World Health Organization

European Region

# HEAT–HEALTH ACTION PLANS

## GUIDANCE

Second edition

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**ABSTRACT**

Extreme heat is an urgent and growing public health threat, driven by climate change and exacerbated by urbanization and population ageing. It increases morbidity and mortality, strains health and social care systems, and disproportionately affects populations at increased risk. Heat–health action plans (HHAPs) are a core public health response, enabling countries to anticipate and prepare for extreme heat, protect populations at increased risk, strengthen health system resilience, and reduce avoidable illness and deaths. This second, updated edition of WHO guidance on HHAPs supports countries in developing, strengthening and implementing such plans at national, regional and local levels. It offers an implementation-oriented framework, structured around eight core elements: governance; heat–health warning system; populations at increased risk; communication; health system resilience; reducing heat exposure; heat–health surveillance; and monitoring, evaluation and learning. The guidance also includes user action briefs for key sectors and a public health message bank to support effective risk communication with the public. It translates accumulated evidence and implementation experience into practical actions, tools and decision points for coordinated heat–health risk prevention and response. While tailored to the WHO European Region, it is adaptable to other contexts.

**KEYWORDS**

CLIMATE CHANGE
EMERGENCY PREPAREDNESS
EXTREME HEAT
HEAT ADAPTATION
HEAT–HEALTH PLANNING
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# Contents

# Foreword by the WHO Regional Director for Europe

The climate crisis is no longer a distant threat; it is a stark reality, and its most immediate and lethal manifestation is extreme heat.

The WHO European Region is the fastest warming global region. Since the first edition of this guidance in 2008, which drew on the lessons learned through the catastrophic heatwaves of the summer of 2003, we have witnessed a dramatic escalation in the frequency and intensity of heatwaves.

These are no longer anomalies but a recurring feature every year, exerting a heavy toll on human health, straining our health systems, and widening the gap of health inequities. Since 2023, because of these concerns, I have declared the climate crisis and extreme weather a public health emergency in the Region. In further recognition of this threat to global health, in 2024 United Nations Secretary-General António Guterres issued a Call to Action on Extreme Heat to enhance international cooperation to address this escalating challenge.

This second edition of the WHO guidance on heat–health action plans reflects a major evolution in our understanding of the evidence of effective interventions that protect people and communities in a warming world. This evolving knowledge can now be translated into practical guidance for our collective efforts across different levels of government and sectors. This update is also strategically aligned with WHO's most ambitious global and regional mandates, including the Fourteenth General Programme of Work 2025–2028 and the Second European Programme of Work 2026–2030, which prioritizes climate action and specifically promotes development and implementation of heat–health action plans. This further reinforces the commitments made in the 2023 Budapest Declaration on Environment and Health, in which the 53 Member States in the WHO European Region pledged to prioritize the health impacts of climate change at the highest political level.

This edition is deeply rooted in the real world, reflecting years of implementation and lessons learned by Member States. It emphasizes that a heat–health action plan is not just a document for a health ministry; it is a blueprint for urban planners, social services and emergency responders.

We have moved beyond theoretical frameworks to practical, scalable and adaptable solutions that address the complexities of urban heat islands, the vulnerabilities of ageing populations and the need for intersectoral governance at different levels of government. We have strengthened

the guidance to monitor progress and results, to bolster accountability and support continuous improvement.

As we look towards a future where record-breaking temperatures are the new norm, our ambition is bold and our goal is clear: zero heat-related deaths. We have the knowledge and we have a roadmap – set out in the pages of this guidance. What we now need to see is political will and urgent implementation. I urge all policy-makers and health professionals to use this WHO guidance to build resilient communities that can thrive, even in a changing climate.

**Dr Hans Henri P. Kluge**
WHO Regional Director for Europe

# Foreword by the European Commissioner for Climate, Net Zero and Clean Growth

After 2023 and 2024, 2025 was the third hottest year on record worldwide, and the European Union is heating at twice the global rate. The result? Europe is feeling the consequences of climate change. Ever more record-breaking and frequent heatwaves, droughts, wildfires and floods are happening across the continent.

Rising heat stress is one of the most tangible consequences, directly threatening our health. Extreme heat is responsible for some 95% of all climate-related deaths in Europe. The summer heatwave of 2022 caused more than 60 000 premature deaths, and heat risks to the general population are already at critical levels in southern Europe. Elderly people; children; pregnant women; workers in physically demanding occupations; and people suffering from cardiovascular, respiratory and renal diseases, diabetes, and mental health disorders are among the most vulnerable.

Beyond health, extreme heat undermines labour productivity and thus the competitiveness of our economy. By 2050, estimated productivity losses may reach just under 1% of gross domestic product overall, with higher losses in southern Europe.

Finally, heat stress also risks overwhelming hospitals. In Portugal, heatwaves were shown to cause a 19% increase in hospitalizations across all age groups and major disease diagnostic categories. Without better cooling systems and public health measures, health-care systems will face unsustainable pressure.

The evidence is clear: investing in emission reductions is far cheaper than paying for climate damage. Yet, while we push for emission reductions, we must also prepare for rougher times. Strengthening Europe's climate resilience, protecting both well-being and economies, is non-negotiable.

The European Commission treats climate change and its impacts on our health as an urgent priority. Our European Climate and Health Observatory partnership, launched in 2021 and involving WHO Regional Office for Europe as a key contributor, marks a key step forward in multidisciplinary collaboration and the creation of actionable knowledge at the interface of climate and health.

But we are not stopping there. By the end of 2026, we will adopt a new European integrated framework for climate resilience to drive transformational change across all sectors – health included – and ensure that Europe is far better prepared for future impacts.

Supported by funding from the European Union, this updated WHO guidance on heat–health action plans will help to save lives and safeguard health in a warming world. We look forward to deepening our collaboration with WHO to future-proof health systems and protect lives, no matter what climate challenges lie ahead.

**Wopke Hoekstra**
European Commissioner for Climate, Net Zero and Clean Growth

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# Abbreviations

| | |
|---|---|
| AC | air-conditioning |
| app | [digital] application |
| GHHIN | Global Heat Health Information Network |
| GP | general practitioner |
| HHAP | heat–health action plan |
| ICD-10 | International Classification of Diseases, 10th revision |
| NGO | nongovernmental organization |
| PPE | personal protective equipment |
| SUPREME | Surveillance and Prevention of the Impacts of Extreme Meteorological Events on Public Health |
| UV | ultraviolet |
| WMO | World Meteorological Organization |

# Executive summary

This second edition of WHO guidance on heat–health action plans (HHAPs) highlights that extreme heat (including heatwaves, unusually hot days and other hazardous heat exposures) is among the most immediate and direct health threats posed by climate change. Rising global temperatures, rapid urbanization and demographic ageing are converging to increase both exposure to heat and vulnerability to its impacts. Urban environments with limited green and blue spaces can also intensify heat through the urban heat island effect. Together, these trends are driving a growing and unevenly distributed burden of heat-related morbidity and mortality and underscore the need for effective prevention and preparedness. Populations at increased risk of threats to health from extreme heat include older adults, people with chronic conditions, pregnant women, newborns and children, workers exposed to heat, and socially disadvantaged populations.

HHAPs are a core public health response to these challenges. When well designed and implemented, they help to anticipate and prepare for heat–health impacts, protect populations at increased risk, strengthen health system resilience, and reduce avoidable illness and deaths.

## Scope and purpose

This second edition of the guidance provides an implementation-oriented framework for HHAP design and delivery across eight core elements, spanning preparedness, activation and response during extreme heat events, and between-seasons learning and improvement. The guidance is tailored to the WHO European Region, while recognizing that many of the challenges and approaches are relevant in other world regions. The guidance does not prescribe a single model but is intended to be adaptable to different national, subnational and local contexts. It does not provide a comprehensive review of the underlying science, which is available separately; instead, it translates accumulated evidence and implementation experience into practical actions and decision points to support consistent, equitable and effective heat–health risk prevention and responses.

The guidance encourages users to adapt its content to their local context, reflecting specific needs, institutional capacities and available resources. It promotes a stepwise implementation approach, whereby users can begin with essential, context-appropriate actions, and can expand, deepen and institutionalize these efforts progressively over time, as capacities and resources develop.

## Objectives

The objectives of this guidance are to support countries to:

- reduce heat-related health risks through the development of HHAPs, or the expansion and improvement of existing HHAPs; and
- enable consistent implementation of HHAPs across sectors and levels of governance by providing practical tools and key decision points for coordinated action, to improve performance over time.

Since the publication of the first edition of guidance on HHAPs in 2008, important progress has been made, and a wealth of scientific evidence and implementation experience has been gained. Many countries have established HHAPs that focus particularly on the development and implementation of early warning systems and/or their integration into HHAPs, improved risk communication, and targeted measures for populations at increased risk. At the same time, gaps remain. Adoption and implementation of HHAPs are uneven, particularly at subnational and local levels. Surveillance and evaluation systems are often weak or subject to delays, and responsibilities can be fragmented across sectors and institutions, leading to diminished accountability. Longer-term preventive measures to reduce heat exposure in urban settings – often requiring sustained collaboration with sectors responsible for the built environment and for urban planning – are less consistently developed or resourced. This updated guidance addresses these persistent gaps by providing more operational, action-oriented direction. It also strengthens and expands the evidence-based actions for the core elements of an HHAP that are already well developed and widely implemented, thereby supporting coordinated action across sectors and levels of governance.

## Methods

The guidance was developed in accordance with the requirements for creating a WHO normative operational product, which includes defined governance arrangements for steering and supervising the production of the guidance, expert oversight, and external peer review.

The development of the updated set of eight core elements is based on evidence resulting from a systematic literature review published by the WHO Regional Office for Europe in 2021, complemented by a structured review that captured publications released afterwards. The draft content was then refined through an iterative process incorporating expert input, targeted manual literature searches, and insights from policy and implementation experience.

Additional systematic literature reviews were conducted in 2023 and 2024, to inform the development of the user action briefs and the public health message bank. These reviews identified, appraised and synthesized the best available evidence on effective heat–health protection measures across individual, service and system levels; health and social care service and facility measures; and policy, planning and measures requiring coordination across sectors.

The development of the guidance involved a core project team, a steering function, an advisory group, a document development group and a multidisciplinary team of technical contributors. This was followed by a structured, broad-based external peer review process.

## Good practice and implementation priorities for HHAPs

Scientific evidence and implementation experience show that effective HHAPs share common features: they are operational (with warnings that trigger predefined actions), equity-focused (reaching populations at increased risk), cross-sectoral and multilevel (coordinated beyond the health sector and delivered locally), communications-ready (containing timely, credible and locally adapted messaging), institutionally integrated (aligned with health policy and planning processes), adequately resourced (supported by sustainable financing and workforce capacity), and learning-oriented (using surveillance and monitoring, evaluation and learning to improve between seasons).

In practical terms, countries strengthen HHAP implementation by establishing clear governance and accountability mechanisms, which are also instrumental in ensuring proper funding for implementation and evaluation; linking heat–health warning systems to locally appropriate, pre-agreed actions; ensuring that protective measures reach populations at increased risk through feasible delivery pathways in priority settings; strengthening health system resilience; reducing indoor and outdoor heat exposure through coordinated measures with relevant sectors; and embedding evaluation and learning to refine thresholds and actions between seasons.

This guidance operationalizes these priorities through eight core elements (Part 1) and provides ready-to-use tools for implementation and communication (Parts 2 and 3).

## What the guidance contains

Part 1 presents the updated HHAP framework across eight core elements, highlighting key actions and decision points for heat–health action planning, coordination, delivery and improvement.

**Core element 1 – Governance** sets out arrangements for political commitment, institutional roles and accountability, cross-sector coordination, and multilevel delivery.

**Core element 2 – Heat–health warning system** guides the development of locally appropriate warning systems that use weather and climate information and services, integrate graded thresholds, and trigger actionable alerts – including consideration of relevant co-exposures, such as air pollution and vegetation fires, where applicable.

**Core element 3 – Populations at increased risk** supports identification of populations and settings at higher risk (including older adults, people with chronic conditions, pregnant women and infants, schoolchildren, workers exposed to extreme heat, and socially disadvantaged populations) to facilitate development of targeted measures and monitoring.

**Core element 4 – Communication** strengthens risk communication so that warnings translate into protective action, supported by the public health message bank (Part 3).

**Core element 5 – Health system resilience** focuses on delivering a strategy and an implementation framework supported by operational plans and business continuity arrangements that protect core health system functions during extreme heat events.

**Core element 6 – Reducing heat exposure** outlines immediate and longer-term prevention measures across household, building and urban scales, implemented with sectors responsible for the built environment and infrastructure.

**Core element 7 – Heat–health surveillance** describes approaches to timely surveillance that can guide responses during events and support learning between seasons, linked to warning-to-action arrangements.

**Core element 8 – Monitoring, evaluation and learning** sets out how to refine triggers, strengthen delivery and improve HHAP performance over time.

Part 2 provides ready-to-use user action briefs for priority sectors (including health and social care, occupational, educational and childcare, and the urban and built environment) to help translate HHAP priorities into operational actions.

Part 3 provides a public health message bank with short, ready-to-use messages tailored to key audiences and settings to support timely, consistent and locally adapted communications aligned with local warning thresholds and response levels.

Annex 1 gives details on actions to manage combined exposure to extreme heat and vegetation fires; Annex 2 gives additional advice for mass gatherings during periods of extreme heat; Annex 3 outlines the signs and symptoms of heat-related illness, and when to seek medical help; and Annex 4 contains the poster for WHO's annual #KeepCool campaign.

## Practical outputs as building blocks of an HHAP

As a practical resource, this guidance supports the development of specific and defined outputs for each core element. Properly documented, these outputs collectively form a comprehensive HHAP. The outputs are:

- an agreed governance structure with clear roles and responsibilities, including an identified lead body and a coordination mechanism or group to initiate, develop and implement the HHAP;
- an operational heat–health warning system, linking each alert level to predefined measures with assigned responsibilities and implementation timelines;
- an assessment and mapping of relevant populations at increased risk of heat-related harm to be addressed within the scope of the HHAP, together with a specific outreach strategy with recommendations and actions to target those identified at increased risk;

- a documented heat–health communication strategy that outlines the communications objectives, activities, allocated resources and agreed responsibilities;
- a strategy and implementation framework for health system resilience to extreme heat, aligned with existing health system and emergency arrangements; and operational plans and business continuity arrangements at regional and local levels that enable health services to maintain priority functions;
- a roadmap for heat exposure reduction that maps relevant and feasible interventions in the local context for immediate heat exposure reduction and preventive, medium- and longer-term interventions, focusing on priority populations and settings;
- an operational heat–health surveillance system with defined indicators, data sources, reporting timelines and data-sharing arrangements, linked to the heat–health warning system and used to inform HHAP activation and response decisions; and
- a functional monitoring, evaluation and learning framework that supports systematic review, accountability and continuous improvement.

# Introduction

# Background

Extreme heat is a growing public health challenge exacerbated by climate change. Extreme heat can increase morbidity and mortality rapidly, and places pressure on essential services, such as health and social care. Effective prevention of the adverse health effects of extreme heat depends on coordinated action across multiple sectors and levels of governance *(1–3)*.

This guidance supports countries in developing national and local heat–health action plans (HHAPs) or expanding and improving existing HHAPs. It offers a comprehensive framework for planning and implementing heat–health measures, as well as practical, evidence-informed recommendations that can be adapted to national and local contexts.

## Extreme heat

A wide range of terms are used in the literature, across meteorological services and among heat–health action planning practitioners, to describe unusually hot weather conditions and associated health risks – including, but not limited to, "heatwave", "hazardous heat" and "heat stress". There is no universal agreed temperature at which heat becomes "extreme" or dangerous *(4–6)*. Although these terms have specific meanings, their use varies considerably across locations because heat thresholds are typically defined nationally. Thresholds generally reflect climate norms and seasonality, population acclimatization, the built and natural environment, and social and economic conditions. They may be based on different indicators, such as air temperature alone, or indices that also account for humidity, wind and radiation *(4,7)*. As a result, the same term can carry different meanings in different settings, which can hinder interpretation of evidence and practical use of triggers and actions in heat–health planning *(4)*.

> This guidance uses the term "extreme heat" to refer to hot weather conditions that are relevant to health protection. These conditions include heatwaves and other hazardous heat conditions. They may occur as short episodes or as sustained hot periods.

The term "heatwave" is commonly used for one form of extreme heat. The Intergovernmental Panel on Climate Change describes heatwaves as periods of abnormally hot weather, often defined using relative temperature thresholds and lasting from a few days to several weeks; it also notes overlap with related concepts such as warm spells *(5)*. The World Meteorological Organization (WMO) similarly defines heatwaves as periods of unusually hot weather persisting over several days and nights, characterized by using indices based on local climatological conditions *(6)*. Heatwaves are cumulative events: as hot conditions persist, exposure accumulates and health risks increase *(4)*. Given the absence of a globally accepted operational definition, countries in the WHO European Region apply different heatwave thresholds and criteria to reflect local climates, exposure patterns and capacities *(8)*.

The term "hazardous heat" refers to a subset of extreme heat in which combined humidity, wind and radiation exceed locally defined thresholds associated with rapidly increasing health risks and preventable morbidity and mortality *(4)*. "Heat stress", by contrast, describes the

physiological response of the body, rather than the environmental conditions. Heat stress arises during overexposure to high air temperatures and/or thermal radiation, and is exacerbated by high humidity and low wind speeds, which can cause thermoregulation to fail *(5)*.

Many other terms are also used across disciplines and regions, reflecting the breadth and evolving ways in which heat and its impacts are described *(4)*.

Given this diversity of terminology and the differences in definitions across settings, this guidance uses "extreme heat" as an overarching term that captures the diversity of technical definitions, while providing a consistent framing to heat–health action. It refers to temperature conditions significantly higher than the climatological average for a given place and time of year, defined through locally relevant thresholds. Extreme heat is typically characterized by persistently high daytime maximum temperatures and/or elevated night-time minimum temperatures over successive days *(4,6)*. This framing covers both acute heatwave episodes and prolonged hazardous heat conditions that can lead to preventable morbidity and mortality, particularly when hot nights limit recovery and when heat is combined with high humidity *(6–9)*. This matters for planning because HHAPs depend on assumptions about how often heat thresholds will be reached, how severe events may become, and how long systems may need to sustain protective measures.

## Understanding the health impacts of extreme heat

In the WHO European Region, extreme heat is the deadliest natural hazard, causing substantial loss of life in recent years and decades *(2,10–11)*. These impacts are likely to be underestimated owing to weak monitoring systems and delays in data reporting.

Extreme heat affects both physical and mental health. The body's inability to regulate internal temperature and eliminate heat gain in such conditions increases the risk of heat exhaustion and heatstroke (Box Int.1). The strain put on the body as it tries to cool itself also stresses the heart and kidneys, which may progress to organ failure and death *(12)*. Heat extremes can worsen health risks from chronic conditions (including cardiovascular, respiratory and diabetes-related conditions) and mental health outcomes such as anxiety and sleep disorders *(13,14)*. Older adults, pregnant women, newborns, infants and children, people with chronic illnesses, outdoor and indoor workers, and socially disadvantaged populations are at increased risk *(15–19)*.

Despite these risks, many people, including those more likely to experience heat-related impacts, underestimate their heat vulnerability, which contributes to insufficient protective behaviour. Willingness to act is shaped by risk perception and by whether people feel that communications are relevant to them *(20–24)*. Unlike expert assessments based on hazard analysis, public perceptions are shaped by values, emotions, context and messaging to which people are exposed *(2,25–28)*. Positive attitudes towards hot weather, cultural stereotypes and traditions can further reduce precautionary behaviour, and some warning formats may inadvertently evoke favourable associations with dangerously high temperatures *(29,30)*. Additionally, mis- and disinformation through mainstream or social media may downplay or trivialize heat-related risks, resulting in their underestimation by the general public and policy-makers *(31)*.

