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Beat the heat: child health amid heatwaves in Europe and Central Asia

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Half of all children living in 50 countries across Europe and Central Asia are exposed to frequent heatwaves – double the global average of 1 in 4 children.[1] More than 92 million children are already exposed to frequent heatwaves in a region where temperatures are rising at a faster rate than in any other region worldwide.

Heatwaves are set to increase in frequency and intensity in the coming years as a result of accelerated global warming. Under the scenario of 2.4°C global warming, expected to be reached by the middle of the next decade, 97 per cent of children across Europe and Central Asia will be exposed to long heatwaves (high heatwave duration) by 2050 and 56 per cent to severe heatwaves (high heatwave severity). In Central Asia, the frequency, duration and severity of heatwaves have all increased by, on average, 30 per cent in the past 60 years. With surface warming now 20–40 per cent higher in the world's drylands than in more humid lands, the prospects for this part of the region are of real concern,[2] particularly as communities face deteriorating water quality in addition to increasing heatwaves.

Rising temperatures are expected to increase the risk of heat stress in children in 23 countries across Europe and Central Asia, and urgent measures are needed to protect the most vulnerable people of all: the youngest children.

Despite the extensive and serious health risks children face as a result of heatwaves, both public awareness and the implementation of adaptation measures are inadequate. This policy brief provides clear recommendations on how communities and governments can better protect our youngest citizens from the increasing and negative impacts of heatwaves and heat stress.

A woman has been evacuated from her home due to a fire raging near Markati area, Keratea, 40km southeast of Athens, Greece (2021).

The risks for children

Heat stress is a rapidly increasing health risk for children. This is not only because heatwaves are increasing in frequency and intensity, alongside a growing number of days with record-breaking temperatures, but also because young children are uniquely vulnerable to the effects of extreme heat, which translates as heat stress within their bodies.[3]

377
children

23
countries

In 2021, approximately 377 children in 23 countries in Europe and Central Asia died prematurely from causes attributable to heat stress.

Around 48 per cent of children under-20 who died as a result of heat stress in 2021 died before their first birthday – 183 infants in all.

32,356
years

Extreme heat caused the loss of 32,356 years of healthy life (disability adjusted life years, or DALYs) as a result of heat-related deaths or illnesses across the region. This highlights the unacceptable cost of inaction as temperatures continue to rise.

The younger the child, the more vulnerable they are to the health impacts of disease and illnesses related to heat stress (*see Figure 1* on the DALYs that are lost by age group). Heat exposure has acute effects on children, even before they are born, and can result in pre-term births, low birth weight, stillbirth and congenital anomalies.[4] The complications of pre-term birth, in particular, are the largest contributors to neonatal deaths.

Heat extremes are also linked to higher mortality rates in infants, particularly newborns.[5] The causes of heat-related deaths among perinatal infants are acute, with the strongest effects resulting from cardiovascular, respiratory, digestive system, and blood disorders.[6] When neonatal intensive care units (NICUs) are not air-conditioned, excessive temperatures can cause neonatal hyperthermia (overheating) as room temperatures exceed incubator set points, leading to the loss of temperature control within a baby's body.[7]

Heatwaves and heat stress are direct causes of infant mortality,[8] can affect infant growth[9], can cause a range of paediatric diseases,[10] and can have a devastating impact in even a short space of time. The main cause of heat-related death among infants and toddlers, for example, is being left alone in hot vehicles.[11] Similarly, enclosing infants and children in strollers with cloth covers that reduce airflow or

wrapping them up in too much clothing can lead to heat stress.

