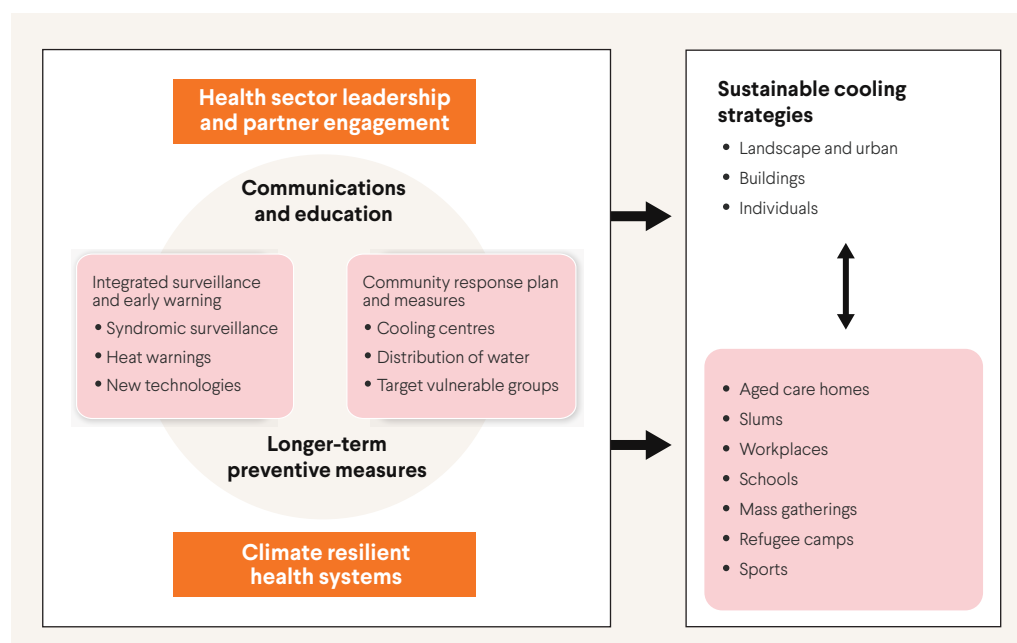


Figure 6: Community heat action plan elements and preventative actions to reduce heat-related health risks. Source: Reducing the health effects of hot weather and heat extremes: from personal cooling strategies to green cities³⁰

» Support policies and programs that increase access to air conditioning, water points, short-term tents, and cooling centers in public spaces during a heatwave. Take note that although mechanical cooling systems can improve thermal comfort, they require a stable and affordable energy source to operate and produce exhaust heat that elevates nearby temperatures. Hence, there are limitations and trade-offs to widely deploying mechanical cooling systems as the primary cooling medium across urban areas.

» Ensure that all public cooling centers are family-friendly, with designated areas for nursing mothers, play zones for toddlers, and easy access to clean water and sanitary facilities.

» Ensure that health professionals in your community have the knowledge and capacity to handle heat-related illnesses, and that health facilities are properly equipped. This UNICEF note (2023) provides clear recommendations for the health sector:

<https://www.unicef.org/media/139926/file/Protecting-children-from-heat-stress-A-technical-note-2023.pdf>

» Ensure that new urban development does not contribute to heat and is adapted to rising temperatures.

» Advocate and implement proven measures to reduce the urban heat island effect. See the boxed section below.

²⁹. UNICEF has provided some resources for running social and behavioral change campaigns here: <https://www.sbcguidance.org/>

³⁰. Jay, Ollie, et al. "Reducing the health effects of hot weather and heat extremes: from personal cooling strategies to green cities." The Lancet 398.10301 (2021): 709–724.

Proven Adaptation Strategies to Reduce Temperatures in Your Community or City



- » Blue solutions like lakes, ponds, and rivers lower temperatures by removing heat from the air through evaporation.
- » Green solutions like trees, vegetation, gardens and green roofs lower temperatures by increasing shade, reflecting solar radiation, and removing heat from the air through evaporation and transpiration.
- » Increase permeable surfaces, such as grass cover and permeable asphalt as they lower temperatures through water infiltration and evaporation. Permeable surfaces also reduce the risk of flooding.
- » Ensure that new urban development does not contribute to heat and is adapted to rising temperatures.
- » Promote the use of light-colored, reflective roofs to lower ambient temperatures. Dark colored roofs can absorb more than 80% of sunlight (Global Cool Cities Alliance 2012).
- » Traditional building materials (clay, mud, adobe, wood, and bamboo) retain less heat than modern materials (concrete, steel, glass)

Source: World Bank, Urban Heat in South Asia: Integrating People and Place in Adapting to Higher Temperatures

At the National Level

- » Develop a multisectoral response plan that outlines clear institutional and individual accountabilities. The World Health Organization has provided example guidance for drafting heat-health action plans, which now exist in 47 countries, the majority in Europe. These plans can support governments in both improving the public health response and integrating the response into larger national plans on tackling climate change. The guidance can be found here: <https://www.who.int/publications/i/item/9789289071918>
- » Integrate heat-health action plans into existing or new climate change and national health plans to better leverage resources and intersectoral coordination.
- » Develop a heat-related illness surveillance system to inform national-level policy and necessary actions through continuous collection, analysis, interpretation and use of heat-related health data.
- » Update building codes and zoning and land-use regulations to mandate more green cover for neighborhoods and cooling infrastructure for new housing, schools, and early childhood development (ECD) centers.
- » Make special workplace provisions and policies to protect pregnant and breastfeeding women from extreme heat for example in: agricultural/farm work or for working indoor structures prone to high heat.
- » Partner with the private sector to provide cooling stations and access to potable water in public areas. These stations could be designed to accommodate young children by including soft furnishings and educational toys. In addition, they can include shaded seating, fans, and educational materials about staying cool during a heatwave.
- » Transition towards a zero-carbon economy. To learn more, please visit <https://netzeroclimate.org/>
- » Fund and support projects that mitigate heat stress and improve climate resilience.
- » Educate the public on how climate change will worsen heat-related issues.

Key Resources:

1. Protecting Children from Heat Stress, UNICEF 2023.
<https://www.unicef.org/media/139926/file/Protecting-children-from-heat-stress-A-technical-note-2023.pdf>
2. Early Childhood Scientific Council on Equity and the Environment (2023). Extreme Heat Affects Early Childhood Development and Health: Working Paper No. 1. <https://developingchild.harvard.edu/heat-paper/>
3. The Coldest Year of the Rest of their Lives: Protecting children from the escalating impacts of heatwaves, UNICEF, New York, October 2022.
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