## Box Int.1. Internal temperature regulation

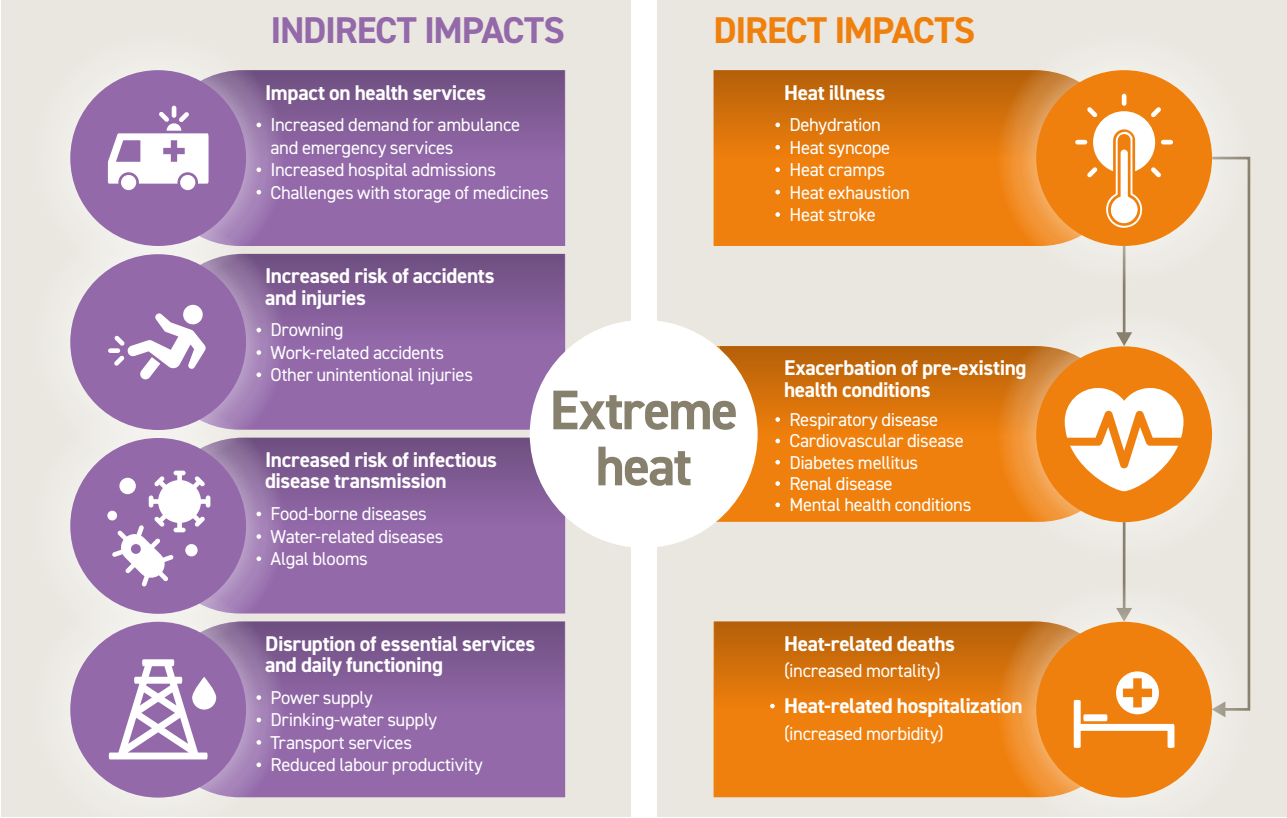
The amount of heat stored in the human body is determined by a combination of:

- an inability to eliminate internally generated heat from metabolic processes due to environmental heat stress (for example, high temperature, high humidity, low wind or high thermal radiation);
- clothing creating a barrier to heat loss; and
- external heat gain from the environment.

Extreme heat increases the risk of elevated core body temperature, increased heart rate, rapid breathing, excessive sweating, nausea, dizziness and, in severe cases, heat-related illnesses like heat exhaustion or heat stroke *(15)*.

Extreme heat has both direct and indirect impacts on health (Fig. Int.1). Direct impacts arise from heat exposure itself, through physiological stress on the body. These include heat illness and acute worsening of pre-existing chronic diseases. In severe cases, these direct effects can rapidly lead to hospitalization and death. Because deaths and increased hospital admissions from extreme heat occur rapidly (on the same day or within the following days), timely interventions following a heat alert – including preparedness of health care facilities to deal with a surge in acute cases – are critical. To act effectively, it is therefore vital to anticipate when and where adverse health effects are likely to occur *(2,32–34)*.

**Fig. Int.1. Health impacts of extreme heat**




*Source*: adapted from WHO *(15,33)*.

Indirect impacts are those that occur through secondary pathways, when extreme heat disrupts the systems and conditions that protect health or increases exposure to other risks. These include heightened pressure on health services, greater risk of accidents and injuries, disruption of essential services – such as electricity, water supply and transport – and environmental changes that increase the risk of infectious disease transmission.

Both direct and indirect impacts are mediated by patterns of exposure, underlying vulnerability and adaptive capacity. They are greatest among population groups with reduced thermoregulatory capacity, pre-existing illness, social isolation, occupational heat exposure, inadequate housing, limited access to cooling spaces and infrastructure, and reduced access to health and social support services *(15,31–34)*.

At the same time, climate change and demographic and societal changes – such as ageing populations, social inequalities and urbanization – are drivers that amplify heat-related health impacts by reshaping patterns of exposure, affecting the capacity to cope with extreme heat and creating new challenges for health systems and climate resilience.

## Climate change, urbanization and ageing populations as drivers of rising heat-related health risks

Climate change is increasing heat-related health risks. Rising average temperatures are making extreme heat events more frequent, more intense and longer lasting, including the most severe hot days *(34,35)*.

Climate change is altering the risk profile that HHAPs are designed to manage. As the baseline climate shifts, extreme heat events that were previously treated as exceptional become more common, and the upper tail of heat risk becomes more relevant for preparedness and response. Model projections indicate that future extreme heat events may become around 2 °C to 5 °C hotter, under higher warming scenarios *(35,36)*.

In many settings, the heat season is no longer confined to a predictable summer period: in the context of the northern hemisphere, extreme heat can occur earlier in spring and extend later into autumn, increasing cumulative exposure and requiring readiness outside traditional peak months. Climate change is thus affecting the timing and operational window for heat action. This has implications for planning cycles (i.e. for training, procurement, communications readiness and health workforce management), scheduling of prevention measures, and the ability of health and social care services to sustain delivery over longer periods *(37)*.

Urbanization in the WHO European Region remains high and is set to get even higher. In 2025, around 75% of the population lived in urban areas, and this share is projected to rise to over 80% by 2050 *(38,39)*. As more people move into cities, demand for housing, transport and energy increases and can contribute to higher greenhouse gas emissions unless development follows low-carbon pathways *(40)*. Urbanization exacerbates the impact of rising temperatures, making cities hotspots of extreme heat. Urban areas experience air temperatures that can be several degrees Celsius warmer than surrounding areas, especially during the night. This is mainly due to the urban heat island effect, which results from several factors – including reduced ventilation and heat trapping due to the close proximity of tall buildings; heat generated directly from human activities; the heat-absorbing properties of asphalt, concrete and other urban building materials; and the limited

amount of vegetation *(41,42)*. Continuing urbanization and increasingly severe extreme heat events under climate change will further amplify this effect in the future *(15)*. People living in informal settlements or densely populated neighbourhoods often face higher exposure and lower capacity to cope (for example, via limited access to cooling spaces and infrastructure, secure housing and services); migrants and refugees may also be disproportionately affected in some urban settings *(43)*.

Ageing populations are a demographic shift with profound implications for exposure to heat. Older people are more vulnerable to the health effects of heat because of factors including reduced mobility, existing health problems, lower ability to regulate body temperature and, in some cases, social isolation and economic deprivation that may result in "energy poverty". As the population of the WHO European Region ages, health systems need to prepare for the growing number of heat-related illnesses among older adults *(44,45)*. The number of people aged 65 years and over living in cities is expected to more than triple in the Region, reflecting the combined effects of population ageing and urbanization *(46,47)*. When these trends are combined with intensifying heat extremes, they could increase by 10 times or more the exposure of populations at increased risk to the most dangerous heat events by 2050 *(48)*.

The interacting trends of climate change, ageing populations and urbanization create a "perfect storm" of vulnerability to extreme heat, putting pressure on health systems and increasing costs to society. Heat–health action planning needs to be ready to respond more frequently to extreme heat, and to protect the most vulnerable people effectively. To maximize coherence and sustainability, HHAPs may be aligned with broader national and subnational climate and health planning and risk management processes, to strengthen governance, improve coordination and support sustained implementation (Box Int.2) *(2,49)*.

### Box Int.2. Aligning HHAPs with national climate and risk frameworks

HHAP priorities can be reflected in national climate adaptation and implementation instruments – for example, health adaptation planning and relevant climate commitments – to strengthen policy commitment, support resource mobilization and improve consistency in climate–health planning and reporting *(50,51)*. Health authorities, working with relevant stakeholders, may undertake a heat–health vulnerability assessment under current and future climate conditions to inform the development or strengthening of an HHAP. Such an assessment can include the following steps *(52)*:

- reviewing the existing policies and measures within the health sector and across other sectors that address, or could contribute to addressing, heat-related health risks;
- clarifying the purpose, scope, timeline and expected outputs of the assessment, aligned with national or subnational climate and health planning needs and priorities;
- describing patterns of current heat exposure and vulnerability at national, regional and/or local levels, considering relevant health determinants and population characteristics;
- assessing potential future risks, including emerging health impacts of climate change, trends affecting heat-related health outcomes, and projected changes in temperature and extreme heat frequency and intensity;
- identifying prevention and response mechanisms and feasible climate adaptation options, and considering contextual factors that may enable or hinder implementation; and
- defining an approach to monitoring, evaluation and learning, including criteria and performance considerations, to support ongoing assessment of health outcomes and adaptation efforts over time.

## The importance of planning for extreme heat to protect health

Extreme heat is a recurrent and largely predictable hazard, which makes advance planning a practical and necessary means to prevent avoidable illness and deaths, and to protect continuity of essential services *(53)*. Without advance planning, responses to heat events tend to be delayed, fragmented and reactive, limiting their effectiveness and increasing avoidable health impacts.

HHAPs are essential tools for countries to prepare for, respond to and mitigate the health impacts of extreme heat. The added value of HHAPs is that they shift heat management from ad hoc measures to predictable and accountable action. HHAPs are structured public health plans that bring together a portfolio of actions and actors across preparedness, warning and response to reduce heat-related health risks through coordinated implementation across sectors and levels of governance *(3)*. They provide a framework for extreme heat planning to protect health: they establish the governance and accountability structures, triggers and a minimum package

of actions that can be implemented repeatedly and consistently, while allowing adaptation to national and local contexts. Countries across the WHO European Region and globally have expanded heat preparedness by developing and implementing HHAPs, which have substantially reduced heat-related mortality and morbidity *(2,54)*.

In practical terms, heat warnings alone do not reduce health impacts unless they are linked to pre-agreed measures, service readiness and targeted support for those most at risk. HHAPs provide a framework to align health and non-health actors around common triggers and responsibilities, ensure continuity of care during heat events, and institutionalize monitoring and improvement over time. Effective HHAPs reduce heat-related health impacts by acting across three dimensions:

- enabling timely action in response to hazardous heat through warning systems linked to predefined measures;
- prioritizing protection for populations and settings with higher exposure and vulnerability; and
- strengthening the resilience of health services during extreme heat events *(2,3)*.

Successful HHAPs require strong partnerships across health and other stakeholders, supported by clear governance structures.

## Scope, purpose and objectives of the guidance

The scope of the guidance is tailored to the WHO European Region, while recognizing that many of the challenges and approaches are also relevant in other global regions and settings. When used outside the WHO European Region, countries should adapt operational parameters, such as heat thresholds and triggers (since what is “extreme” varies), timing (as heat risks can be year-round or coincide with monsoons/dry seasons, changing preparedness calendars and surge planning), and intervention packages to local climatic conditions, epidemiological risk relationships and system capacities *(6)*.

The purpose of this second edition is to provide an implementation-oriented framework for HHAP design and delivery across eight core elements, embracing the full cycle of heat–health management from preparedness, activation and response during heat events to post-event improvement.

The guidance does not prescribe a single implementation model; it is intended to be adapted to national, subnational and local contexts. It also does not provide a comprehensive review of the underlying science. Instead, it translates accumulated evidence and implementation experience into practical actions, tools and decision points to support consistent, equitable and effective heat–health responses.

The objectives of this guidance are to support countries to:

- reduce heat-related health risks through development of new or strengthening of existing HHAPs at both national and local levels; and

- enable consistent implementation of HHAPs across sectors and levels of governance by providing practical tools and key decision points for coordinated action, to improve performance over time.

## Target audience of the guidance

This guidance is primarily intended for institutions and professionals who lead, coordinate and are accountable for the development, implementation and evaluation of HHAPs at national, subnational (regional) and local levels. In many countries these are ministries of health and their subordinated agencies, such as public health authorities.

Primary users include:

- policy-makers and public authorities at national, regional and local levels responsible for HHAP governance, legislation, funding and policy coordination;
- health authorities and public health institutions responsible for preparedness, response, surveillance and evaluation;
- national meteorological services and other providers of warning information supporting heat–health warning systems; and
- civil protection/emergency management bodies supporting coordination and response.

Delivery partners and contributing users include:

- health professionals and health facility managers – including public health practitioners and front-line health-care workers who prevent, manage and treat heat-related illness;
- occupational safety agencies, employers and worker representatives – particularly in high-risk sectors such as agriculture, construction and manufacturing;
- social care home managers and staff providing direct care and support to residents;
- education authorities, school leaders, teachers and childcare staff – including school health staff – and health and social care staff supporting pregnant women;
- local authorities (including municipal councils and planning departments), urban planners, housing actors and built-environment professionals involved in reducing heat exposure and ensuring equitable access to cooling spaces and infrastructure;
- community leaders and organizations supporting local groups; and
- media and communication specialists disseminating accurate, timely and actionable heat–health information.

## Adapting the guidance to the local context

This guidance offers a flexible framework intended for a wide range of users and contexts, acknowledging that some stakeholders will have extensive experience with heat–health action planning, while others may be engaging with the topic for the first time. It acknowledges varying levels of expertise, institutional capacity and socioeconomic conditions, and supports phased and context-specific application.

The guidance encourages the users to adapt its content to their local context, reflecting specific needs, institutional capacities and available resources. It promotes a stepwise implementation approach, whereby users can begin with essential, context-appropriate actions and expand, deepen and institutionalize these efforts progressively over time, as capacities and resources develop.

Accordingly, the guidance is not a prescriptive rulebook but a foundational resource – an adaptable point of departure for locally tailored heat–health action planning. Stakeholders sharing responsibility are encouraged to apply and refine the recommendations incrementally, in line with evolving local realities, resources and constraints.

## Structure of the guidance

Part 1 presents the updated HHAP framework across eight core elements (Fig. Int.2), highlighting key actions and decision points for heat–health action planning, coordination, delivery and improvement.

Part 2 provides ready-to-use user action briefs for priority sectors (including the health and social care, occupational, educational and childcare, and urban and built environment sectors) to help translate HHAP priorities into operational actions.

Part 3 provides a public health message bank with short, ready-to-use messages tailored to key audiences and settings to support timely, consistent and locally adapted communications, aligned with local warning thresholds and response levels.

Annex 1 gives details on actions to manage combined exposure to extreme heat and vegetation fires; Annex 2 gives additional advice for mass gatherings during periods of extreme heat; Annex 3 outlines the signs and symptoms of heat-related illness, and when to seek medical help; and Annex 4 contains the poster for WHO's annual #KeepCool campaign.

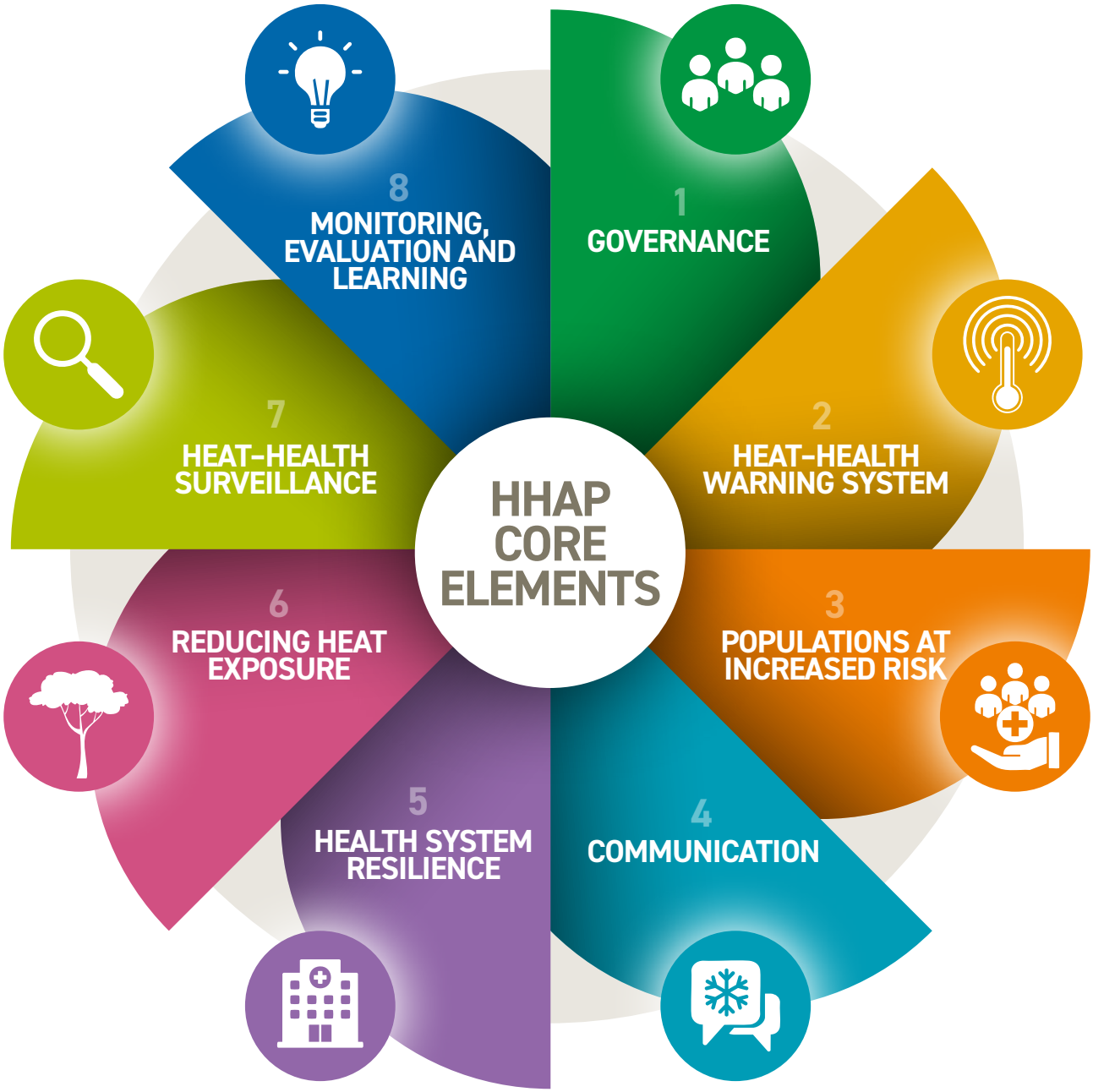
In Part 1 of this guidance, the following eight core elements compose the HHAP framework. Each core element opens with an introduction sheet, clearly outlining the key messages, the steps needed for development, and the specific and defined outputs of the core element. Properly documented and published, these outputs collectively form a comprehensive HHAP.

**Core element 1 – Governance** sets out arrangements for political commitment, institutional roles and accountability, cross-sector coordination and multilevel delivery.

**Core element 2 – Heat–health warning system** guides the development of locally appropriate warning systems that use weather and climate information and services, integrate graded thresholds, and trigger actionable alerts – including consideration of relevant co-exposures, such as air pollution and vegetation fires, where applicable.

**Core element 3 – Populations at increased risk** supports identification of populations and settings at higher risk (including older adults, people with chronic conditions, pregnant women and infants, schoolchildren, workers exposed to extreme heat, and socially disadvantaged populations) to facilitate development of targeted measures and monitoring.

Fig. Int.2. The HHAP framework



**Core element 4 – Communication** strengthens risk communication so that warnings translate into protective action, supported by the public health message bank (Part 3).

**Core element 5 – Health system resilience** focuses on delivering a strategy and an implementation framework supported by operational plans and business continuity arrangements that protect core health system functions during extreme heat events.

**Core element 6 – Reducing heat exposure** outlines immediate and longer-term prevention measures across household, building and urban scales, implemented with sectors responsible for the built environment and infrastructure.

**Core element 7 – Heat–health surveillance** describes approaches to timely surveillance that can guide responses during events and support learning between seasons, linked to warning-to-action arrangements.

**Core element 8 – Monitoring, evaluation and learning** sets out how to refine triggers, strengthen delivery and improve HHAP performance over time.

## Lessons learned from HHAP implementation

The structure and content of this second edition of the HHAP guidance has been informed by the implementation experience gained and lessons learned since the first edition of the guidance was published in 2008 *(3)*. Experience has shown that plans are most effective when they translate warnings into predefined actions, reach populations at increased risk through feasible delivery mechanisms, and embed routine evaluation and learning *(1,2)*. At the same time, however, studies on European HHAP governance point to fragmentation of roles and responsibilities across institutions and levels of government, and to the importance of clearer mandates, sustained coordination mechanisms, and accountability arrangements that function outside emergency period *(55)*.

Implementation experience and updated evidence confirm several consistent lessons *(2,8,55)*.

- Plans protect health only when they operate as a system, not as a document. The most effective HHAPs are operational: warnings trigger predefined actions, responsibilities are clear, and measures can be delivered reliably during events and sustained when heat persists.
- Warning messages alone are insufficient without "warning-to-action" arrangements. The critical factor is not only issuing alerts but ensuring that alerts effectively reach both the public – including those most at risk – and those with the responsibility to respond. Alerts need to be linked to locally appropriate, pre-agreed measures, with clear response levels and escalation pathways across services and sectors.
- Equity requires targeted delivery mechanisms. Many plans identify populations at increased risk, but implementation experience shows that impact depends on whether plans include practical, resourced measures that do indeed reach people who are least able to protect themselves (including through health and social care systems and community channels).
- Health and social care services are repeatedly stressed during heat, yet preparedness is uneven. Heat events expose vulnerabilities in hospitals and in long-term care, home care and emergency services – particularly during prolonged or repeated heat periods.