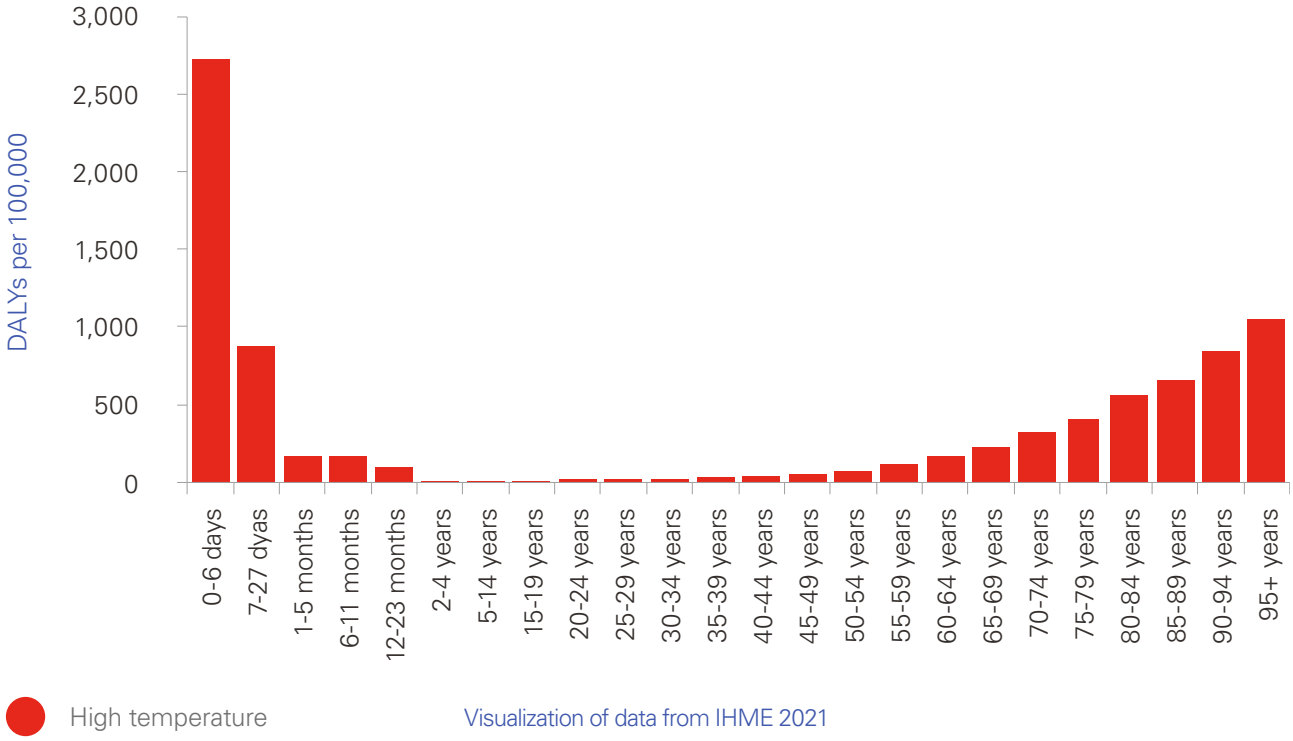
Young infants are more vulnerable to the health impacts of heat stress because of their smaller body size, their higher ratio of body surface area to mass, and the immaturity of their bodies' temperature regulating mechanisms.[12] They overheat more quickly when ambient air temperatures are high because they have a harder time regulating their body temperature and have little ability to sweat, which impairs their ability to cool down.[13]

In addition to heat-related mortality, high temperatures exacerbate several paediatric diseases, including intestinal infectious diseases; respiratory diseases; endocrine, nutritional and metabolic diseases; nervous system diseases and chronic lower respiratory diseases in children aged 0–4 years.[14] Heat stress, for example, increases the likelihood of children being taken to emergency departments with pneumonia [15] and of pneumonia-related hospital admissions,[16] and can lead to worse outcomes related to paediatric pneumonia. Such respiratory infections increase when children are exposed to both high temperatures and poor air quality, which combine to compound the adverse health outcomes.[17]

In older children, heat stress is often related to exercise or participation in sports when ambient temperatures are high. Hospital admissions for dehydration, for example, have been shown to be greatest for those aged 5–18 years.[18] As climate change leads to more frequent heatwaves and periods of high temperatures in late spring, in summer and in early autumn, measures are needed to provide children with shaded areas where they can play, to ensure adequate hydration regimes for children playing sports, and to ensure that rapid responses are available to cool down children who are suffering from heat exhaustion.