- Long-term prevention remains the most difficult element to implement. Reducing indoor and urban heat exposure depends heavily on housing, buildings, urban planning – including for green and blue spaces – and infrastructure. These are areas often outside the direct mandate of health authorities, so sustained cross-sectoral governance and planning linkages to local adaptation plans are essential.
- Surveillance of impacts and evaluation of HHAP performance are still not routine, limiting learning and improvement. Regional evidence indicates that heat–health surveillance remains inconsistently developed across the WHO European Region, constraining the ability to track heat-related mortality and morbidity, refine thresholds and target measures. Recent work also shows that only around half of countries report in the Region routinely monitor heat-related outcomes, underscoring the need to strengthen surveillance capacity and comparability. Evaluations have often focused on health outcomes rather than on the effectiveness of HHAPs in practice, including timely activation, adequate resourcing, clarity of roles and responsibilities, and delivery of intended measures to priority populations and settings.

While this second edition retains the architecture of eight core elements introduced in the first edition *(3),* it features updated names, revised content and new emphasis for each core element. The aim is to strengthen cross-sector coordination, operational delivery, an equity focus, and monitoring and learning-oriented improvement over time. Further details are shown in Table Int.1.

**Table Int.1. Updated core elements of the guidance**

| New core element | Update in this edition (summary) | Explanation |
|---|---|---|
| Governance | Greater emphasis on clear roles and responsibilities, accountability, multilevel and multisectoral coordination, and sustained resourcing beyond the heat season | Implementation falters when mandates are unclear or coordination is ad hoc. |
| Heat–health warning system | Stronger emphasis on the need for locally appropriate thresholds with graded levels, tighter links between alerts and pre-agreed actions, and routine refinement | Warnings reduce harm only when they trigger action reliably, and are reviewed after events. |
| Populations at increased risk | More practical focus on the need for formal identification of populations at increased risk where feasible, and clear outreach mechanisms for high-risk settings | Listing groups at increased risk of threats to health from extreme heat is not enough: plans need delivery pathways that reach people who are most at risk. |
| Communication | Increased focus on the need for actionable, tailored and timely messaging, and emphasis on credibility, usability and inclusive communication channels | Communication works when it enables protective behaviour, especially for those least able to protect themselves. |

**Table Int.1 contd**

| New core element | Update in this edition (summary) | Explanation |
|---|---|---|
| Health system resilience | Greater emphasis on heat-specific considerations for preparedness of the health workforce; use of health information systems; infrastructure, technologies and supply chains; and service delivery | Health systems, including services and facilities, are repeatedly stressed during extreme heat, and need stronger preparedness, readiness, response and continuity. |
| Reducing heat exposure | Stronger focus on prevention across scales (households, buildings and urban space), and clearer cross-sector collaboration levers | Long-term exposure reduction is often weakest, because it sits outside health-sector mandates. |
| Heat–health surveillance | More emphasis on combining health and weather data for timely detection, integration with warning systems, and scalability | Surveillance is uneven, delaying learning and the timeliness of response; timely data improve targeting, operational decisions and their implementation. |
| Monitoring, evaluation and learning | More emphasis on explicit monitoring, evaluation and learning cycles across all core elements with co-defined indicators, reporting, after-action review and feedback loops | Evaluation is frequently underdeveloped; routine learning is needed to improve performance between seasons. |

Implementation experience has also shown that countries often need practical, ready-to-use materials to translate HHAPs into delivery, clarifying who does what and when, and supporting consistent coordination across sectors and levels of governance. Parts 2 and 3 respond to this need by providing implementation tools (user action briefs) and communication resources (the public health message bank) that can be adapted to national and subnational contexts.

## Considerations for the use and implementation of the guidance

This guidance provides a structured approach and practical tools that can be used flexibly, depending on a country's starting-point and planning level (national, subnational or local), and can be adapted to the local climate, governance structures and health system contexts.

Users may apply it to:

- develop a new HHAP;
- strengthen an existing HHAP;
- review the performance of the HHAP after heat events; and/or
- guide HHAP updates for the next season and phased strengthening over time.

Box Int.3 summarizes what an effective HHAP should deliver, highlighting the common features of strong heat–health action planning and the priority actions countries can use to develop, strengthen or review their HHAPs. It reflects the main implementation lessons incorporated in this second edition, and guides users to the core elements and tools that support coordinated action and continuous improvement over time.

## Box Int.3. What makes an effective HHAP?

An HHAP is effective when it ensures that protective measures reach the people and places that need them most, supported by coordinated systems and continuous improvement. To achieve this, an HHAP should:

- be designed for delivery, defining triggers, roles and delivery pathways so that HHAPs function as an operational system, not only a plan;
- reach populations at increased risk, specifying how measures will achieve this in practice, including priority settings and services;
- coordinate across sectors and levels, using governance arrangements that facilitate coordination across sectors and levels of governance, including local delivery;
- support protective action, ensuring that communications are timely and locally adapted, and linked to practical measures that make protective behaviour feasible; and
- promote learning and improvement, using surveillance and evaluation findings to refine triggers, actions and coordination from one season to the next.

Effective HHAPs ensure reliable delivery, with clear triggers, accountable roles, adequate resources and measurable actions. To strengthen implementation across the eight core elements and ensure that they function together as an operational system, priority actions for countries are:

- using the eight core elements to structure HHAP strengthening across the full cycle (preparedness, activation and response, and post-season review and improvement);
- linking heat–health warning systems to locally appropriate, pre-agreed actions and response levels, refining triggers through evaluation and learning;
- identifying populations at increased risk and specifying how protective measures will reach them in practice, including priority settings;
- preparing health and social care services to protect patients/residents and maintain continuity of care;
- reducing indoor and outdoor heat exposure through coordinated measures at the household, building and urban scale, implemented with relevant sectors and local authorities;
- implementing surveillance and monitoring, evaluation and learning, with feasible indicators, responsibilities and reporting timelines; and
- using the ready-to-apply tools in Parts 2 and 3 to support operational delivery and communication to the public.

The HHAP approach presented in this guidance also contributes to broader efforts to strengthen health resilience, climate adaptation and disaster risk management. To support effective and sustainable heat–health action, it is beneficial to implement an HHAP as an integral part of a systematic approach to strengthening health system resilience, adapting to climate change and reducing carbon emissions, as illustrated by WHO's operational framework for building climate resilient and low carbon health systems *(56)*. When developed and implemented alongside existing policy processes – such as health national adaptation plans, national adaptation plans, Nationally Determined Contributions and disaster risk reduction strategies *(50,51)* – HHAPs help to ensure that actions to address extreme heat are coherent, mutually reinforcing and sustained over time.

## Methods used to develop the updated guidance

This second edition was developed as a WHO normative product, classified as operational guidance/tool, in accordance with WHO rules and procedures for accountability, expert oversight, transparency and peer review.

A governance structure was established to ensure methodological consistency and independent expert input. Development was led by a core project team and supported by:

- a steering function providing strategic oversight and accountability;
- a WHO advisory function overseeing contributor/reviewer selection and methodological integrity;
- a document development group responsible for scoping, drafting and formulation of guidance content; and
- a multidisciplinary pool of technical contributors and independent external peer reviewers providing specialist input and usability review.

The updated guidance was informed by a combination of evidence synthesis and practice-based learning.

For Part 1, the development of the updated set of eight core elements is based on the evidence resulting from a systematic literature review published by the WHO Regional Office for Europe in 2021 *(2)*, complemented by a structured review of more recent scientific literature and HHAPs available in the public domain published between 2020 and 2024. Predefined review questions and keyword combinations were used to examine HHAP implementation patterns, evidence of effectiveness, evaluation approaches, stakeholder engagement, reasons for inclusion or exclusion of core elements, and how HHAPs identified and addressed populations at increased risk. Throughout the drafting process, review findings were iteratively complemented by expert input, targeted manual literature searches, and consideration of policy and implementation experience. The core element structure was informed by consultation with the document development group and external experts during two technical consultation meetings, considering the strength and consistency of evidence, implementation experience and feasibility, equity aspects, resource implications, applicability across national and local contexts, and operational relevance.

For Parts 2 and 3, two predefined review protocols were used to inform the development of the user action briefs and the public health message bank. The protocols specified the review

questions, search strategies, eligibility criteria, screening and selection procedures, as well as data extraction, appraisal and synthesis methods. Under these protocols, multiple systematic reviews were conducted in 2023 and 2024 using transparent and reproducible methods aligned with the Cochrane Handbook for Systematic Reviews of Interventions *(57)*, as appropriate for the scope and purpose of each review.

The first review protocol focused on measures that can be implemented directly during heat events. It synthesized evidence on practical protective actions and communication approaches for individuals and households and for front-line health and social care services and facilities. Priority topics included heat-related risk factors and health conditions, management of heat related illness, patient and resident communication in health and social care facilities, hydration and other public advice during hot weather, and indoor heat reduction.

The second review protocol focused on measures that health authorities and partner sectors can put in place to enable and scale protection. It synthesized peer-reviewed and grey literature on policies, planning and implementation actions for health authorities and for key settings that influence heat exposure and vulnerability. Priority topics included co-exposure with vegetation fire smoke, built-environment interventions, urban and city planning, workplaces and occupational safety, care homes and schools, with particular emphasis on protecting populations at increased risk.

Searches included peer-reviewed literature databases (Embase, PubMed Central, Scopus, Web of Science) and selected grey literature sources/databases (Climate-ADAPT, the United Nations Digital Library, WHO Institutional Repository for Information Sharing). Findings were appraised and synthesized to identify effective measures for preventing and reducing adverse health effects associated with extreme heat across individual and household actions, health and social care service and facility measures, and broader policy and planning measures.

Evidence summaries and draft outputs were reviewed through iterative technical consultations involving the document development group and external multidisciplinary experts. Review findings were appraised in technical meetings and chapter-level reviews to validate interpretation of evidence, identify evidence gaps and inconsistencies, and agree on implications for guidance content and the adequacy of illustrative country case studies. Decisions on inclusion and prioritization considered the strength and consistency of evidence, feasibility of implementation, resource implications, equity aspects, applicability across national, subnational and local contexts, and implementation experience. Conclusions were incorporated into successive drafts of the guidance through a documented revision process coordinated by the WHO Secretariat.

A structured external peer review process of the final draft guidance was implemented. Peer reviewers were identified by the WHO Secretariat against predefined criteria (including proven expertise in climate change and/or heat and health; relevant peer-reviewed and/or policy publications published; English fluency; academic reputation; and HHAP implementation experience) and were vetted by the WHO advisory function. Reviewer input was collected through a standardized tool to support systematic tracking and integration of comments, and revisions were incorporated through a documented follow-up process to ensure traceability, in accordance with WHO clearance procedures (including requesting and assessing of declarations of interest and respecting confidentiality requirements).

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# Part 1.

## The eight core elements of the HHAP framework

# Introduction

Part 1 of this guidance is structured around the eight core elements of an HHAP (see Fig. Int.2), which together provide a practical and adaptable approach to protecting health before, during and after periods of extreme heat:

- Core element 1 – Governance
- Core element 2 – Heat–health warning system
- Core element 3 – Populations at increased risk
- Core element 4 – Communication
- Core element 5 – Health system resilience
- Core element 6 – Reducing heat exposure
- Core element 7 – Heat–health surveillance
- Core element 8 – Monitoring, evaluation and learning.

The opening of each core element chapter provides a summary of key messages, steps for implementation and the expected output. Each chapter also includes a subsection on monitoring, evaluation and learning to support tracking, review and continuous improvement of the HHAP. References supporting the design of the core elements are provided at the end of each chapter and reflect the most up-to-date evidence available.

The core elements are numbered for the ease of presentation only; this does not indicate a prescribed sequence or hierarchy. Responsible stakeholders at national, regional and local levels may initiate action across any core element, depending on their level of preparedness, institutional capacity and priority needs, as well as in reflection of past or ongoing efforts in heat–health action planning.

Taken together, the eight core elements provide a coherent approach that supports countries in organizing effective, equitable and well-integrated heat–health action. The material presented in the core element chapters can support development and implementation of a new HHAP at the national, regional or local level, or revision and strengthening of an existing plan. In settings with limited institutional, human or financial resources, it is important to get the HHAP process started. The emphasis should be on beginning with feasible, high-impact actions – building on existing structures, data and capacities – and scaling up progressively over time as experience is gained and additional resources become available.

# Core element 1 – Governance

**The aim of this core element is to establish a governance structure for heat–health action.**

## Key messages

- HHAPs may be developed and managed at national, regional or local levels, depending on country-specific governance structures and health competences and responsibilities. HHAP governance models need to be context-appropriate.
- Heat–health action planning is typically led by a designated lead body – often, but not exclusively, a health authority. Its responsibilities include establishing appropriate governance structures and coordinating health and non-health sectors. Early endorsement from overarching political leadership helps to unlock effective cross-sector delivery.
- Alignment of HHAP processes with existing coordination mechanisms, governance structures, legislative arrangements, and national and subnational adaptation frameworks provides a foundation for effective and coherent heat–health governance.
- Political leadership, combined with clearly defined roles, responsibilities and accountability mechanisms, contributes to more effective governance in heat–health action planning.
- Financing mechanisms should be specified as part of HHAP governance, including identified funding sources, to ensure delivery and continuity of agreed actions.

## Core element output

The core element output is an agreed governance structure with clear roles and responsibilities, including an identified lead body and a coordination mechanism or group to initiate, develop and implement the HHAP.

## Steps to implement the core element

The following steps collectively support the development of a comprehensive governance structure. It is important to:

- identify a lead body to take the first steps in heat–health action planning – this includes providing strategic direction, mobilizing political and institutional support across relevant sectors, coordinating the initial steps, and overseeing and leading the HHAP process;
- conduct a situational assessment to understand existing risks, assets, policies, initiatives, knowledge, resources, infrastructure and governance frameworks related to heat and health;
- build strategic direction and political leadership by communicating heat–health risks, using evidence to advocate for commitment and financing, and integrating heat into relevant agendas across sectors;
- identify key actors and stakeholders across sectors and levels of governance, and analyse their roles, interests and capacities;
- establish a multisectoral working group to coordinate HHAP development and implementation under the leadership of the designated lead body;
- establish the appropriate governance mechanism and coordination arrangements for HHAP development and implementation, while defining clear roles and responsibilities based on institutional mandates and expertise;
- identify synergies and leverage existing programmes, partnerships, data systems and funding mechanisms to support and sustain HHAP implementation; and
- establish accountability mechanisms, regular reporting cycles, performance indicators and feedback loops to ensure effective implementation.

## 1.1 Introduction

Heat governance refers to the individual actors, institutions, strategies and processes embedded within a coherent policy framework that guide efforts to manage and reduce heat-related health risks *(1)*. It provides the basis for decision-making and implementation aimed at protecting population health from the impacts of heat. Heat governance operationalizes actors, institutions, infrastructure, knowledge and resources across timescales *(2)*. The pace and form of heat governance are shaped by political priorities, available resources and existing institutional structures. Progress is often achieved by building on governance structures and processes that already exist, sequencing actions over time, and using political windows of opportunity (for example, following extreme events or policy cycles) to strengthen mandates, coordination and resourcing.

Effective governance for HHAPs is important yet inherently complex. Addressing heat as a health risk requires aligned governance across national, regional and local levels and coordinated efforts that cut across sectors and levels of government, combining both immediate emergency response and long-term preventive strategies *(2)*.

To promote effective governance, establishing a clear institutional foundation – such as a designated lead body or, where appropriate, a legal framework – can help to align efforts and clarify mandates *(3–5)*. Political leadership, supported by clearly defined roles, responsibilities, accountability mechanisms, and reliable, integrated data *(2,6)* can drive more effective governance in heat–health action planning. This can facilitate integration of heat–health considerations into existing policies and programmes, offering a practical pathway to scale up impact.

This chapter outlines governance functions and actions for initiating, developing, implementing and overseeing an effective, accountable and coordinated HHAP. It draws on a range of existing resources and guidance, including WMO's Extreme Heat Risk Governance Framework and Toolkit *(2),* which offers a structured foundation for strengthening governance systems to manage extreme heat risk.

## 1.2 Governance structures for heat–health action planning

Effective heat–health action planning requires governance arrangements that can operate across sectors and administrative levels, while remaining responsive to differing institutional contexts. In practice, coordination is often challenged by fragmented governance structures, siloed responsibilities and limited collaboration between relevant actors *(7–11)*. These challenges are frequently compounded by competing policy priorities, limited technical capacity and resource constraints, which can delay or even prevent sustained action on heat–health risks *(11,12)*.

Governance structures for HHAPs therefore need to be adapted to a country's administrative and institutional context *(7)*. In many settings, national HHAPs provide an overarching framework and strategic direction, establishing priorities, roles and coordination principles. At the same time, implementation of specific measures typically takes place at subnational levels, where interventions can be tailored to local conditions, capacities and community needs. Depending

on the degree to which health sector competences are decentralized, and on the specific goals, needs and resources available in a given territory, HHAPs may be developed and managed at national, regional or local levels, or through coordinated arrangements spanning several levels.

Across these different contexts and levels, HHAP governance can be understood in terms of a set of core functions that structure how heat–health action is initiated, developed, implemented and overseen. These functions provide a practical way to organize roles and responsibilities without prescribing a single institutional model, allowing governance arrangements to start where capacity may be limited and to evolve over time as mandates, coordination and resources are strengthened. Table 1. presents this functional governance structure, outlining the key governance functions for HHAPs, the bodies typically involved, and their main activities across the HHAP process.

**Table 1. Governance for heat–health action planning**

| Function | Body or group | Main activities |
|---|---|---|
| Initiating the HHAP process | Lead body | • Setting strategic direction<br>• Mobilizing political and institutional support<br>• Coordinating initial steps |
| Developing and implementing the HHAP | Working group | • Coordinating multisectoral engagement<br>• Leveraging existing resources<br>• Implementing planned actions |
| Overseeing the HHAP | Lead body or other dedicated mechanism | • Ensuring alignment and continuity across core elements<br>• Confirming that agreed structures, processes and actions function as planned, and are adapted as conditions evolve |

## 1.3 Initiating the HHAP process

To initiate an HHAP, the first steps involve setting a strategic direction, mobilizing political and institutional support, and coordinating early actions that inform the design of an appropriate governance mechanism and multisectoral planning. In settings where institutional structures are still developing or resources are constrained, these steps may need to be approached in a phased or simplified manner to ensure feasibility, while aiming for incremental improvement over time.

Given the central focus on protecting population health, these initial steps are usually led by health authorities. However, the body responsible for initiating and leading the HHAP may vary according to the governance context and the administrative level at which the HHAP is being developed. Depending on the setting, the leading role may be assumed by the national ministry of health or the ministry of the environment; by regional health authorities or other relevant regional bodies such as public health institutes, environmental authorities, civil protection agencies or regional administrations; or by local health authorities, municipalities, district administration offices or city

authorities. In some settings, the lead body benefits from securing early, explicit endorsement from high-level leadership to enable effective multisectoral coordination and action beyond the health sector's mandate. Where leadership structures are unclear or less mature, informal or provisional endorsement may help to initiate cooperation while more formal arrangements are developed over time.

Regardless of the institutional entry point, the steps outlined below should be carried out by the lead body. They can be adapted and applied across governance levels and contexts, and may be scaled to match available capacity.

First, the lead body should conduct a situational assessment, by:

- identifying existing assessments (such as vulnerability assessments, climate risk profiles and disaster risk assessments, as appropriate) that address heat-related risks for health, and determining the existing physical or technological infrastructure, knowledge, resources and critical data required to address current gaps and support effective decision-making *(2)*;
- mapping existing policies (Fig. 1), programmes and institutional mandates relevant to heat–health action;
- identifying ongoing initiatives at the relevant levels (national, regional and/or local) in climate adaptation, disaster risk reduction, housing, energy, infrastructure and public health that can be aligned with and/or leveraged for the HHAP; and
- reviewing legal and regulatory frameworks, legislative arrangements, institutional mandates, governing agreements between different levels (national, regional and local) and interagency coordination mechanisms to inform HHAP governance design *(7)*.

In settings where assessments, data systems or legal frameworks are incomplete or fragmented, the situational assessment may initially rely on available information and rapidly generated insights, with the intention to expand and strengthen these inputs progressively.

The lead body should next set strategic direction and build political leadership by:

- recognizing and communicating the relevance and urgency of addressing heat-related health risks within the local, regional and/or national context to create demand for managing heat risks;
- using evidence from the situational assessment to communicate the local, regional and/or national burden, identify who is most affected, and make the case for political commitment and sustained financing for the HHAP; where such an assessment is not yet available, supporting its development as a foundational step for informed decisionmaking;
- presenting HHAPs as a high-value public-health investment, with economic benefits that exceed associated costs *(7)*;
- lobbying for integration of heat–health considerations into relevant public health, climate adaptation and emergency planning agendas; and
- seeking political endorsement early to enable whole-of-government coordination and implementation.