Vahe, 7, is watering the plants in their garden after participating in the Healthy Buddy project organized by UNICEF Armenia and Family Academy in one of Achajur schools.

Age-specific impact of heat stress related diseases in 23 countries in Europe and Central Asia



Source: The Institute for Health Metrics and Evaluation (IHME), 2001.[19]

The Disability Adjusted Life Year (DALY)

Mortality itself is not a complete indicator for the burden of a disease, because all of us will die at the end of our life span.

Disability-Adjusted Life Years (DALYs) measure the overall impact of diseases and injuries on people's lives, expressed as the number of years lost due to ill-health, disability or early death. It is calculated by combining years of life lost due to premature mortality with years lived with disability, taking into account the severity of the disability. Think of it as adding up all the years of life lost as a result of early death and all the years spent living with a disability or illness. For example, if a disease causes someone to die 10 years early and another person to live for 5 years with a severe illness, the total DALYs would be 15. This is a tool that helps us to understand to what extent health and life are affected by different health issues, helping us see the bigger picture of how diseases and injuries impact communities.

For more on DALYs, see: www.who.int/data/gho/indicator-metadata-registry/imr-details/158

Arshik Dalibaldyan, Head of Neonatal Department at Austrian Children's Hospital of Gyumri, is checking up on a newborn. He participated in the training sessions for new parents organized by UNICEF Armenia in Gyumri town.

The added risk from wildfires

Longer and more intense heatwaves contribute to hotter, drier and longer fire seasons, and the impact of the smoke from wildfires on children can be profound. The fine particulate matter (PM2.5) unleashed by wildfires has been found to be up to 10 times more harmful to children's respiratory health than to PM2.5 from other sources, and particularly so for children aged between 0 and 5 years.

Wildfire smoke has been closely linked to increased morbidity issues in exposed populations. It puts children at risk of a range of health issues, from asthma and poor lung function to mental health disorders. While air pollution of any kind is associated with higher incidence of asthma attacks and children's visits to emergency departments, the incidence rate is higher when it is also hot outside and the chances of developing asthma in the first place are also higher, both from pre-natal and post-natal exposure. A study by Ha et al. has found that prenatal exposure of pregnant women to wildfire smoke is associated with low birthweight, premature birth and increased risk of stillbirth. While wildfire smoke and extreme heat have been independently associated with higher risks of pre-term births, there are stronger associations with the health outcomes for those pregnant women who have been exposed to both. Other enduring impacts can result from related injuries, disabilities, trauma, loss of learning and recreational opportunities, and displacement.

A holistic approach is needed for the effective mitigation of the potential harm caused by wildfires to the health and well-being of children. This means placing a strong primary health care response at the centre of preparedness, mitigation, response and recovery efforts. [20,21]

A volunteer firefighter helps put out a fire in the Plaka area,in Keratea, 40km southeast of Athens, Greece (2021).

Reduce the risk: community action to beat the heat

Understand the risk and know how to respond

Infants are susceptible to heat stress during heatwaves and periods of elevated temperature if the ambient temperature is higher than their skin temperature. The risk of heat exposure to infants is higher if they are in vehicles, in strollers, or wrapped up in too much clothing during hot conditions.

Because children are vulnerable to heat stress and because of their increased exertion when they are playing outside, kindergartens and schools need response mechanisms and infrastructure investments to reduce children's vulnerability, including shaded areas and green spaces. Teachers, who are often the first line of response for children suffering from heat stress, need to be empowered

to take swift action in education facilities.[22] The training of teachers and community health workers on rapid response to the impacts of heat stress on children needs to be institutionalized, alongside investments in air-conditioned spaces and hydration stations.