In emerging or low-maturity governance settings, political leadership may need to be cultivated gradually, starting by raising awareness among key actors and identifying "champions" who can promote heat–health action despite limited authority or resources.

**Fig. 1. Relevant broader policies that should be considered for the HHAP at the appropriate level**


*Source*: adapted from WHO Regional Office for Europe (7).

The lead body should also identify actors and stakeholders across sectors and, if applicable, across levels by:

- mapping key heat–health actors from health and social care, meteorology and climate services, urban planning and housing, environment, energy, infrastructure, labour – including occupational health and safety, education, civil protection and emergency response, academia, the private sector, nongovernmental organizations (NGOs) working in communities, media, and other relevant stakeholders, as appropriate, at national, regional and/or local levels; and
- conducting stakeholder analysis to clarify roles, interests and capacities.

Where multisectoral cooperation is weak or informal, the initial emphasis may be on identifying a minimum set of essential actors and gradually broadening engagement as trust and capacity increase.

The lead body should establish a multisectoral governance mechanism by:

- reviewing and assessing the maturity of national, regional or local extreme heat risk governance as an entry point for understanding current heat resilience development and for identifying how existing or emerging governance mechanisms can be strengthened *(2)*;
- convening the actors and stakeholders identified to define who is involved, how and why, while establishing clear roles and responsibilities based on legally binding duties and tasks *(6,7)* at the applicable levels (national, regional and/or local); and
- creating or designating a working group involving the actors and stakeholders identified to support HHAP development and implementation, with overall leadership provided by the lead body.

In contexts where heat governance systems are emerging or fragmented, the governance mechanism may need to begin with simpler, flexible structures – such as a small task team – with the aim of formalizing and expanding these arrangements over time. WMO's Extreme Heat Risk Governance Framework and Toolkit *(2)* offers a practical way for authorities to assess the maturity of their current heat governance systems, and to identify priority areas for improvement across five key dimensions.

Finally, the lead body should identify synergies and make use of existing resources by:

- exploring linkages with health-sector programmes such as health promotion, surveillance, healthy living, mental health, healthy ageing, maternal, newborn and child health, and climate-resilient health systems; with social and community priorities related to social isolation and support for populations at increased risk; with climate, energy and environmental agendas; with housing and built-environment initiatives that influence heat exposure; with disaster and emergency-response arrangements; and with other existing early warning systems for health – particularly those with a climate component *(7)*;
- leveraging existing partnerships and networks to ensure adequate resourcing of implementation and sustainability, with particular attention to human resources and capacity-building;

- promoting data-sharing agreements that support interoperability and enable integration of reliable data – such as temperature trends, vulnerability mapping, health outcomes and urban exposure indicators – to facilitate real-time, data-driven decision-making *(2)*; and
- identifying specific funding mechanisms and programmes that can support heat–health action – including the lead agency's budget, budgets available to sectors and stakeholders involved in HHAPs, climate change adaptation funding, and resources accessed through multilateral development banks – to ensure delivery and continuity of the HHAP across all governance levels *(2,7)*.

In resource-constrained or early-stage settings, synergies may be especially critical. Leveraging existing programmes, local networks and community structures can help to compensate for funding gaps, limited staffing and unclear mandates until more stable arrangements are established.

## 1.4 Developing and implementing the HHAP

Development and implementation of an HHAP involves co-designing, documenting and operationalizing its objectives, measures, roles, procedures and coordination arrangements across all core elements. This results in an actionable framework that guides implementation during extreme heat events and longer-term efforts to reduce heat risk.

### 1.4.1 Coordination arrangements for HHAP development and implementation

To carry out this function, the governance mechanism established during initiation by the lead body should designate a working group or similar mechanism to serve as the primary coordination and cooperation platform for all involved sectors throughout both HHAP development and implementation *(7)*. This working group, overseen by the lead body or by a dedicated coordinating mechanism (see section 1.5), brings together the actors responsible for designing measures, defining activation procedures and delivering agreed actions within their institutional mandates. At the local level, this platform may initially be small, informal or limited to a core group of essential actors, which can be expanded as capacity and cooperation mature.

The working group should include representatives from key sectors relevant to heat–health action, including direct stakeholders, local authorities and actors on the ground who are well positioned to make HHAPs more effective *(7)*. The composition of the group should reflect the scope of the HHAP and, where possible, should build on existing coordination mechanisms. Where such coordination mechanisms do not exist, simple and flexible arrangements may serve as a starting-point.

> For further details on specific roles and actions to be taken by different sectors before, during and after extreme heat events and throughout the summer season, see the collection of user action briefs provided in Part 2 of this guidance.

Clear roles and responsibilities for participating institutions and actors should be defined and documented within the HHAP, based on their legally binding duties and tasks *(7)*. These roles are expected to be supported by the designated lead body, which should ensure that the necessary human and financial resources are identified, mobilized and facilitated to enable the agreed actions during implementation. In settings where mandates are unclear, authority is limited or funding streams are uncertain, roles may need to be simplified, provisional or based on available capacity until more robust structures and predictable resources can be secured.

### 1.4.2 Key functional roles defined during HHAP development and applied during implementation

The following functional roles illustrate how responsibilities may be distributed within the working group *(9)*.

- Authors are responsible, with support from the broader working group, for writing and updating the HHAP document through a continuous, iterative process under the guidance of the lead body, drawing on the findings of the situational assessment and on the inputs from relevant national, regional and/or local stakeholders identified during initiation. In contexts with emerging institutional support or reduced capacity, authors may need to rely more on available local information, simplified consultation processes and pragmatic prioritization of actions.
- Coordinators are responsible for coordinating measures across specific core elements, taking into account possible needs for coordination with other administrative levels. Meaningful involvement of groups at increased risk of threats to health from extreme heat and their representation in the planning, development and implementation of HHAP measures should be sought by coordinators, with the support of communicators. Where multisectoral collaboration is weak or not yet established, coordinators may need to focus first on developing minimum communication channels, clarifying responsibilities, and gradually expanding cooperation as trust and capacity grow.
- Communicators are responsible for developing and implementing a heat–health communication strategy, enabling two-way information flows between institutions, stakeholders and the public, including defining message responsibilities, channels and timing (see also Core element 4 – Communication). They may also support the inclusion of and outreach to populations at increased risk of heat-related harm by facilitating dialogue, gathering feedback, and ensuring that their concerns and perspectives are communicated to coordinators and decision-makers for consideration in HHAP implementation. In settings with limited resources, communicators may need to work with readily available channels and adapt messages to existing local networks.
- Monitors are responsible for operating agreed monitoring arrangements, including meteorological and/or epidemiological parameters. They inform activators and implementers when defined surveillance or warning thresholds are reached. They are responsible for defining relevant impact and outcome measurements to ensure that relevant data are collected (see also Core element 7 – Heat–health surveillance and Core element 8 – Monitoring, evaluation and learning). In settings where systems are still being built, monitors may need to rely on simplified indicators based on basic meteorological data (such as daily maximum temperature) and easily collected health service data (for

example, heat-related emergency visits), and on limited datasets or manual reporting while building towards more comprehensive systems over time.

- Activators are responsible for activating the heat–health warning systems when thresholds are met (see also Core element 2 – Heat–health warning system). Their role includes communicating activation decisions to internal and external stakeholders and the public, in line with established communication pathways. Where authority or mandates are unclear, activation procedures should be simplified and clarified to avoid delays, ensuring that at least a minimum response can be triggered reliably.
- Implementers are responsible for implementing and delivering concrete measures set out in the HHAP within their respective mandates across the core elements. When resources, staff or clear responsibilities are limited, implementers may need to focus on a core set of feasible, high-impact actions and progressively expand as capacity increases.
- Holders of evaluation and learning roles are responsible for systematically evaluating the HHAP, including the relevance and effectiveness of its measures, their implementation during an extreme heat event, and lessons learned to be included in any future updates (see also Core element 8 – Monitoring, evaluation and learning). In settings with restricted capacity, evaluation may initially focus on basic process measures and simple feedback mechanisms, evolving into more comprehensive evaluations as resources grow.

As noted above, in settings with limited capacity, unclear mandates or weak multisectoral cooperation, several functions may need to be simplified, combined or sequenced over time to remain feasible. At the local level, several of these functions might be assigned to one person or to a compact team of actors to reflect availability of human resources.

Roles within the working group should be assigned based on institutional mandates, technical expertise and operational capacity. In contexts with diffuse authority or unclear mandates, it may be necessary to explicitly define responsibilities and designate interim focal points until more formal structures can be established.

The HHAP should specify clear communication and decision-making pathways among the working group members, implementing actors and relevant administrative levels *(6)*. If communication structures are weak or fragmented, these pathways should be made as explicit and realistic as possible, focusing first on essential connections needed for timely action. Such communication arrangements support a timely, unified and coherent response during extreme heat events, and provide a foundation for longer-term planning to reduce heat exposure (see also Core element 6 – Reducing heat exposure).

## 1.5 Overseeing the HHAP

Oversight is a continuous governance and coordination function that operates across all core elements of the HHAP, ideally all year round. It focuses on ensuring alignment and continuity across core elements, ensuring that agreed structures, processes and actions function as intended and are adapted as conditions evolve.

In some contexts, the oversight function may be carried out by the lead body, while in others it may be assigned to a dedicated coordinating mechanism or shared across institutions. In all

cases, oversight should be understood not as a policing function but as a function that enables others to act effectively and ensures that the HHAP is implemented in line with the agreed roles, procedures and coordination arrangements set out during development.

Oversight may involve:

- ensuring coherence and coordination during HHAP implementation across all core elements;
- ensuring that roles, responsibilities and coordination arrangements defined in the HHAP are applied consistently;
- maintaining information exchange among key actors and sectors throughout HHAP implementation, supported by the working group – especially during periods of heightened extreme heat risk;
- facilitating alignment between HHAP implementation and related disaster risk reduction and civil protection;
- reviewing the continued integration of heat–health considerations into sectoral policies and programmes during implementation;
- facilitating integration of heat–health action planning into broader climate change and health governance mechanisms; and
- ensuring that HHAP implementation arrangements are clearly linked to accountability and review mechanisms established through monitoring, evaluation and learning processes (see section 1.7 and Core element 8 – Monitoring, evaluation and learning).

HHAP oversight should ensure that the sectors and institutions involved in HHAP implementation remain engaged and coordinated. Oversight spans all core elements of the HHAP to maintain coherence, coordinated implementation, continuity and alignment over time (Fig. 2).

Oversight should also ensure continuity in the prioritization of populations at increased risk of threats to health from extreme heat, and should maintain clarity regarding which actors are responsible for contacting and supporting them (see also Core element 3 – Populations at increased risk). Where awareness of heat–health risks or institutional capacity is still emerging, oversight may identify the need for targeted outreach or capacity-building to support effective HHAP implementation across key actors, sectors and affected communities *(13)*.

**Fig. 2. Oversight function across all core elements of the HHAP**


## 1.6 Tailoring HHAP governance to different levels

Depending on a country's administrative and institutional context, HHAPs can be developed and implemented at different levels to address heat risks effectively. At each administrative level, the scope of an HHAP and its core elements may differ. For examples that illustrate HHAP development and governance in both unitary and federal systems, covering different levels, see Box 1.

## Box 1. Case studies on HHAP governance at different levels

The following examples illustrate how countries and subnational authorities have set up leadership and multisectoral coordination, assigned functions and roles, and linked HHAP implementation to existing institutional and policy frameworks – from national plans in unitary and federal contexts to regional and district-level arrangements, and a multilevel model connecting national, regional, municipal and neighbourhood action.

**National HHAP example in a unitary government**

In 2024–2025, North Macedonia's Ministry of Health convened a multisectoral working group to develop the country's second national HHAP *(20)*. This group coordinated across sectors and brought together representatives from national institutions, including public health centres; the Public Health Institute; the Occupational Health Institute; the Crisis Management Centre; the Hydro-meteorological Institute; the Directorate for Protection and Rescue; and the Ministries of Environment, Labour and Social Policy, Education and Science, alongside the Macedonian Red Cross, NGOs and international partners. Once finalized, the government formally endorsed the updated HHAP, assigning each institution clear implementation responsibilities while placing overall oversight with the Ministry of Health. Building on lessons learned from the 2011 plan *(21)*, the new HHAP incorporates evidence from recent reviews, and is tested through regular simulation exercises to ensure its continued relevance and effectiveness. It remains formally linked to North Macedonia's 2011 Climate Change Health Strategy, reinforcing the country's commitment to a coordinated, evidence-based approach to heat–health hazard preparedness and response.

**National HHAP example in a federal government**

In 2024, Austria published its updated federal-level HHAP from 2017 based on new evidence. One year later, in June 2025, another update was made *(15)*. This sets out steps to be taken at the federal level in cooperation with the federal states and the Federal Institute for Geology, Geophysics, Climatology and Meteorology (GeoSphere Austria) in the event of extremely high temperatures and heatwaves. It provides a framework with information on starting points for additional heat protection measures at the state level and at regional and local levels, including for health facilities, social services and organizations at the state or municipal level. As part of the HHAP governance structure, a working group advises the Minister of Health on heat–health action planning and serves as a platform for regular technical exchange and discussions. Core group members are the Austrian National Public Health Institute, Austrian Agency for Health and Food Safety, Ministry of Health, GeoSphere Austria and federal state public health offices, enabling cooperation and consultation between the federal and state level. The extended working group includes experts from the Environment Agency, the ministry responsible for climate action, Austrian Broadcasting Corporation, Medical University of Vienna, Austrian Chamber of Pharmacists and – when required – further experts *(15)*.

**Regional HHAP example**

In 2024, the German district of Ludwigsburg in the Federal State of Baden-Württemberg, the local health office, with the State and the District Medical Councils, initiated development of the district HHAP that acts as a framework for its 19 towns and 20 municipalities *(8)*.

## Box 1 contd

Relevant stakeholders were identified, who jointly developed the district HHAP as part of a working group. Members included representatives of local pharmacists, nursing homes, the state health insurance association, the city school board, hospitals, social centres, and the district administration's press, civil protection, education, climate and mobility departments. The State Health Office of Baden-Württemberg also participated in the meetings, ensuring the involvement of the federal state level. To align the district HHAP development with heat–health action already planned or implemented by municipalities, towns and other key actors, a needs assessment was first carried out in all nursing homes, and in administrative government offices in towns and municipalities in the district. Further, to ensure political support from the local level, the results of the assessment were presented and jointly discussed with all mayors in the district.

The local health office and the District Medical Council act as a joint body that provides strategic oversight, evaluating the heat–health warnings by the National Meteorological Institute and, when deemed necessary, initiating the HHAP and overseeing its overall implementation. Key aspects of the HHAP are a heat–health warning cascade to all key stakeholders in the district (Fig. 3), a collection of information material for the general public and groups at increased risk to be distributed by the towns and municipalities, and specific action plans for all the key stakeholders. The plan is to evaluate this governance structure, including its communication mechanisms, regularly *(8)*.

**Multilevel HHAP example**

In the Netherlands (Kingdom of the), the National Institute for Public Health and the Environment (RIVM) leads the national HHAP *(22)*. RIVM is responsible for informing the public and the media, and for monitoring heat-related impacts and emerging scientific evidence on heat risks. At the regional level, an increasing number of provinces support municipalities in developing HHAPs – often collaborating closely with the regional public health service. This regional facilitation has contributed to a substantial rise in the numbers of local HHAPs. By 2025, over 90 municipalities had developed local HHAPs, engaging both professional and voluntary civil society-based organizations locally. These local partners implement preventive actions to educate and prepare groups at increased risk ahead of the summer season. They also play a critical role in informing the public and providing direct assistance to populations at increased risk during extreme heat. Regional public health services frequently collaborate in the development and execution of these plans.

In recent years, larger municipalities have begun identifying heat-vulnerable neighbourhoods to develop targeted neighbourhood-level HHAPs involving their local inhabitants. National initiatives, such as the Community of Practice on Heat for local and regional governments, along with regularly organized workshops and webinars, foster effective stakeholder across governance levels. These platforms bring together knowledge centres and sectors including public health, social housing, and regional security and crisis management. This organic, multilevel process culminated in the publication of the first national integrated policy document on heat adaptation *(23)*.

Box 1 contd

**Fig. 3. Governance structure of the District of Ludwigsburg HHAP**


*Source*: District of Ludwigsburg *(8)*.

National HHAPs often provide general guidance and a framework for regional and local heat–health action. This is especially the case in federal governance systems, where regional governments hold the power to legislate and govern certain sectors, such as public health or education, independently. In unitary governance systems, national HHAPs may also delegate substantial implementation responsibilities to regional and local authorities, enabling more targeted and

timely responses *(14)*. Accordingly, HHAPs at the regional level often provide guidance and support for local heat–health governance and action, ensuring a link to national policies, support capacities and technical expertise. HHAPs at the local level typically focus on targeted measures for populations at increased risk of heat-related harm and localized reduction in heat exposure – for example, through context-specific urban planning and management.

The scope and institutional arrangements of HHAPs may also vary across core elements. For example, for Core element 2 – Heat–health warning system and Core element 7 – Heat–health surveillance, government institutions at the national level play a crucial role in enabling local heat–health action. Locally relevant heat–health warnings are often issued centrally at the national level as part of a national HHAP *(15)*. In some federal systems, regional and/or local HHAPs may need to establish heat–health warning systems that take into account nationally issued heat–health warnings to reach key actors at regional and/or local level *(16)*. Similarly, surveillance is often implemented at the national level *(17,18)* – for example, through national public health institutes. Depending on the availability of data, surveillance at a regional or local level may have a more limited scope, but can draw on national surveillance to manage heat–health risks at those levels. Conversely, in local or regional HHAPs the scope of Core element 3 – Populations at increased risk may be more extensive than at the national level, as active outreach, community involvement and participatory development measures are typically better targeted and more effective when implemented at the local and regional level *(19)*.

Given the diversity of scopes and institutional arrangements, governance mechanisms spanning national, regional and local levels can strengthen coordination and promote coherent and effective heat–health action. These multilevel mechanisms should be tailored according to existing legal and institutional arrangements, and can be different across core elements.

## 1.7 Monitoring, evaluation and learning for improving governance structures

Monitoring, evaluation and learning are central to accountability within effective governance systems. In the context of HHAPs, these processes provide the information needed to assess whether commitments translate into action, resources are used effectively, and progress is assessed and reported transparently (see also Core element 8 – Monitoring, evaluation and learning). Monitoring, evaluation and learning enable performance review, gap identification and informed decision-making, while supporting continuous improvement through the identification of implementation enablers, barriers and course corrections. As such, monitoring, evaluation and learning function as both a learning system and an accountability mechanism within HHAP governance.

Monitoring focuses on routine tracking of governance arrangements supporting heat–health action, including roles, reporting and information flows. Key monitoring questions include:

- Are governance roles and mandates clearly defined and operational?
- Are governance reports produced and shared according to agreed cycles and standards?
- Are governance-related enablers and barriers systematically identified and monitored over time?

Monitoring indicators may include the existence of formal mandates and terms of reference; proportion of working group members with clearly assigned functions; frequency of governance reports submitted as scheduled; completeness of reports covering performance, coordination and resource use; completeness of reporting against agreed governance indicators; and existence of data-sharing protocols across sectors and levels.

Evaluation provides a structured assessment of how effectively governance arrangements support coordination, accountability and decision-making for heat–health action. It examines whether governance structures, mandates and coordination mechanisms are fit for purpose, and whether governance review processes are supported by adequate data governance arrangements – including applied protocols for data quality, access and use, and functioning data-sharing agreements across national, regional and local levels. Key evaluation questions include:

- Do existing governance arrangements support coordination and oversight effectively?
- What governance or data-governance weaknesses limit effective performance?
- Are evaluation findings used to inform oversight and strengthen accountability?

Evaluation indicators may include the completion of scheduled governance reviews or evaluations; the number and type of governance gaps or inefficiencies identified; the conduct of independent reviews or audits where feasible; the availability of governance performance data that meet agreed quality standards; and the publication of evaluation findings to support transparency.

Learning ensures that evidence generated through governance monitoring and evaluation is systematically used to strengthen governance arrangements over time. It relies on feedback loops that translate findings into adjustments to governance structures, mandates, coordination mechanisms and decision-making processes, and on the systematic documentation of governance-related enablers and barriers. Key learning questions include:

- Are governance-related enablers and barriers consistently documented across review cycles?
- Are corrective actions implemented in response to identified governance challenges?
- Do learning processes lead to sustained improvements in coordination, accountability and data governance?

Learning indicators may include the regular documentation of identified enablers and barriers, such as enabling policy frameworks, interoperable information systems, municipal capacity; the number of governance adjustments or corrective actions taken in response to identified issues; and improvements over time in data-sharing practices and information system interoperability.

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# Core element 2 – Heat–health warning system

**The aim of this core element is to implement an accurate and timely warning system.**

## Key messages

- Heat–health warning systems are most effective when they are integrated into the HHAP's governance, activation, communication and response arrangements, rather than functioning as standalone alerts.
- Heat–health warning systems should use locally appropriate indicators and thresholds, ensuring that warning levels reflect the climatic conditions, health risks, and the capacity of relevant health and other services ability to act upon the warnings.
- Warning levels should be clearly linked to predefined actions, responsibilities and decision pathways within the HHAP, so that alerts trigger timely and proportionate response measures.
- Warnings should be disseminated through agreed communication channels with sufficient lead time to allow authorities, services and communities to act.
- Heat–health warning systems should be reviewed regularly through monitoring, evaluation and learning to improve performance over time and to reflect changing climate conditions, demographics, vulnerability patterns and institutional capacities.

## Core element output

The core element output is an agreed governance structure with clear roles and responsibilities, including an identified lead body and a coordination mechanism or group to initiate, develop and implement the HHAP.

## Steps to implement the core element

The following steps collectively support the development of an operational heat–health warning system. It is important to:

- co-design the heat–health warning system through the multisectoral coordination arrangements involving meteorological services, public health authorities, civil protection, regional and local authorities, health and social care providers, communication actors, and relevant community representatives;
- define the characteristics of the heat–health warning system within the HHAP, including the indicators used, warning thresholds, warning levels, geographical coverage, lead time and update frequency;
- align warning levels with HHAP activation levels, specifying measures and response actions required at each level, and start and stop criteria for each warning level;
- clarify institutional roles and responsibilities for issuing, receiving, disseminating, interpreting and acting on warnings across national, regional and local levels;
- establish a decision pathway for alerts, including who receives warning information, who confirms or authorizes activation, and how escalation and stand-down decisions are made;
- define targeted protection measures for populations and settings at increased risk of threats to health from extreme heat, including tailored triggers and actions for relevant service providers and community actors;
- brief and train all relevant HHAP actors with coordination, activation and implementation roles on warning levels, required actions, coordination procedures, communication protocols and reporting expectations; and
- review and update the heat–health warning system regularly through seasonal reviews and after-action learning, and use the findings to refine thresholds, procedures, action matrices and dissemination arrangements within the monitoring, evaluation and learning framework.

## 2.1 Introduction

Heat–health warning systems are a core component of HHAPs. Their purpose is to anticipate periods of elevated heat-related health risk and provide timely, actionable information that enables authorities, services, communities and the public to take protective action. By translating meteorological information into health-relevant warnings, heat–health warning systems support early response, targeted outreach to populations at increased risk of threats to health from extreme heat, and coordinated action across relevant sectors, agencies and levels of government *(1,2)*.

> **Governance considerations**
>
> The HHAP should define the roles, responsibilities, communication channels and coordination mechanisms for issuing, disseminating and acting on heat–health warnings across national, regional and local levels. National meteorological and health authorities typically issue the warnings, while regional and local actors operationalize the warnings by conducting outreach to at-risk groups; adapting operations of public health, hospital, ambulance, social care and other municipal/local government services; implementing protective measures; and delivering messaging and communication.

To be effective, heat–health warning systems need to be embedded within broader heat–health action planning and supported by defined governance and institutional roles, agreed communication pathways and operational arrangements. Their design should reflect local climatic conditions, population vulnerabilities, health risks and institutional capacities. This includes selecting appropriate indicators and thresholds, defining warning levels, linking alerts to response measures, ensuring dissemination through trusted channels, and clarifying responsibilities for interpretation and action at national, regional and local levels.

Countries across the WHO European Region use a range of approaches to heat–health warning systems depending on available data, institutional arrangements and existing public health and meteorological capacities. Most heat–health warning systems are developed and managed by national meteorological services.[3] Across these different models, performance depends not only on the quality of the forecast but also on how well the system is integrated into decision-making, communication and response processes.

This chapter provides an overview of the main components of heat–health warning systems within HHAPs. It includes general considerations for their development; information on their operation, co-design, coordination and dissemination – including roles of key actors and integration into response; details about environmental co-exposures; and elements to consider for review.

[3] In some contexts, meteorological services are referred to as "meteorological and hydrological services". In this guidance, the term "meteorological services" is used to encompass both meanings.

## 2.2 General considerations for developing heat–health warning systems

Key principles for developing effective heat–health warning systems include *(2)*:

- accurate forecasting;
- setting scientifically supported heat–health thresholds;
- implementing graded warnings; and
- ensuring prompt communication of warnings to relevant actors defined in the HHAP and to the public.

Heat–health warning systems have been developed using various exposure indices that range from single meteorological variables – usually temperature parameters (such as mean, minimum and maximum) and meteorological intensity – to thermal (heat stress) indices of different complexity *(2,3)*. These indices combine several parameters, such as temperature, humidity, wind speed and solar radiation, to represent the perceived temperature. A range of indices and approaches has been developed across the WHO European Region *(2–5)*; however, there is no universally agreed index or indicator: the choice should be guided by the specific climatic conditions, context and objectives of the warning system.

In the context of HHAPs, heat–health warning systems should be tailored to local risk by considering the meteorological conditions that drive heat stress (such as high daytime temperatures, warm nights and humidity), population characteristics and vulnerability factors. Where routine health data and meteorological data are available, countries should use epidemiological evidence (local analyses where feasible, or evidence from comparable settings) to quantify the heat–health relationship and to establish impact-based thresholds to define warning levels – linking thresholds to observed increases in outcomes such as mortality, emergency visits or ambulance call-outs.

In addition to short-range forecasts, subseasonal and seasonal climate models can support preparedness before the summer season by providing probabilistic information on temperature trends and the likelihood of extreme heat. Although longer lead times may reduce forecast accuracy, these tools can still support planning, resource allocation and readiness for services involved in HHAP implementation *(1–3,6)*.

Heat–health warning systems in the WHO European Region use different operational models. Some are primarily impact-based, defining thresholds based on the association between health outcomes and temperature indicators. Others are hazard-based, using solely meteorological thresholds. While the choice of model will depend on data availability, heat–health warnings should be grounded in temperature–health relationships, ensuring that thresholds are informed by health risks rather than meteorological conditions alone, and adjusted to account for changing vulnerability patterns in health outcomes *(1)*.

Governance arrangements for heat–health warning systems also differ in their institutional and coordination mechanisms, levels of spatial resolution and coverage, and protocols for communication of warnings *(1,3,4,6)*. The examples in Box 2 illustrate how these approaches can be operationalized within HHAPs.

## Box 2. Examples of heat–health warning systems

France has a national heatwave vigilance system. The warning system is managed by the French National Meteorological Service within the national vigilance meteorological framework. It uses four graded warning levels (green, yellow, orange and red) to communicate the level of heat-related danger to authorities and the public. The system is based on department-specific biometeorological indicators developed with health sector actors, including the national public health agency, Santé publique France, using the average minimum and maximum temperatures over a rolling three-day period, and taking into account local sensitivity and acclimatization characteristics. Operational alert levels are further adjusted according to aggravating or attenuating factors such as episode duration, precocity, humidity, air pollution and pressures on the health system. It is a nationally managed warning system that combines public-facing graded alerts with locally adapted health-relevant threshold criteria. National guidance also notes that heat episodes are generally forecast about one week in advance, allowing time to alert prevention and risk management actors *(7)*.

Germany has a federal biometeorological warning system. The heat–health warning system is operated by the German Weather Service. It is a threshold-based system using health-relevant biometeorological criteria rather than a fixed air temperature threshold alone. Warnings are based on perceived temperature, together with night-time indoor cooling and seasonal acclimatization parameters. The German Weather Service applies two warning levels: strong heat stress (perceived temperature above about 32 °C with insufficient night cooling) and extreme heat stress (perceived temperature above 38 °C). Heat warnings are issued through state and municipal levels for the current day and the following day, with additional pre-heat information available several days in advance. Warnings are disseminated through official German Weather Service warning channels, including the WarnWetter application (app), newsletters and civil protection warning systems, with supporting information for health sector users and the public *(8,9)*.

Italy has a national system with city-specific models in regional capitals. The National Coordination Centre for Heat–Health Prevention manages an impact-based heat–health warning system using city-specific maximum apparent temperature–mortality associations to define graded warning levels. Warnings are defined in relation to expected mortality impacts rather than temperature measurements alone. City-specific thresholds vary by city and throughout the summer season, taking into account consecutive days and seasonal acclimatization. HHAPs make use of warnings to trigger health and social responses and public messaging *(1,10)*.

Spain has a national plan with territorial thresholds. The alert system is coordinated by the Ministry of Health and uses forecast data from the State Meteorological Agency. Meteosalud is the Ministry of Health's heat–health risk information and alert framework, which uses territorially defined zones to apply locally adapted thresholds and assign daily risk levels. The system defines four health risk levels: Level 0 (no risk), Level 1 (low risk), Level 2 (medium risk) and Level 3 (high risk), using a decision algorithm based on forecast maximum temperature, duration and a territorial risk factor. This is a health-impact-based system rather than a single national meteorological threshold *(10,11)*.

## Box 2 contd

Switzerland has a national hazard-based model. The Federal Office of Meteorology and Climatology uses daily mean temperature ($T_{mean}$) and duration to issue graded warnings: Level 1 for minimal or no danger, Level 2 for $T_{mean}$ ≥25 °C for one to two days, Level 3 for $T_{mean}$ ≥25 °C for at least three consecutive days, and Level 4 for $T_{mean}$ ≥27 °C for at least 3 days. The system is informed by Swiss epidemiological evidence linking daily mean temperature to mortality. Warnings are disseminated to the public through the MeteoSwiss app, a hazard map and the Natural Hazards Portal, while Level 3 and Level 4 warnings are also communicated directly to canton authorities *(12)*.

The examples in Box 2 show that countries may use different approaches to define warning thresholds; however, in all cases, warning levels need to be linked to clear operational actions, responsibilities and review mechanisms within the HHAP.

Heat–health warning systems should meet several operational requirements to support timely and effective public health action *(3)*.

- Adequate lead time is vital. Given the short lag between heat exposure and worsening health outcomes, warnings should be issued sufficiently in advance to allow stakeholders to activate pre-agreed response measures linked to each warning level. The required lead time will vary by measure, but should be long enough to support timely communication among stakeholders set out in the HHAP, mobilization of supporting services, outreach to at-risk groups and activation of response measures. In practice, this may include advance notice several days ahead and warning notifications 24–48 hours before the extreme event.
- Heat–health warning systems should use graded warning levels where appropriate, with each level reflecting increasing heat intensity, duration and expected health risk. Lower warning levels may support preparedness and early action, while higher levels should trigger more immediate and targeted response measures.
- Warning levels and thresholds should reflect local customization, including local health risks, capacities of relevant services and agencies to act on the warnings, and the types of interventions triggered.
- Each warning level should correspond to clearly defined measures, including linkage to actions tailored to local populations and those at increased risk of heat-related harm. A warning-level action matrix, or similar arrangement, should be developed as integral part of the HHAP. This should set out the minimum measures, responsible actors, implementation timelines, and start and stop criteria for each warning level. Such an approach helps to ensure that responses to warnings are timely, proportionate and coordinated.
- Adaptability and flexibility are essential. Heat–health warning systems, and the HHAPs under which they operate, should be able to adjust to local public health and emergency frameworks, and should remain operational beyond the traditional summer period when required.

Adapting heat–health warning systems to shifting demographics, population vulnerabilities and the changing climate is an ongoing task: it is essential that warning systems evolve to remain effective. This may involve recalibrating temperature thresholds, updating health impact models and expanding the geographical coverage of warning systems. For example, the ageing population and widening social inequalities (including poverty, energy insecurity, substandard housing and social isolation) in many regions may increase vulnerability to heat, necessitating lower thresholds for issuing warnings – particularly in deprived neighbourhoods and among structurally disadvantaged groups. Similarly, as urban areas expand, the urban heat island effect may require more localized warning systems within large urban areas. Conversely, as HHAPs and warning systems are implemented, and adaptation to heat is enhanced, it might be necessary to revise thresholds accordingly *(1,2,4,7)*.

## 2.3 Operational arrangements for heat–health warning systems

For heat–health warning systems to function effectively within an HHAP, operational responsibilities should be defined across national, regional and local levels. Warning systems are typically operated at the national level, but warning information must be disseminated in a timely manner to regional and local authorities and other relevant actors responsible for organizing and implementing response actions under the HHAP.

- At the national level, meteorological services use weather forecast data to issue warnings and inform decision-makers. The responsible national authorities then communicate warning information to relevant sectors at different levels of government to support timely activation of health, social care and emergency response measures set out in the HHAP.
- At the regional level, health and other responsible authorities set out in the HHAP typically relay warnings and associated communications within their jurisdictions. They activate and coordinate implementation of preparedness and response measures across relevant services and agencies.
- Local authorities and service providers are responsible for implementing the actions linked to each warning level, including outreach to populations at increased risk of heat-related harm, and communication with relevant local stakeholders and actors. Operations of local public health, hospital, ambulance, social care and other municipal/local government service delivery need to be adapted *(1,3,4,6)*. Within the HHAP, warning levels need to be linked to health and social care readiness arrangements. These may include continuity-of-care measures for patients and service users at increased risk, surge arrangements to respond to higher demand, and updated service guidance to support providers in adapting operations during heat events. Such roles and arrangements should be specified for the preparedness phase before summer, the operational phase during warnings, and the review phase after the event or season (see also Core element 1 – Governance; User action brief 1 – Health domain and User action brief 4 – Social care domain in Part 2).

To ensure continuous operation of the heat–health warning system, the HHAP should define out-of-hours arrangements for nights, weekends and public holidays. These arrangements should specify which institution is responsible for receiving warning information, confirming or authorizing alert activation where required, disseminating warnings to relevant actors, and initiating procedures outside normal working hours.

## 2.4 Co-design of heat–health warning systems within the HHAP

Active participation of multiple stakeholders is essential for successful implementation of heat–health warning systems. Co-design is understood as an overarching participatory approach to the development of the warning system and its operationalization. Co-design also entails co-management, referring to the shared coordination and implementation of warning system, and co-production, referring to the collaborative generation, interpretation and use of knowledge, warnings and responses.

Relevant actors to be involved in the co-design of heat–health warning systems include meteorological services, health and civil protection authorities, subnational and local authorities, health and social care providers, and other relevant local services involved in implementing heat response measures. Local communities and representatives of populations at increased risk of heat-related harm should be explicitly included in the design to ensure that warning thresholds, messages and actions reflect real-world needs, vulnerabilities and capacities. Their early involvement ensures that heat–health warning systems are not only technically robust but also actionable, trusted and responsive to local needs.

Co-design should focus on practical deliverables, including agreement on:

- the warning thresholds and warning levels;
- the relevant actors and the decisions that each actor is expected to take at different warning levels;
- the minimum actions expected at each warning level and the responsible actors;
- the dissemination channels and the frequency with which warnings and updates will be issued;
- training and information to ensure common understanding of warnings and risk communication among all actors involved; and
- arrangements for in-season feedback from warning system users and implementing stakeholders, and post-season evaluation and revision *(2)*.

At the national level, a key starting-point for co-designing the heat–health warning system is early collaboration between meteorological and health authorities. Within the broader HHAP multisectoral coordination process, these authorities typically play a central role in developing warning thresholds and levels, shaping communication approaches, and contributing to evaluation of the warning system. This collaboration helps to ensure that weather forecasts are interpreted in the light of health evidence and that health actions are informed by accurate meteorological information. Such collaboration is essential during all the phases: the preparedness phase before summer, the operational phase during summer when warnings are issued, and the evaluation phase after summer to assess the effectiveness of actions and responses put in place *(1–3)*.

The HHAP working group – particularly those partners with monitoring, activation and implementing roles (see also Core element 1 – Governance) – should understand the basis for warning levels, the geographical coverage, the update cycle and the action guidance linked to each warning level. Where appropriate, this information should also be publicly available to support trust and consistent interpretation of warnings *(3)*.

Countries operationalize co-design in different ways, depending on governance arrangements and existing public health systems *(1,6)*. The examples in Box 3 illustrate how co-design can strengthen cross-sector coordination, territorial adaptation, practical implementation guidance and action by local actors.

### Box 3. Examples of co-designing heat–health warning systems

The heat–health warning system in France is coordinated between Météo-France and Santé publique France, so that warning issuance, health surveillance and prevention messaging are closely aligned. Météo-France is responsible for the heatwave vigilance warning, while Santé publique France contributes health surveillance through the Heatwave and Health Alert System, and supports prevention and communication measures before and during heat alerts. Heat vigilance information is used by prefectures to trigger departmental heat alerts, while health authorities and local actors – notably municipalities – implement prevention, communication and response measures at territorial and local levels *(7,13)*.

The heat–health warning system in Italy was co-designed between national and regional meteorological services, civil protection, and the Ministry of Health and regional health services. It involved the development of heat-impact models through epidemiological studies, definition of warning levels, provision of forecasts and alerts, and integration into the national warning framework for emergency response, communication and dissemination. The warning system is embedded in the national, regional and local HHAPs to trigger health and social prevention and emergency response measures, targeted to at-risk groups. Before the summer season, the composition of institutions, services and people in charge participating in the national, regional and local networks of stakeholders involved in HHAPs is confirmed or updated to ensure that dissemination of the warnings is cascaded and inclusive *(14)*.

In England (United Kingdom of Great Britain and Northern Ireland), the weather–health alerting system was jointly developed by the UK Health Security Agency and the Met Office to combine meteorological forecasting with public health impact assessment. The system provides graded alert levels and region-specific decision-aid temperature thresholds; it is intended for use by health and social care services, local responders, voluntary and community organizations, and government bodies. The developers produced cards and user guidance explaining the actions expected at each alert level. The alerts are cascaded through national, regional and local structures, with tailored guidance for health and social care providers, national government and the voluntary and community sector *(15)*.

## 2.5 Warning dissemination and integration into a heat–health communication strategy

Effective communication is crucial to the success of heat–health warning systems. Within the HHAP governance framework, national meteorological services should issue the warnings, while the responsible public health authority should translate them into health-relevant guidance and operational advice. Warning systems should also be linked to broader emergency response and public health plans, and closely aligned with the HHAP's heat–health communication strategy to

support warning dissemination and coordinated action during extreme heat events *(1,2,6)* (see also Core element 4 – Communication).

All HHAP actors with activating and implementing roles require training. This will ensure joint understanding and alignment in terms of how heat–health warnings function, and effective implementation of the health protection and adaptation measures that should be taken at each warning level, according to the provisions set out in the HHAP.

Warnings should be disseminated through multiple channels to ensure that they reach all segments of the population, including groups at increased risk of threats to health from extreme heat (see also Core element 3 – Populations at increased risk) and others who may not understand the primary national or local language *(1,16,17)*. Integrating heat–health warning systems with specific alert systems for populations at risk enhances the overall effectiveness of public health interventions. To achieve this, the warnings and accompanying public health advice should be disseminated to regional and local authorities, health and social care providers, emergency services, community actors, and the public (see also the public health message bank in Part 3). Community engagement further strengthens warning dissemination and uptake.

Using standardized digital formats – such as the Common Alerting Protocol – for exchanging public warnings and emergency alerts in a uniform way can support rapid and consistent dissemination of heat–health warnings across multiple channels. Such a format enables the same heat–health warning to be automatically and consistently redistributed across different communication platforms, including mobile phone alerts, radio, television, websites and public displays *(18)*.

The information distributed should specify the warning level, the expected heat conditions, the duration of the event and the measures to be implemented by each audience, as set out in the relevant HHAP *(1–3)*. Public messages should be clear, concise and actionable, informing people not only about the risk but also about the protective measures they should take *(18)*. The public health message bank in Part 3 provides relevant messages for the public about how to prepare for hot weather, what to do during hot periods and how to recover afterwards, covering various settings. In addition, the user action briefs in Part 2 provide actionable guidance for diverse audiences on practical steps that can be taken before, during and after heat events.

## 2.6 Environmental co-exposures

Extreme heat often coincides with other environmental hazards, such as solar ultraviolet (UV) radiation, droughts and air pollution, including vegetation fire smoke (see also Annex 1 for details on actions to manage combined exposure to extreme heat and vegetation fires). These combined, cascading and cumulative exposures can amplify health risks – particularly for people with chronic conditions, those with limited resources and those living in at-risk areas. Power outages are among the most important cascading effects, as they can disrupt communications, emergency response, health services, medical equipment and cooling. For HHAP development, this means that environmental co-exposures and cascading events should be treated as an integral part of heat risk assessment, preparedness planning and response arrangements, rather than as separate or secondary issues *(19–29)*.

From a public health perspective, integrating environmental co-exposures into heat–health warning systems allows a more complete assessment of risk and supports better-targeted protective action. When developing or updating an HHAP, countries should therefore consider how heat alerts relate to other relevant warning systems, how combined risks will be reflected in public health advice, and which institutions need to coordinate action when multiple hazards occur at the same time. This requires alignment of plans and public messages across hazards, and strong multisectoral collaboration among key heat–health actors from meteorology and climate services, public health authorities, civil protection, environmental agencies, energy providers and other relevant actors. For example, when extreme heat coincides with air pollution, including vegetation fire smoke, warning systems and response measures should provide harmonized advice – especially for people with respiratory and cardiovascular conditions *(2,22)*.

Heat–health warning systems should therefore not operate in isolation. Integrating them within a multihazard early warning framework can help HHAPs to reflect real-world risk conditions, strengthen operational coordination during heat events, and support evaluation and revision after the heat season *(30)*.