Community health workers need to know how to care for children suffering from heat stress. In addition, given the increased vulnerability of heavily pregnant women to extreme heat and the risk of labour complications, high blood pressure, eclampsia and preterm birth, both they and their health care providers need to know how to prevent, identify and respond to heat stress. [23]

In addition, paediatricians should advise caregivers on how to monitor how much water children consume and encourage children to have a drink before they ask for one.

In general, the most effective ways to avoid heat-related illness are to create cooler places for infants and children, to drink plenty of water, avoid being outdoors at midday and in the afternoon, and to take it slow when exercising.

Heat stress: Signs, symptoms and immediate action

The signs of heat stress in children are shortness of breath, dizziness, headaches, tiredness and nausea. The most immediate way to reduce heat stress in a child is to cool their body down by providing hydration, take the child to a cool space, and actively cool the surface of their skin. When temperatures are high, fans may not prevent heat-related illness. Cooling a child with the direct application of cold water to the head and neck or moving them to an air-conditioned place is more effective.

Azamat, 5 years old, eats watermelon at home in Kurshab village, Osh Oblast, Kyrgyzstan, on 1 September 2021. Children are more vulnerable to the health impacts of heat stress because of their smaller body size, their higher ratio of body surface area to mass, and the immaturity of their bodies' temperature regulating mechanisms.

Knowledge is power

Health workers, particularly those at the community level (including home visitors) need to be equipped with information about reducing the impact of heat stress on children at home – knowledge that they can then share with caregivers. For example, heat stress and hyperthermia are common findings in cases of sudden infant death syndrome (SIDS), which peaks before 4 months of age and often occurs in unusually warm environments or where children are excessively clothed or overwrapped.[24]

In addition, civil society organizations, schools and health and social care professionals are key community actors in supporting awareness campaigns and measures to prevent the overheating of young infants, for example in vehicles.

Communication of the dangers of heat stress to the population, combined with the development of emergency response measures, will play a major role in minimizing its impact.

The photo captures a heartfelt and crucial moment: a mother holding her premature baby in a skin-to-skin method. The infant is gently pressed against the mother's chest without any clothing in between, which helps to foster a deep bond between them. This method is also known as 'kangaroo care,' and it contributes to better development and survival of the child, especially when born prematurely

Safeguarding incomes during heatwaves: the potential for shock-responsive social protection in Uzbekistan

Around 9.5 million children in Uzbekistan (91 per cent of its children) are exposed to climate-induced heatwaves and the country is predicted to be one of the top 10 countries globally affected by heat stress in 2030. UNICEF conducted research on the likely socio-economic impacts of heatwaves, and the potential role of social protection as a response mechanism in 2023, aiming to fill a knowledge gap that hampers an effective response to this silent crisis.

The research confirmed that the share of GDP lost to heat stress is expected to have doubled between 1995 and 2030, with data from the International Labour Organization showing a loss of 0.15 per cent of working hours in the agriculture, construction and service industries in 2030, compared to 0.04 per cent in 1995. Those working in the informal sector face bigger losses in incomes and productivity, with the potential for growing gender gaps in the workforce as a result of the burden of extreme heat on the bodies of pregnant women, particularly those working in agriculture.

The Government of Uzbekistan is expanding its shock-responsive social protection by revising emergency cash responses and enhancing its systems for cash scale-ups to protect people from shocks. There is an opportunity to integrate social protection interventions into National Heatwave Action Plans to support vulnerable individuals and households and help them cope with the economic and health impacts of extreme heat.

UNICEF is also exploring the potential of parametric insurance, which provides payments that are triggered automatically in response to weather-based trigger events. This approach can be used to fund the scale up of social assistance programs as needed. The United Kingdom's Cold Weather Payment, for example, delivers cash transfers based on forecasted extreme cold weather (0°C or colder for at least a week), with payments going to those enrolled in social protection interventions, such as pension plans and income support benefits. A similar approach could be used for extreme heatwaves in Uzbekistan and other countries across Central Asia, acting to safeguard income security and enabling children and their families to meet their needs and access vital services during heatwaves.[25]

What is a heat alert system?