## 2.7 Monitoring, evaluation and learning for improving heat–health warning systems

Monitoring, evaluation and learning are essential to ensure that the heat–health warning system remains operationally effective, understandable to users and aligned with the response measures set out in the HHAP. They help to assess whether warnings are issued, disseminated and used as intended, and whether the system continues to reflect changing heat risks, vulnerabilities and institutional capacities. Responsibilities should be defined clearly within the HHAP *(1,2,4,31)*. National meteorological and public health authorities should lead the monitoring, evaluation and learning framework of the warning system, including establishment of indicators, reporting arrangements and review processes. Regional and local authorities should coordinate review within their jurisdictions. Local authorities, health and social care services, emergency management actors, and other implementing agencies should monitor operational use of warnings and provide feedback on implementation in practice.

Monitoring tracks the performance of the warning system and related operational arrangements throughout the heat season. This includes routine tracking of warning issuance, lead time, dissemination, updates and use by responsible actors. Key monitoring questions include:

- Are warnings being issued and updated according to agreed procedures?
- Are warnings reaching the responsible authorities; health, social care and other relevant services; and target populations in sufficient time to act?
- Are the actions linked to each warning level being activated as planned?

Monitoring indicators may include the number of warnings issued; proportion of warnings issued with the expected lead time; proportion of warnings updated according to established procedures; proportion of responsible authorities and services receiving warnings on time; number of dissemination channels activated; and, where feasible, proportion of sectors or services that initiated the actions linked to the warning level.

Evaluation provides an assessment of the warning system's relevance, effectiveness and suitability for supporting timely and appropriate action. Key criteria for evaluating the effectiveness of a heat–health warning system include simplicity, acceptability, timeliness, sensitivity and specificity *(1,6,32–35)* (Table 2). Key evaluation questions include:

- Does the warning system function in a practical and reliable way under routine conditions?
- Does the warning system provide timely and usable warnings for the actors expected to respond?
- Does the warning system identify warning days and non-warning days appropriately, in line with the agreed thresholds and criteria?

Learning ensures that findings from monitoring and evaluation are used to improve the warning system before the next heat season. The findings from seasonal review, post-event reflection and regular exchange between meteorological services, health authorities and implementing actors provide valuable input to the learning process. Key learning questions include:

- What worked well and what gaps and challenges were observed during the heat season?
- What changes are needed to improve warning thresholds, dissemination, coordination or linked actions?
- How should the system be adapted over time to respond to changing climate conditions, vulnerabilities and implementation capacities?

Learning indicators may include the number of review meetings conducted; number of agreed improvements to thresholds, procedures, dissemination arrangements or action matrices; proportion of agreed improvements implemented before the following heat season; and updates made to training, guidance or standard operating procedures.

## Table 2. Criteria and indicators for evaluating the effectiveness of a heat–health warning system

| Evaluation criterion | Elements involved | Possible indicators |
|---|---|---|
| Simplicity of operation and management | Data input and processing requirements<br>Operational steps for generating warnings<br>Clarity of roles and responsibilities<br>Standard operating procedures<br>Maintenance arrangements | Whether the system is practical to operate and maintain effectively in routine conditions:<br>• operational steps defined<br>• procedures in place<br>• clear roles and responsibilities defined<br>• availability of required data<br>• ease of routine operation<br>• continuity of system functioning |
| Acceptability by stakeholders | Agreement among agencies to use the system<br>Willingness to engage<br>Evidence of uptake and use in practice | Whether the system is accepted, trusted and used by the relevant actors:<br>• participation of all relevant stakeholders<br>• perceived usefulness<br>• uptake in practice<br>• regular use by responsible institutions<br>• continued engagement of all partners |
| Timeliness | Timing of warning issuance and updates<br>Adequacy of lead time for communication, service mobilization and activation of measures | Whether warnings support timely preparedness and response:<br>• timeliness of issuance and updates<br>• communication<br>• sufficiency of lead time for communication and service mobilization<br>• activation of measures<br>• service readiness |
| Sensitivity of warnings | Ability of the system to identify warning days correctly compared to observed conditions or impacts | Whether the system appropriately detects periods of elevated heat-related risk:<br>• correct identification of warning days<br>• proportion of warning days detected<br>• appropriate activation during periods of elevated risk<br>• reduced emergency department visits or hospital admissions during heat events |
| Specificity of warnings | Ability of the system to identify non-warning days correctly and minimize false-positives | Whether the system avoids unnecessary warnings while maintaining credibility and usability:<br>• low false-alarm rate<br>• maintenance of user confidence and trust in the warning system |

*Sources:* adapted from WMO & WHO *(3)*.

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# Core element 3 – Populations at increased risk

**The aim of this core element is to identify populations at increased risk to ensure appropriate prevention, protection and care.**

## Key messages

- Identifying populations at increased risk of threats to health from extreme heat is essential for effective and equitable heat–health action.
- Populations at increased risk of heat-related harm include older people, infants and young children, pregnant women, people with chronic conditions, people with restricted mobility or cognitive impairment, workers, athletes and people exercising in the extreme heat, tourists and people attending mass gatherings, migrants, refugees, and people facing socioeconomic disadvantage or reduced access to services.
- Extreme heat vulnerability arises from the interaction of exposure, sensitivity and capacity to respond, and may change over time.
- Targeted outreach, tailored communication, and coordinated health and social care responses are required to protect those most at risk.
- Local actors play a critical role in identifying and supporting populations at increased risk, within a framework defined at the national level.
- Continuous monitoring, evaluation and learning are necessary to adapt measures and respond to evolving risks and needs.

## Core element output

The core element output is an assessment and mapping of relevant populations at increased risk of heat-related harm to be addressed within the scope of the HHAP, together with a specific outreach strategy with recommendations and actions to target those identified at increased risk.

## Steps to implement the core element

The following steps collectively support the assessment and mapping of populations at increased risk of threats to health from extreme heat and the development of targeted recommendations and actions. It is important to:

- define institutional roles and responsibilities across governance levels and sectors, for assessing, identifying and supporting populations at increased risk – including coordination between health and social care actors;
- define populations, settings and circumstances associated with increased risk of heat-related harm within the HHAP;
- assess extreme heat vulnerability using available demographic, health, social, environmental and service-related data, taking account of local context and changing patterns of risk;
- identify and, where feasible, map priority populations, locations and settings – including high-risk neighbourhoods, facilities and population groups;
- use available data, service knowledge and community networks to support targeted action – including for groups who may require proactive support before and during extreme heat events;
- establish outreach, referral and follow-up arrangements for populations at increased risk;
- ensure that outreach and support measures are equitable, accessible and adapted to local needs;
- support implementing actors such as health, social care and relevant community actors with guidance and training to recognize heat-related risks, support groups at increased risk, and implement outreach and response actions effectively; and
- review and update identification, mapping and outreach approaches regularly as vulnerabilities, service capacities and local conditions change over time.

## 3.1 Introduction

Populations are not affected equally by extreme heat. Heat-related risk is shaped by a combination of factors, including (but not limited to) health status – such as chronic illness and functional limitations, age and medication use, living conditions, socioeconomic circumstances, occupational exposure and access to essential public services. Populations at increased risk of threats to health from extreme heat include older people, infants and young children, pregnant women, people with chronic conditions, people with restricted mobility or cognitive impairment, outdoor workers, athletes and people exercising, tourists and people attending mass gatherings, migrants, refugees, and people with limited resources, inadequate housing or reduced access to services *(1,2)*. Effective HHAPs, therefore, need to look beyond measures addressing the general population, and should pay particular attention to prevention, preparedness and response actions that are tailored to those groups at increased risk.

A central requirement is strong coordination between the health and social care sectors. Many populations at increased risk of heat-related harm are identified, supported and monitored through routine contacts with primary care, hospitals, home-care services, long-term care, disability services, social protection systems and community-based support networks. For this reason, HHAPs should ensure that health and social care actors work in a coordinated way to identify people at increased risk, share responsibilities, align outreach and referral pathways, and provide timely support before and during extreme heat events. Since vulnerability status and the needs of the population at increased risk change over time, it is important to evaluate any actions put in place to ensure their continued effectiveness and help to minimize health-related impacts *(1–3)*.

> **Governance considerations**
>
> National HHAPs should provide the framework for identifying and supporting populations at increased risk of threats to health from extreme heat, including defining and establishing coordination between the health and social care sectors.
>
> Regional and local HHAPs should set out concrete measures to ensure that populations at increased risk are identified, reached and supported effectively before and during extreme heat events. Civil society organizations and representatives of affected population groups can support targeted action at regional and local levels.

The purpose of this core element is therefore to ensure that those most at risk are systematically identified and supported through targeted, timely and equitable interventions. By linking vulnerability assessment with practical action, HHAPs can reduce preventable illness and mortality during extreme heat events *(1)*. This chapter outlines key concepts of extreme heat vulnerability, approaches to identifying populations at increased risk, and practical measures for tailoring interventions and ensuring equitable protection.

While recognizing the interdependence between the health and social care sectors, this core element focuses primarily on actions within the direct scope of work of the health sector. However, many of the actions and suggested interventions to protect populations at increased risk are also highly relevant to social care services, and additional, more specific and complementary actions are presented in the user action briefs in Part 2.

## 3.2 Extreme heat vulnerability

During extreme heat, everyone may be affected to some extent. The health impacts of extreme heat depend on the interactions between vulnerability and risk factors at both individual and community levels. Vulnerability reflects people's capacity to adapt or respond to heat stress and to protect their health, and its interaction with risk-related factors such as exposure to extreme heat, including through access to cooling opportunities, health and social care services, and supportive living environments *(1,2)*. Risk factors relate primarily to physiological sensitivity or susceptibility to the effects of extreme heat (for example, in the cases of older or pregnant people, or those with chronic conditions); exposure (such as occupational or environmental heat exposure), and capacity to protect health (such as social isolation, poverty, housing conditions and access to services) *(2,4)*.

These factors should be considered when developing an HHAP – particularly in identifying populations at increased risk at the local level, shaping targeted response actions and information campaigns to help raise awareness (see also Core element 4 – Communication).

### 3.2.1 Vulnerability at the individual level

Populations at increased risk from extreme heat can be identified through three overlapping dimensions: individual risk factors related to greater physiological sensitivity or susceptibility to heat stress, vulnerability associated with higher exposure to extreme heat, and vulnerability linked to lower capacity to protect health and cope with heat impacts *(1–3)*.

Greater physiological sensitivity or susceptibility to heat stress refers to biological and health-related characteristics that increase the likelihood of adverse health effects during heat exposure *(3,4)*. Population groups at increased risk particularly include the following.

- Older people are at particular risk from exposure to heat. Ageing can impair thermoregulation and blunt thirst – people do not feel thirsty when dehydrated due to impaired thirst threshold, which can increase the risk of dehydration. Multimorbidity, frailty, cognitive or functional limitations, and the use of multiple medications may further reduce coping capacity and worsen medicine-related adverse effects during extreme heat events *(5–8)*.
- Vulnerability to extreme heat varies across childhood and adolescence. Newborns and infants are particularly sensitive because of immature thermoregulation, higher body surface-to-volume ratio, greater dehydration risk and complete dependence on caregivers for hydration, cooling and protection. Young children may also be at increased risk because they are less able to recognize, communicate or respond to heat stress independently. Older children and adolescents at school in hot indoor environments with inadequate ventilation, or undertaking physical activity in extreme heat, may also be at greater risk. Across all

age groups, vulnerability is shaped both by physiological factors and by dependence on caregivers, schools and other settings to provide protection during extreme heat *(9–12)*.

- Pregnant women are at increased risk. Heat stress and dehydration during pregnancy are associated with adverse maternal and birth outcomes, including increased odds of preterm birth, stillbirth, congenital anomalies and gestational diabetes mellitus, as well as low birth weight. The risk of obstetric complications may also increase during extreme heat events – particularly among women with pre-existing chronic conditions *(13–15)*. Although the mechanisms are complex, pregnancy is associated with physiological changes that may increase susceptibility to heat stress, including higher blood volume and cardiac output, hormonal changes affecting vascular tone and thermoregulation, greater metabolic demands, and increased fluid requirements, all of which may reduce heat tolerance and increase the risk of dehydration – particularly during extreme heat events *(16–18)*.
- People with chronic conditions may experience impaired thermoregulation, hydration, metabolic stability, cardiovascular adaptation, symptom recognition or the ability to take protective action during extreme heat events. Cardiovascular disease may increase cardiovascular strain and worsen arrhythmias, ischaemic stroke and acute myocardial infarction. Respiratory disease – including chronic obstructive pulmonary disease and asthma – may aggravate symptoms through airway and systemic inflammation. Mental health and neurodegenerative conditions may impair risk perception, adaptive behaviour or thermoregulation, and some psychotropic medicines may further increase risk. Diabetes may reduce heat tolerance through impaired circulation, reduced sweating, dehydration risk and comorbidities. Kidney disease may be worsened by dehydration, electrolyte imbalance and renal stress. Some medicines – including diuretics, anticholinergics and neuroleptics – may further affect sweating, hydration, renal function or cardiovascular response *(19–22)*.
- People with restricted mobility, cognitive impairment or dependence on others for daily care may have limited ability to cool themselves, hydrate adequately, ventilate or shade the indoor environment, access cooling spaces, recognize danger signs or seek help can increase risk during extreme heat events *(23–25)*.

Higher exposure to extreme heat refers to the extent to which individuals or groups are physically exposed to high temperatures *(3)*. Population groups at increased risk include the following.

- Workplace heat stress can affect both outdoor and indoor workers – particularly those performing manual or physically demanding work, and those working in settings with inadequate cooling or ventilation. High-risk sectors include agriculture, construction and fisheries, as well as other occupations involving intense physical activity, heat-generating processes, or use of personal protective equipment or specialized clothing that increases physiological heat strain. Migrant workers may face additional risks because they are more likely to work in manual outdoor occupations, may be less acclimatized to local conditions, and may face barriers to accessing heat-related information, training and protective measures due to language differences, working conditions or lower awareness of local systems *(26–30)*.
- Athletes and people exercising may experience exertional hyperthermia, dehydration, lack of acclimatization and unsafe training or competition conditions, which increase the risk of heat cramps, heat exhaustion, heat stroke and related injury *(31–33)*.

- Tourists, travellers, transient populations and people attending mass gatherings are at greater risk (see also Annex 2 for specific advice for mass gatherings during periods of extreme heat). Lack of acclimatization, unfamiliarity with local heat risks and services, prolonged outdoor exposure, direct sunlight, crowding, physical activity, and dehydration can increase the risk of heat-related illness and aggravation of pre-existing conditions. Transient populations may be particularly difficult to reach through routine warning, communication and support systems – especially where language barriers, limited local knowledge or temporary accommodation reduce access to protective measures and services *(34,35)*.

Lower capacity to protect health refers to reduced ability to anticipate, cope with and respond effectively to heat risks *(1,3)*. Population groups at increased risk include the following.

- Refugees and migrants may have poor living conditions in temporary settlements with limited services and infrastructure like refugee camps, transit centres or informal settlements. They may also experience social and political isolation, insecure migration status, dependence on external aid, language barriers, unmanaged chronic illnesses and limited access to health and social care, which can exacerbate heat-related health effects. Risks may be especially underrecognized among undocumented migrants *(36–39)*.
- People facing socioeconomic disadvantage and related structural barriers: Low income, social deprivation, inadequate housing, residence in hotter deprived urban areas, social isolation and homelessness can reduce adaptive capacity and increase heat-related risk. These factors often interact with other vulnerabilities and risk factors, including age, chronic conditions, pregnancy, disability and limited mobility, and may increase the likelihood that high temperatures result in preventable harm. Limited access to cooling and public services such as transport, health and social care, and community support can further worsen risk *(40,41)*.
- Extreme heat vulnerability is dynamic. For example, an old person living in a well-ventilated home with strong family support may not currently be at high risk, but their vulnerability may increase with declining health, increasing social isolation or intensifying extreme heat due to climate change.

### 3.2.2 Vulnerability at the community level

At the community level, extreme heat exposure is often greater in urban areas, where the urban heat island effect, dense built surfaces and limited vegetation increase daytime temperatures and, importantly, keep night-time temperatures elevated, reducing physiological recovery and increasing cumulative heat strain. This outdoor heat often transfers indoors, especially in buildings that retain heat *(1–3)*. Vulnerability at the community level also changes over time, as demographic trends, migration and urban development influence the capacity of populations to protect their health, and may increase the risk of extreme heat-related health effects *(3,42–44)*.

Housing conditions influence vulnerability through several pathways. Poor-quality or overheating-prone housing – such as top-floor flats; buildings with inadequate or absent external shading, high solar gain, or limited summer-appropriate insulation; or environments that discourage window opening – can trap heat and sustain high indoor temperatures day and night. Where cooling is absent or unaffordable, indoor exposure may remain high even when outdoor activity is reduced,

increasing the risk of dehydration, sleep disruption, cardiovascular strain and heat-related illness *(1,3,5)* (see also Core element 6 – Reducing heat exposure).

Ventilation is a critical low-cost cooling mechanism. Night-time purge ventilation and cross-ventilation can remove accumulated indoor heat, but where ventilation is constrained by building design, security concerns, outdoor noise or air pollution, or high night-time temperatures, indoor heat may build up and bedrooms may remain hot. This can impair sleep and recovery, and can increase heat stress, particularly among people with chronic conditions and others with reduced physiological resilience *(1,3,5)* (see also Core element 6 – Reducing heat exposure).

Neighbourhood characteristics also shape vulnerability. Access to green and blue spaces can reduce risk by cooling local microclimates through shading and evapotranspiration, while also providing nearby cooler places for people who cannot keep their homes cool. Conversely, limited greenery and shade increase direct heat exposure outdoors *(1,2)* (see also Core element 6 – Reducing heat exposure).

Social conditions affect both exposure to heat and capacity to protect health. Poverty and energy insecurity can limit access to cooling, electricity, transport to cooler places and home improvements. Social isolation reduces the likelihood that heat risk will be recognized and acted upon, while language barriers and limited access to health and community support can delay warnings, care seeking and follow-up. Limited access to protective resources – including cooling devices, shaded public areas, safe housing, reliable information, transport and social networks – therefore increase the likelihood that high temperatures will result in preventable health effects *(1,3,7)*.

Vulnerability at the community level can be examined through small-area heat vulnerability mapping. This type of analysis helps to show how social, demographic, environmental and built-environment factors combine spatially to shape unequal heat-related health risks across neighbourhoods and communities. It can also highlight where multiple vulnerabilities cluster, and where certain population groups or settings may be more affected. The examples in Box 4 illustrate how such approaches have been used in practice.

### Box 4. City examples of how to identify community-level vulnerability

New York City (United States of America) uses a heat vulnerability index to identify neighbourhoods whose residents are more at risk of all adverse impacts on health during and immediately following extreme heat. The index summarizes key social and environmental determinants of neighbourhood heat risk. A spatial analysis tool is used to look at exposure, housing and social vulnerability factors – including surface temperature, green space, home air-conditioning (AC) and income. Using these inputs, neighbourhoods are scored on a scale of 1 to 5, from lowest to highest vulnerability. The tool draws on a variety of existing data sources. The index is used to help prioritize cooling and other heat–health interventions in neighbourhoods facing the highest risk. New York City also links this vulnerability framework to citywide heat–mortality monitoring *(45)*.

In Barcelona (Spain), identification of the populations at increased risk is guided by the city's Heat Plan 2025–2035, which prioritizes neighbourhoods and groups facing heightened vulnerability to extreme heat. The Plan draws on a climate vulnerability index that integrates climate, energy, socioeconomic and building-related indicators to support municipal decision-making. This assessment is linked to targeted measures such as the Climate Shelter Network and reinforced support for populations at increased risk *(45,46)*.

## 3.3 Identifying populations at risk

Formal identification of populations at increased risk of threats to health from heat is a key function of HHAPs. It enables targeted outreach, communication and support measures, and helps to ensure that limited resources are directed at those most in need. This process should be embedded within the governance arrangements of the HHAP, and should be supported by coordination across sectors and levels of government – particularly between the health and social care sectors.

National HHAPs should define the overall framework, criteria and coordination arrangements for identifying populations at increased risk of heat-related harm, while subnational and local authorities – in coordination with health and social care services and other relevant actors – are usually best placed to apply these criteria in practice. Identification of populations at increased risk could be based on a combination of available data, information from health and social care services and other front-line providers (such as general practitioners (GPs), social workers and community organizations), and community-level information. Climate change and health vulnerability and adaptation assessments can also be a valuable source of information to account for changing health risks driven by climate change.

### 3.3.1 Factors and data sources for identifying populations at increased risk

Key factors that can be considered by authorities and services when identifying populations at increased risk include the following *(2)*.

- Demographic factors can help to identify populations at risk due to age, gender or marital status (such as people living alone or socially isolated individuals).
- Individuals with chronic conditions – particularly those with multiple comorbidities – can be identified through screening or review of available health and care records. Those temporarily at risk (such as patients discharged from hospital or recovering from illness, and pregnant women) and those taking medication that increases sensitivity to heat should also be identified.
- Socioeconomic barriers can be detected to identify individuals in deprived areas and in the hottest parts of the city, those living in poor-quality housing (with poor ventilation, inadequate cooling and greater heat exposure), people living in isolation with limited financial resources, and people with limited access to health and social care and cooling facilities. Those experiencing language barriers among local communities also need to be accounted for.
- Public structures – such as health-care facilities, schools, nursing homes and long-term care facilities, older adult centres, community centres, shelters for homeless people, informal settlements and prisons can be mapped to identify where groups at increased risk spend time or are located.
- Occupational settings can be mapped to identify groups exposed to extreme heat owing to their profession – including, but not limited to, outdoor workers, athletes and emergency responders. They need to be recognized and provided with information on occupational health and safety regulations and prevention measures.
- Mobility and shelter status can help to identify those experiencing homelessness, migrants, refugees and individuals living in informal settlements with limited access to health and social care services.
- Cultural and religious considerations can be considered to identify populations whose cultural practices or religious obligations might increase exposure to heat or reduce adaptive capacity.

Identification of populations at increased risk should draw on a combination of data and information sources, depending on availability and local context. These may include demographic and census data; health and social care records; housing, environmental and urban data; facility and service registries; labour and employment data; and information from community organizations, civil society and front-line service providers. Combining quantitative data with local knowledge is often essential to capture populations that may not be visible in formal datasets.

### 3.3.2 Operationalizing identification of the populations at increased risk

Identification of populations at increased risk requires coordinated action across governance levels and sectors, in line with the roles and functions established in the HHAP (see also Core element 1 – Governance). The lead body typically defines the overall framework, while the designated working group develops and implements interventions for the populations at increased risk, and sets up the required coordination arrangements. Regional and local authorities are usually best placed to identify priority populations, settings and service needs, according to their mandates.

Table 3 summarizes how responsibilities can be distributed across national, regional and local levels. Within these levels, effective implementation depends in particular on coordination between health and social care services, together with engagement of municipalities, community organizations and civil society actors.

### Table 3. Responsibilities for identifying and supporting populations at increased risk

| Level | Main responsibilities | Typical actions |
|---|---|---|
| National | Providing the overall framework for identifying and supporting populations at increased risk of threats to health from heat within the HHAP<br>Defining priority populations and coordination arrangements across health, social care, meteorological services and other relevant sectors | • Defining national criteria and priority populations<br>• Developing guidance and communication materials<br>• Supporting use of data for vulnerability assessment<br>• Ensuring integration with warning systems and other core elements |
| Regional | Adapting the national framework to regional conditions, service structures and available data<br>Coordinating implementation across health, social care and other relevant services | • Interpreting regional data<br>• Identifying populations and settings at increased risk<br>• Adapting outreach and communication approaches<br>• Coordinating referral pathways and service arrangements |
| Local | Identifying populations at increased risk using local knowledge, service information and community networks<br>Reaching and supporting populations at increased risk | • Identifying and, where feasible, mapping priority groups and settings<br>• Carrying out outreach and welfare checks, and ensuring that people are connected to appropriate health, social care and community support services<br>• Providing tailored advice and support<br>• Facilitating access to cooling centres and services |

Countries and subnational authorities have operationalized identification of populations at increased risk in different ways, depending on governance structures, available data, service organization and legal frameworks. Box 5 illustrates some examples, and shows how identification can be linked to practical outreach, monitoring and support measures.

## Box 5. Examples of formal identification of populations at increased risk and response actions

In England (United Kingdom), identification of populations at heat risk is formalized mainly through health and social care services rather than a municipal public register. UK Health Security Agency guidance requires service providers to know who is at risk, adapt individual care plans for hot weather, and ensure that local action plans are in place before summer. Services delivering care in people's homes are specifically advised to identify people at higher risk of heat-related illness, and to put individual plans in place to keep those people and their homes cool *(48,49)*.

Under France's National Heatwave Plan, municipalities manage lists of people at risk (mainly people aged over 65 years and people living with disability aged over 60 years), who can register at the beginning of the summer season. Social services and nurses delivering home care can help them register if needed. During extreme heat events, volunteers call those on the lists to check whether they can cope with heat, and to give advice or call an ambulance if needed. In some cities, municipal staff offer transport services to cooling spaces (such as community centres or nursing homes and long-term care facilities) to recover from heat *(50,51)*.

In Italy, the national HHAP includes formal identification of older people at increased risk and mapping of areas at risk in cities. These data are used by health authorities, municipalities and social services for active monitoring and surveillance during extreme heat events. A susceptibility score is determined locally, based on individual risk factors related to heat. This uses data from population and health registries (for example, on age, sex, marital status, socioeconomic position, health status, medication use and access to health care – including hospitalizations, emergency department visits, specialist care and social care) or provided by GPs and social service active surveillance. In summer 2024, 57% of cities included in the HHAP identified patients at risk using ad hoc notifications by health and social services, while 43% used standardized registries in compliance with privacy regulations. Actions carried out in conjunction with active surveillance of older people included home visits by GPs, nurses or social services; tele-assistance with health monitoring; activation of home health and social care; home delivery of groceries or medication for those living alone or with limited mobility; and referral to hospital, nursing homes or long-term care facilities *(52)*.

In parts of Victoria (Australia), including Moorabool Shire, municipal emergency management arrangements include formal identification of populations of increased risk and facilities. The Moorabool Municipal Emergency Management Plan states that funded agencies maintain information on consenting people in a vulnerable persons register, with the Moorabool Shire Council providing local oversight and system administration, and with access available to authorized Victoria Police for planning, exercising and emergency response.

The Plan also requires the Council to maintain a list of facilities where vulnerable people are likely to be, such as care and community facilities, to support emergency planning and response. Extreme temperatures are identified as a high municipal risk, and the Plan refers to a separate Municipal Heatwave Plan for more specific heat-related arrangements *(53)*.

### Box 5 contd

In North Macedonia, the Red Cross plays a key role in supporting populations at increased risk through community-based outreach and volunteer networks. During extreme heat events, trained volunteers conduct home visits and telephone check-ins for older people, people living alone and those with limited mobility, providing information on heat protection, hydration and early signs of heat-related illness. The Red Cross also supports distribution of water and basic supplies, and helps connect individuals at increased risk with health and social services where needed *(54,55)*.

## 3.4 Tailored interventions for the populations at increased risk

Once populations at increased risk of threats to health from extreme heat have been identified, HHAPs should provide interventions adapted to the needs of different groups. These may include proactive outreach, community support, access to cooling, continuity of care and targeted communication, with particular attention to populations facing barriers to protection.

Active outreach to people at increased risk of heat-related harm is essential. This may include regular home visits or remote monitoring, such as phone calls or telemonitoring services, to help people prepare before the hot season and to support their well-being during extreme heat. Effective outreach requires collaboration and coordination between health services, social care services, local authorities and other relevant actors – including community groups, humanitarian organizations, employers, sport clubs, schools and event organizers – depending on the populations and settings concerned. Co-creation of tailored content with affected groups at increased risk is important to ensure that support measures reflect their needs and circumstances. Emergency contact plans help outreach efforts, and people at high risk should have priority access to assistance and emergency services (see also examples in Box 5) *(6,48,56–57)*.

> **Communication considerations**
>
> Tailored interventions for populations at increased risk of threats to health from heat should be supported by targeted, accessible and trusted communication. See Core element 4 – Communication for further guidance and the public health message bank in Part 3 for example messages.

Community involvement is a powerful tool for raising awareness of heat-related risks and effective health protection measures, and for caring for populations at increased risk during extreme heat events. Mobilizing community members and volunteers to assist with home visits, delivering essential supplies such as groceries and medication, and providing companionship can help reduce the need for individuals at high risk to leave their homes during periods of extreme heat. It can also support continuity of care and provision of support for daily needs, and reduce social isolation *(6)*. Public buildings (libraries, community centres, recreation centres for older people, public pools,

schools, gyms, shopping malls and cultural or religious centres) can also serve as cooling spaces during extreme heat events, providing a safe space for those who lack access to AC, while promoting social interaction (see also Core element 6 – Reducing heat exposure) *(58–62)*.

Active surveillance of the health status of groups at increased risk throughout the warm season is essential for triggering timely interventions. Ad hoc surveillance systems, as implemented in several countries (see also Core element 7 – Heat–health surveillance), can help stakeholders track the heat-related health impacts and ensure timely activation of additional health, social or emergency services and measures when required. Continuous evaluation of these measures is also important to assess their effectiveness and make necessary adjustments to ensure that they remain robust (see also Core element 8 – Monitoring, evaluation and learning).

HHAPs should define targeted interventions tailored to the needs of different populations at increased risk. These measures are important not only for effective protection in general but also from an equity perspective – particularly where people face social, economic or structural barriers that reduce their ability to protect themselves from heat. HHAP actions should therefore pay particular attention to deprived areas and populations with lower adaptive capacity and more limited access to services or private cooling options. Accessible information tailored to the specific requirements and needs of different population groups should also be provided *(1)*.

> Health, occupational health, education and childcare, and social care authorities and stakeholders need to take action to protect populations at increased risk of threats to health from extreme heat. The user action briefs in Part 2 provide guidance on action that could be taken before, during and after extreme heat events and the summer season.

While interventions are organized around populations at increased risk, they are often delivered through specific settings, including health and social care facilities, workplaces, schools and childcare environments, households, and community settings. Effective implementation therefore requires alignment between population-based interventions and the operational measures described in the user action briefs in Part 2, which provide detailed guidance for key domains such as health and social care, occupational settings, education and childcare, and the urban and built environment. Linking population groups to relevant settings and domains helps to ensure that interventions are feasible, coordinated and embedded within existing service delivery structures.

Health and social care staff play a central role in implementing targeted interventions for populations at increased risk. This includes identifying individuals at risk, providing tailored advice, supporting continuity of care, conducting outreach and follow-up, and coordinating with other services and community actors. Their role is particularly critical during extreme heat alerts, when early recognition of risk and timely action can prevent adverse health outcomes. These functions should be supported through clear protocols, training and communication arrangements (see also Core element 4 – Communication).

Once populations at increased risk have been identified, HHAPs should define interventions adapted to their specific needs and circumstances. These may relate to proactive outreach,

continuity of care, support for hydration and cooling, tailored communication, and facilitating access to services for populations at increased risk facing social, economic or structural barriers to protection. Table 4 summarizes examples of broad intervention areas for selected populations at increased risk, and indicates where more detailed information is provided elsewhere in this guidance.

### Table 4. Examples of tailored interventions for populations at increased risk

| Population at increased risk | Tailored interventions |
|---|---|
| Older people | Health and social care services, caregivers and relevant community actors have a key role in ensuring that older people are identified, followed up and supported during extreme heat.<br>Measures include providing practical advice and support on hydration, cooling, rest and early recognition of warning symptoms of heat-related illness, particularly during prolonged or extreme heat; providing support to reduce heat exposure at home and in daily activities; supporting medication use and routine monitoring; and facilitating access to care – especially for those living alone, or with limited mobility, multimorbidity or social vulnerabilities *(5–8,63–68)*.<br>See also User action brief 1 – Health domain and User action brief 4 – Social care domain in Part 2; Annex 3 on signs and symptoms of heat-related illness. |
| Newborns, infants, children and adolescents | Parents and caregivers – supported by paediatricians, primary care providers, maternity and newborn services, childcare services, schools, education authorities and public health authorities – have a key role in ensuring that newborns, infants, children and adolescents are protected during extreme heat.<br>Measures include providing guidance for parents and caregivers on hydration, cooling, clothing, indoor heat management and early signs of heat-related illness; adapting preschool, school and other daily routines during extreme heat – including reduction of intense physical activity and outdoor exposure during the hottest parts of the day; ensuring easy access to drinking-water, shade and cooler environments; providing clear advice for families and caregivers on protective measures before and during heat events; and supporting timely care seeking when symptoms occur *(9–12)*.<br>See also User action brief 5 – Education and childcare domain and User action brief 1 – Health domain in Part 2; the public health message bank in Part 3; Annex 3 on signs and symptoms of heat-related illness. |
| Pregnant women | Antenatal care providers, gynaecologists, midwives and other relevant health professionals need to ensure that pregnant women receive appropriate advice on measures, follow-up and referral, where needed.<br>Measures include providing practical advice on hydration, cooling, rest and early recognition of warning symptoms of heat-related illness, particularly during prolonged or extreme heat; and providing support to reduce heat exposure at home, during travel and in daily activities *(13–18)*.<br>See also Core element 6 – Reducing heat exposure; User action brief 1 – Health domain in Part 2; Annex 3 on signs and symptoms of heat-related illness. |

**Table 4 contd**

| Population at increased risk | Tailored interventions |
|---|---|
| People with chronic conditions | GPs, primary care providers and relevant health services have a key role in ensuring that people with chronic conditions receive appropriate monitoring, advice and continuity of care during extreme heat.<br>Measures include providing individualized advice on hydration, cooling, symptom monitoring and when to seek help; reviewing medicines that may affect thermoregulation, hydration or cardiovascular stability; providing advice on worsening symptoms or complications; and providing advice and support to reduce heat exposure at home, during travel and in daily activities *(19–22,63–68)*.<br>See also Annex 3 on signs and symptoms of heat-related illness. |
| People with restricted mobility, cognitive impairment or dependence on others for daily care | Health and social care services, caregivers and relevant support services have a key role in ensuring that people with restricted mobility, cognitive impairment or dependence on others for daily care receive practical assistance during extreme heat.<br>Measures include providing active outreach and follow-up during heat events; providing practical support with hydration, cooling, movement to cooler places and daily activities; supporting people who may be less able to recognize risk, act on warnings or protect themselves independently; and providing guidance to family members, carers and caregivers on early recognition of warning symptoms of heat-related illness and protective measures *(23–25)*.<br>See also User action brief 4 – Social care domain and User action brief 1 – Health domain in Part 2; Annex 3 on signs and symptoms of heat-related illness. |
| Workers | Employers, supported by occupational health and safety services, have a key role in ensuring that workers are protected during extreme heat.<br>Measures include adapting work schedules to cooler parts of the day; reducing work intensity and duration during peak heat; ensuring regular rest breaks; providing easy access to drinking-water and encouraging frequent hydration; providing shaded or cooled rest areas; adapting clothing or personal protective equipment, where possible; providing clear instructions on recognizing early symptoms of heat-related illness and on what actions to take; ensuring supervision for early identification of symptoms; and ensuring access to first aid and emergency response *(26–30,69)*.<br>See also User action brief 2 – Occupational domain in Part 2; the public health message bank in Part 3; Annex 3 on signs and symptoms of heat-related illness. |
| Athletes and people exercising | Sports clubs, coaches, event organizers, sports medicine professionals and relevant public authorities have a key role in ensuring that athletes and people exercising are protected during extreme heat.<br>Measures include providing targeted communication on extreme heat risks; adapting training and physical activity, including timing, intensity and duration; reducing, modifying, postponing or cancelling strenuous activity during extreme heat; providing drinking-water, shade, cooling opportunities and rest periods; and supporting early recognition and rapid response to heat-related illness *(31–33)*.<br>See also the public health message bank in Part 3; Annex 3 on signs and symptoms of heat-related illness. |

**Table 4 contd**

| Population at increased risk | Tailored interventions |
|---|---|
| Tourists, travellers, transient populations and people attending mass gatherings | Local authorities, public health authorities, tourism operators and event organizers have a key role in ensuring that tourists, travellers, transient populations and people attending mass gatherings are informed and protected during extreme heat.<br>Measures include providing clear and accessible information on local heat conditions, risks and protective measures; providing guidance on limiting outdoor exposure, especially during the hottest parts of the day; ensuring availability of drinking-water and promoting regular hydration; ensuring access to shaded or cooled areas in crowded or outdoor settings; adapting or scheduling activities to reduce physical exertion during extreme heat; and ensuring availability of onsite medical support and rapid response for heat-related illness *(34,35)*.<br>See also Core element 4 – Communication; the public health message bank in Part 3. |
| Refugees and migrants | Health and social care services, municipalities, humanitarian and other organizations supporting refugees and migrants have a key role in ensuring that refugees and migrants receive appropriate information, support and access to services during extreme heat.<br>Measures include providing clear and multilingual information on heat risks, protective measures and available services; providing practical advice and support on hydration, cooling, rest and early recognition of warning symptoms of heat-related illness; facilitating access to drinking-water, food, cooling and safe spaces during extreme heat; ensuring access to health care, social support and emergency services regardless of legal or administrative status; and providing advice and support to reduce heat exposure in temporary, overcrowded or poorly ventilated accommodation *(36–38)*.<br>See also Core element 4 – Communication; User action brief 1 – Health domain and User action brief 4 – Social care domain in Part 2. |
| People facing socioeconomic disadvantage and related structural barriers | Municipalities, social protection and social care services, and community or humanitarian organizations have a key role in ensuring that people facing socioeconomic disadvantage and related structural barriers receive practical support during extreme heat. Measures include providing advice on heat risk, protective measures, hydration, cooling and reducing heat exposure; facilitating access to drinking-water, cooling opportunities, safe spaces and essential services during extreme heat; and supporting timely access to health and social care when needed *(39–40)*.<br>See also User action brief 4 – Social care domain in Part 2. |

## 3.5 Considerations for low-resource settings

In low-resource settings, identification of populations at increased risk of threats to health from extreme heat and delivery of support measures may need to rely on simpler, community-based and low-cost approaches – particularly where formal data systems, registries or surveillance mechanisms are limited. In such contexts, practical implementation often depends on local knowledge, existing community structures and integration of heat-related action into routine services and outreach mechanisms *(70,71)*. Approaches may include the following.

- Community networks can be used. Community health workers, volunteers, local leaders, NGOs and civil society organizations can help to identify individuals and groups at increased risk of heat-related harm based on local knowledge and direct contact.
- Simple risk identification can be achieved based on local knowledge. Basic indicators such as age, visible illness, disability, housing conditions or social isolation can be used to identify people at increased risk where detailed data are not available.
- Community mapping can be undertaken. Informal mapping of high-risk households, neighbourhoods or population groups can support identification and prioritization of support.
- Active outreach approaches can be applied. Door-to-door visits or phone-based check-ins can help to identify and support people who might otherwise be missed – particularly before and during heat events.
- Accessible communication channels can be used. Local communication platforms such as radio, newspapers, text messaging, social media and community gatherings, as well as engagement of faith-based institutions, can support identification and engagement of populations at increased risk.
- Action should be integrated with existing services. Identification and support efforts can be embedded within primary care, social services and emergency response activities to maximize efficiency and avoid duplication.
- Engagement of communities via participatory approaches can help to ensure that identification methods are culturally appropriate, acceptable and feasible, and that local knowledge is used effectively.

## 3.6 Monitoring, evaluation and learning for improving the protection of populations at increased risk

Monitoring, evaluation and learning support effective identification of, outreach to and protection of populations at increased risk of threats to health from extreme heat. They help to determine whether arrangements for identification, outreach, communication and support are functioning, and whether they remain responsive to changing risks, vulnerabilities and capacities. Responsibilities should be clearly assigned within the HHAP. National authorities, led by the designated lead body, should define the monitoring, evaluation and learning framework, including indicators, reporting arrangements and review processes. Regional and local authorities should adapt and coordinate implementation within their jurisdictions, while health services, social care services and relevant community actors should track implementation in practice and provide operational feedback.

Monitoring supports verification that arrangements and actions for the protection of populations at increased risk are prepared, activated and sustained before, during and after periods of extreme heat. Key monitoring questions include:

- Are populations at increased risk being identified and updated appropriately?
- Are outreach and support measures reaching the intended groups and settings?

- Are coordination arrangements between health, social care and other relevant sectors functioning as planned?

Monitoring indicators may include measurable aspects of implementation, such as the number and proportion of municipalities or service areas with an updated list or map of populations at increased risk; the number and proportion of identified individuals or priority groups contacted before or during an extreme heat event; the number of welfare checks, home visits or telephone follow-ups carried out; the number of referrals made to health, social care or emergency services; the availability and use of cooling spaces or other support measures; and the time taken to activate targeted measures after a heat warning is issued.

Evaluation considers the extent to which actions implemented to protect populations at increased risk are relevant, effective, adequately covered and equitable. It should draw on available surveillance data, service data, administrative information, implementation reports and community-level experience. Key evaluation questions include:

- Are populations and settings at increased risk being prioritized?
- How effective are the measures in reaching and protecting those at increased risk?
- Are actions being implemented in a coordinated, timely and equitable way across levels and sectors?

Evaluation indicators may include specific measures such as the proportion of identified individuals at increased risk who received outreach or follow-up during extreme heat events; the proportion of referrals that resulted in support being provided; the proportion of priority facilities or settings covered by heat-related preparedness and response measures; differences in coverage between geographical areas or population groups; and the extent to which planned actions were implemented within the expected time frame.

Learning involves organizing postextreme heat event reviews, endofseason reflections and regular exchange across sectors and levels of governance, with a focus on improving identification and support of populations at increased risk. Key learning questions include:

- Which population groups were effectively identified and reached, and where were gaps and challenges observed?
- What improvements are needed in mapping, outreach, coordination or support mechanisms?
- How should approaches to identifying and reaching populations at increased risk be adapted in response to changing patterns of heat risk, vulnerability and service capacity?