A heat alert system is a set of incremental activities based on temperatures or heat advisories issued by the national weather service or other governmental agencies that provide weather forecasts and warnings. It supports a city or municipality to prepare a comprehensive plan that includes preparedness and response activities. These, in turn, make it possible to mobilize an effective notification system through various communication channels.

Heat alert systems are common throughout Europe, but are rare in Central Asia. UNICEF advocates for the urgent implementation of early warning systems to change behaviour in response to warning levels in kindergartens and schools.

UNICEF in action

UNICEF aims to protect the lives, health and well-being of children and the resilience of their communities by raising awareness among caregivers and supporting the adaptation of schools, kindergartens and health systems. At the same time, we invest in emergency preparedness and response systems including **multi-sectoral heat action plans**[26] and **heat alert systems**.

UNICEF works with governments, partners and communities to mitigate heat stress. As temperatures rise, a whole-of-society approach is vital to adapt to the increasing threat of heat stress on children. The following recommendations aim to build such an approach to safeguard children against this growing risk to their lives and well-being.

Definitions:[27]

Heatwave:

Any period of 3 days or more when the maximum temperature each day is in the top 10 per cent of the local 15-day average.

High heatwave frequency:

Where there are, on average, 4.5 or more heatwaves per year.

High heatwave duration:

Where the average heatwave 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.

A call to action for governments

1. Integrate strategies to reduce the impact of heatwaves on children into National Determined Contributions (NDCs), National Adaptation Plans (NAPs), and disaster risk reduction and management policies, keeping children – particularly young children – at the centre of all plans.

2. Invest in *heat health action plans* and primary health care to more adequately support the prevention of, early response to, and diagnosis and treatment of heat-related illness among children.[28] As a result of the vulnerability of newborns and the inability to sweat among infants of less than 36-weeks' gestation, air conditioning in NICUs or incubators that have cooling capability to maintain temperature set points can help to save lives.[29]

3. Ensure climate control for children in the first days of life, particularly for babies in neonatal intensive care, by increasing the number of NICU units with air conditioning or incubators that have cooling capability to maintain temperature set points.

4. Invest in early warning systems, including heat alert systems: incremental activities based on temperatures or heat advisories issued by the national weather service or other governmental agencies that provide weather forecasts and warnings.

5. Adapt education facilities to reduce temperatures ensuring that the school building is properly insulated and using energy-efficient windows to help regulate the temperature inside in the areas where children play, including through tree canopies, access to clean water, shaded areas and green spaces in schools, while equipping teachers with the skills to identify and respond to children suffering from heat stress.

6. Adapt urban design and infrastructure, including reforming building standards, undertaking vulnerability reviews, and ensuring that buildings (particularly those housing the most vulnerable communities) are equipped to minimize heat exposure. This includes investments in air-to-air heat pumps that can heat homes in the winter and cool them in the summer, using renewable energy sources. Financial models are necessary to extend such protection to residents of informal settlements, who often lack the resources to protect themselves from heat stress.

7. Secure the provision of clean water supplies, particularly in countries with deteriorating water quality. The provision of clean water is a primary mitigation measure for heat stress, and investment in emergency management capacity and tools to respond to heat stress is a priority.

8. Investment is needed to empower communities with knowledge around the dangers of heat stress and to work with communities, particularly young people and children on the design of heat action plans and the development of cooler community spaces for infants, children and their families.

Notes to editors:

Health impact estimates are not intended to be predictors of disease in individuals; rather they are intended as an objective assessment of health impacts on a population basis. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of UNICEF concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

UNICEF's Children's Environmental Health Collaborative supports public, private and civil society actors to work together on prioritizing climate and environmental action that protects children's health and well-being. The Collaborative provides resources about how extreme heat is affecting children and what action can be taken.

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