Learning indicators capture concrete evidence that learning has been applied to mapping and outreach practices, such as the number of reviews that explicitly examine the effectiveness of population risk mapping and outreach approaches; the number of agreed actions aimed at improving identification criteria, targeting methods or outreach mechanisms; the proportion of agreed mapping or outreach actions implemented before the next heat season; revisions made to population risk maps, identification criteria, outreach protocols or referral pathways; and updates to guidance, training materials or coordination arrangements related to reaching and supporting at-risk populations, based on lessons learned.

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# Core element 4 – Communication

**The aim of this core element is to develop a heat–health communication strategy.**

## Key messages

- A heat–health communication strategy serves to inform, educate and empower the public and health professionals to take protective action during periods of heat.
- Effective communication strategies can raise awareness by addressing local risk perception of heat risks and adaptation, while promoting protective and healthy behaviours and encouraging individuals to support the well-being of themselves and others in their communities.
- Tailored and timely messaging helps to build heat literacy and addresses varying risk perceptions. A co-design and user engagement process will generate messaging more likely to resonate with the intended recipients, while improving understanding of any misinformation and disinformation and supporting infodemic management.
- Public health agencies can strengthen their responses to heat and heat extremes by aligning communication efforts with the needs and characteristics of different population groups.
- Identifying and leveraging a diverse network of partners working collaboratively will extend the reach and impact of a heat–health communication strategy.
- Building heat competency and literacy is relevant not only for health professionals but for all partners, sectors and stakeholders involved in HHAPs.

## Core element output

The core element output is a documented heat–health communication strategy within a comprehensive HHAP that outlines the communications objectives, activities, allocated resources and agreed responsibilities.

## Steps to implement the core element

The following steps collectively support the development of a comprehensive communication strategy. It is important to:

- define the objectives of the communication strategy at the start to ensure alignment with the goals of the HHAP;
- identify the target audiences – such as the public, groups at increased risk of threats to health from extreme heat and media – to ensure that the communication is both effective and as far-reaching as possible;
- identify partners to support broad public outreach and timely communication of public health messages;
- select channels for dissemination that are appropriate for messages to reach the intended audiences effectively, taking into account accessibility for populations at increased risk, such as people with lower socioeconomic status or older people;
- develop concise and actionable messages that are relevant to the specific target audience, using community engagement and audience feedback to enhance the impact of the messages;
- allocate human and financial resources to determine capacity to implement a communication strategy;
- define a time frame outlining what information to communicate throughout the year and to whom, integrating heat–health warning dissemination into the communication strategy; and
- establish monitoring, evaluation and learning indicators and tools to measure the effectiveness of the communication strategy.

## 4.1 Introduction

A heat–health communication strategy serves as a structured approach for all engaged actors involved in risk communication before periods of hot weather, who need to convey critical and timely health information to the public and other relevant stakeholders during extreme heat. Its primary objective is to enhance heat–health literacy by increasing public awareness and promoting protective behaviours, and thus ultimately to reduce the adverse health impacts of heat.

Effective communication strategies that address local risk perception are key to driving adaptation and behaviour change that can reduce the health risks associated with extreme heat *(1,2)*. In this context, risk communication is the exchange of information, advice and opinions between experts and officials with people who face a threat (a hazard) to their survival or to their health, economic or social well-being. Its ultimate purpose is to empower those at risk to make informed decisions to mitigate the effects of the hazard and take protective and preventive action *(2)*. Thus, building heat competency and literacy is relevant not only for health professionals but also for all sectors and stakeholders involved in HHAPs *(3)*. WHO outlines six principles to guide development and dissemination of effective health communication (Box 6).

### Box 6. WHO principles for effective communications

- Understandability is the cornerstone of effective communication. Messages should be clear, concise and devoid of technical jargon that could confuse the audience. The use of visuals, analogies and relatable examples can help to convey complex health information in a way that is easily understood by diverse audiences.
- Accessibility involves making information available through channels and formats that are accessible to all. This may include providing information in multiple languages, using audio and visual aids, and ensuring that content is accessible to individuals with visual or hearing impairments or other disabilities.
- Actionability is about moving audiences to take specific actions. Messages should include clear calls to action. Actionable messages help to bridge the gap between awareness and behaviour change by providing audiences with tangible steps they can take to protect themselves and others from the health effects of heat.
- Credibility is built through accuracy, transparency and consistency in messaging. Coordinating with credible partners, such as health organizations and community leaders, can enhance the credibility of messages.
- Relevance means that messages should be tailored to the specific target audiences and motivate them. Communicators need to know and listen to their audience.
- Timeliness is essential for ensuring that the public receive information when it is most needed. Heat–health messages should be disseminated in advance of and during heat and should be updated regularly as conditions change.

*Source*: WHO *(4)*.

This chapter provides an overview of the main components of a well-structured communication strategy to enable authorities to respond swiftly and effectively during heat events. This proactive approach helps stakeholders avoid delays in informing the public, and reduces the risk of miscommunication or contradictory messages. By planning in advance, public health agencies can also coordinate more efficiently with HHAP actors and stakeholders and with the media, ensuring that critical, correct and pre-approved information can be disseminated quickly, avoiding delays for approval. The following are the key components a heat–health communication strategy should address *(5)*:

- objectives defined to align the communication strategy with the overall goals of the HHAP;
- target audiences identified – such as the public, groups at increased risk of threats to health from extreme heat, media and other stakeholders;
- partners and communicators identified to enhance the reach and effectiveness of the communication strategy significantly;
- dissemination channels selected on the basis of appropriateness for messages to reach the intended audiences effectively;
- public health messages developed to be concise, actionable, timely and relevant to the specific target audience (see also the public health message bank in Part 3);
- resources allocated to determine capacity to implement a heat–health communication strategy;
- a time frame defined, including what information needs to be communicated when, and to what audience; and
- monitoring, evaluation and learning indicators and tools established to measure the effectiveness of the communication strategy.

## 4.2 Objectives of the heat–health communication strategy

The overarching goal of heat–health communication is to enhance heat–health literacy to drive behaviour change towards protective actions during periods of extreme heat at an individual, community, institutional, regional and national level *(6)*. This needs to occur within the general population, among groups at increased risk of heat-related harm and those who interact with and support them, and among all HHAP stakeholders at all levels. (For a detailed description of groups at increased risk see Core element 3 – Populations at increased risk.) To achieve this goal, the objectives of a heat–health communication strategy include:

- raising awareness
- increasing public risk perception and understanding
- promoting adaptive and protective behaviours
- educating stakeholders and communicators
- enabling stakeholders to take action
- utilizing social listening to improve messaging and tackle misinformation.

**Governance considerations**

At a national level, an HHAP might include general communication strategies and guidelines. Regional and local HHAPs can adapt these to develop targeted communication approaches in collaboration with communities at increased risk and local civil society, thereby enhancing outreach and community involvement.

## 4.3 Target audiences

Communication activities should be tailored to the target audiences, ensuring that communication is both effective and as far-reaching as possible. Target audiences can be diverse, and include the general public as well as communicators of the heat–health messages. Communicators such as health professionals (see section 4.4 on partners) directly or indirectly recommunicate heat–health messaging within their specific settings – for example, GPs to their patients. A heat–health communication strategy should therefore include a bidirectional two-track approach to communication: it should address both the public and the potential communicators while assessing risk perception and adjusting the messages as appropriate.

Communicating effectively with a target audience involves identifying their language preferences; tailoring messages to resonate with their needs, values, social and cultural environment; and selecting appropriate communication channels. It is also important to pay attention to demographic, cultural (Box 7), educational, psychosocial and behavioural factors to ensure effective engagement and message delivery and reception. To achieve this, it is important to consider several key points:

- varying risk perceptions among different groups and communicators – noting that groups who perceive little risk from heat exposure (such as young people) may thus be putting themselves at increased risk;
- populations at increased risk identified in the HHAP;
- identification of specific partners and communicators relevant to the national or local context;
- choices of communication channels and platforms that suit the different audiences' needs;
- the need to listen to the audience and identify what they know, what they do not know and what could be potential misinformation; and
- co-creation of messages and communication materials with target audiences to develop tailored content.

### Box 7. Addressing cultural differences

The most effective heat–health communication would ideally account for cultural differences to ensure that communication efforts reach diverse populations – including minority groups, who may face unique vulnerabilities due to socioeconomic factors, language barriers or differing levels of access to resources. Tailoring communication activities to local cultural contexts, and involving clear language, culturally sensitive visuals and engagement with trusted community and faith leaders or organizations will enhance credibility and reach. Additionally, addressing systemic inequities – such as those related to housing, outdoor labour or access to cooling systems – can be tackled through targeted messaging on structural prevention measures within an HHAP (see also the user action briefs in Part 2). Research has shown that – especially among occupational and ethnic minority groups – high heat risk perception was not sufficient to motivate willingness to employ adaptive behaviours *(7)*.

## 4.4 Partners and communicators

A successful heat–health communication strategy relies on leveraging a diverse network of partners working collaboratively to extend its reach and impact. In a heat–health communication strategy:

- partners may include the actors within the HHAP and other organizations or stakeholders that specifically collaborate in planning, developing and implementing communication campaigns; and
- communicators are those stakeholders responsible for distributing the messages to the public and groups at increased risk of threats to health from extreme heat.

Thus, communicators can be partners, but not all partners are considered communicators. Partners may also be able to provide additional capacity for a social listening and infodemic management system for heat–health communications, supporting monitoring and fact checking.

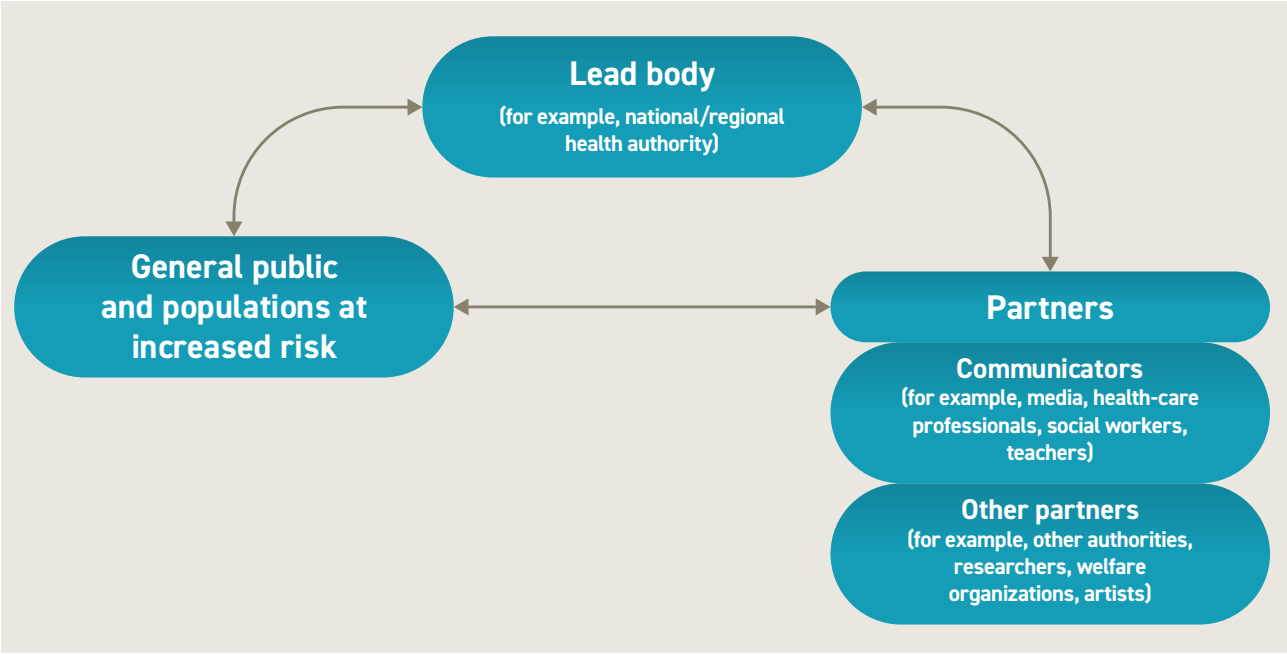
Stakeholder mapping (see also Core element 1 – Governance) also benefits the development of a communication strategy by identifying the partners, communicators and audiences involved in the communication process and their roles. Stakeholders that are also communicators may include:

- national, regional and local government departments, such as health, environment and social services, which play a role in coordinating efforts and delivering vital information;
- media outlets, both traditional and digital, which are essential for broad public outreach and timely communication, highlighting the importance of developing partnerships with the media in advance of a heat–health campaign;
- health professionals, social workers and caregivers, who are crucial in reaching groups at increased risk, such as older people and those with chronic conditions;

- civil society and community organizations, which can be important entry points to reach minority and migrant populations and to enhance outreach to other groups at increased risk; and
- scientific community and experts, who can provide evidence-based information and communicate heat–health messages, and whose involvement can build public trust, making the communication more credible.

Information ideally flows bi-directionally between the lead body, communicators and the public via message dissemination, co-creation and evaluation processes (Fig. 4).

### Fig. 4. Information flow within a heat–health communication strategy




Additionally, engaging with other partners – such as artists, community and faith leaders, and cultural organizations – can add creativity and local relevance to the campaign, making it more engaging and memorable (Box 8). These unique collaborations help to foster community resilience by ensuring that heat–health messages resonate with diverse audiences and are embraced at a grass-roots level. Passive, low-level communication methods for heat–health protection can also be integrated with culturally significant touchpoints – for example, by placing short messages on supermarket or bakery packaging, near check-out areas or on public transport. These are everyday spaces with which the population has frequent contact; such passive, repeated exposure to messages over time can support learning and help information become more memorable.

### Box 8. Case study on the #BeatTheHeat campaign

The International Federation of Red Cross and Red Crescent Societies and the Red Cross Red Crescent Climate Centre organize a yearly Heat Action Day on 2 June to raise awareness of extreme heat. Around the world, national societies and other organizations are invited to join the campaign. In previous years, participating organizations and cities have been called upon to organize local cultural events, art exhibitions and performances to raise awareness about heat risks and promote community resilience to #BeatTheHeat. Using creative media such as music, theatre and visual arts, it is possible to convey messages about the importance of heat safety and climate adaptation in a novel way.

*Source:* Red Cross Red Crescent Climate Centre *(8)*.

## 4.5 Dissemination channels

Selecting the right communication channels to meet the needs and preferences of different audiences is vital for the success of heat–health communication. While heat–health messaging has remained reasonably consistent, communication channels have changed radically in recent years, as web-based platforms and social media have become key channels for disseminating information *(9)*. However, there are concerns about their accessibility for populations at increased risk of threats to health from extreme heat, such as people with lower socioeconomic status or older people.

Communication channels can be categorized into two types:

- passive dissemination of information, such as through media and information materials
- active outreach activities and face-to-face communication.

Traditional media channels, including television, radio and print, should be combined with digital platforms such as social media, messaging applications (apps) and websites, which provide real-time updates and interactive features. Proactive engagement with media (Box 9) before and during hot weather can strengthen this partnership for dissemination of heat–health messaging. In many areas, both local media and specialist weather news outlets and mobile phone apps play a critical role in reaching communities with timely and accurate information. By placing messages in public spaces – particularly where the information is contextually relevant, such as posters on public transport – greater acceptance of protective measures can be fostered among the wider population.

## Box 9. Proactive engagement with media

Journalists are often looking for reliable and relevant content when an extreme heat event hits, so being prepared with a pre-packaged, expert-verified narrative can ensure that public health messaging is consistent, authoritative and visually engaging. This strategy shifts the focus from reactive damage control to proactive public education. Suggestions for action to engage proactively with media include the following.

- Approach investigative journalists before the summer to share key public health messaging and resources for hot weather. Suggest opportunities for deep-dive stories on heat-related topics, such as urban heat islands, that can be prepared in advance.
- Identify a selection of experts who are prepared to give interviews on the topic of heat-related risks to health, public health response measures and protective behaviours. Organize a briefing in spring/before heat events are anticipated to align on core messaging and enable referral to each other on different topics.
- Identify hot spots where media can film during hot weather (such as cooling centres and hydration stations) to make their stories more tangible.
- Provide questions instead of just answering them. Give journalists research prompts based on available research and data, such as how the local climate is changing or what local measures have been put in place to protect public health from heat.

Currently, scientific evidence focusing on the most effective communication channels for heat–health communication tailored to specific groups at increased risk of heat-related harm is limited; however, insights drawn from studies on media usage, health information behaviours and existing communication concepts suggest several potential key channels *(6,10–13)*. For example, older populations may have limited access to digital media and prefer to receive information through traditional channels such as radio, television or print media. Conversely, younger audiences are more likely to respond to digital campaigns and social media posts.

To increase risk perception among groups at increased risk and encourage behaviour change, communication through trusted communicators identified within the relevant local context – such as community leaders – is essential, although it will depend on the scope of the HHAP. This can include community engagement integrated into the communication strategy – such as peer-to-peer communication, whether face-to-face or via telephone or social media. Face-to-face communication and personal discussions are some of the most effective methods for facilitating behavioural change within populations at increased risk *(14,15)*, yet they are also the most resource-intensive, and require a longer lead time to be effective. The involvement of health-care professionals (especially GPs/primary care physicians) and other stakeholders is essential, especially in these direct forms of communication; however, these actors may have gaps in their own awareness of heat risks *(3,16)*. Individuals who care for people at increased risk, whether professionally or privately, often possess limited knowledge about heat-related health risks, despite showing greater interest in heat-related information compared to others *(17)*. Explicitly addressing this gap in the development of communication strategies presents an opportunity to strengthen HHAP effectiveness.

When choosing communication channels, an assessment could identify the best fit for targeted audiences and consider social injustice and inequity. Individuals with disabilities, limited mobility or low social participation and those living in marginalized conditions are often harder to reach through online information, public posters and printed materials. This reinforces the need for tailored communication via communicators because of their ability to reach populations at increased risk within their various settings. It is advisable to leverage existing communication channels and integrate heat–health messaging into these channels, such as through regular medical check-ups and social programmes in care facilities, or during community events like sports, cultural or religious festivals. Employing a diverse range of communication channels across different life contexts will help to ensure comprehensive outreach to groups at increased risk.

## 4.6 Public health messages

Heat–health messaging and the information therein should generally follow the principles of effective communication: it must be understandable, easily accessible and actionable (see section 4.1). Information materials should be clearly designed and tailored to ensure that all target groups can identify with the materials and feel addressed by them.

To make materials as inclusive as possible, multilingual options and simple, understandable language are important. Combining text with culturally relevant visual symbols helps to convey messages; for instance, pictograms and illustrations can help with message communication even when there are language, comprehension or disability barriers (Box 10).

### Box 10. WHO #KeepCool campaign

WHO's annual #KeepCool campaign serves as a model for heat–health communication. Launched to raise awareness about the dangers of extreme heat, the campaign provides broadly relevant, simple and actionable messages on how to stay safe during hot weather.

Centred around these simple messages, communication materials including information sheets, social media resources and video resources are available in several languages to be used in different national contexts. They provide direct support to national authorities and highlight how WHO can be a partner to complement their own communication campaigns.

For a full ready-to-use version of the #KeepCool campaign poster, see Annex 4.

*Source*: WHO Regional Office for Europe *(18)*.

> As a practical starting-point for developing tailored and relevant messaging, please refer to the public health message bank in Part 3. Further information on the rationale for the messaging and considerations on how best to adapt it is found in this section.

Knowledge of local heat risks and appropriate responses is generally stronger in local communities; recent immigrants, tourists and migrant workers are more likely to be less familiar with the local weather and public health measures available locally. Targeted communication of messages – incorporating multilingual outreach and disseminated in collaboration with community organizations – would reach these groups more effectively because tailored information can improve protective behaviours *(19–21)*.

Co-design and user engagement in developing heat–health communication strategies involve the target audience in the design process. This can support creation of messages that are more likely to resonate with the intended recipients. It can also improve understanding of any misinformation and disinformation that may be circulating, and thus support infodemic management activities. User engagement can take many forms, such as engaging social scientists and behaviour change specialists to test and develop the public health messages with focus groups and through surveys, and organizing participatory community workshops. While potentially resource-intensive, lower-cost methods exist, and other partners such as communications experts, NGOs and academia may be able to support the process and provide evidence of effective messaging. Ultimately, target audience feedback is essential to enhance the relevance and impact of the messages, as well as being another avenue to build trust with the community.

Messages addressing certain groups at increased risk of threats to health from extreme heat are more likely to be well received if they include specific actionable recommendations tailored to these groups, compared with general advice *(22)*. Recommendations should ideally consider the resources available so that they do not exceed the adaptive capacity of the target audience. Moreover, when considering this adaptive capacity, consideration of co-exposures ensures that the messaging remains relevant. Thus, the messaging should ideally be adapted to the local geographical and temporal circumstances. For example, recommendations that increase water use (excluding for hydration purposes), such as taking cool baths or showers, may need to be reformulated in areas that are also experiencing concomitant water shortages. Likewise, air pollution and potential vegetation fire activity during an extreme heat event may also influence messaging related to ventilation: there may be strong public health grounds to recommend keeping windows shut (see also section 2.6 on environmental co-exposures).

When communication campaigns target the general population, broadly framed messages such as “anyone can be at risk” can be effective, particularly for groups who do not recognize their vulnerability *(23,24)*, without instilling fear. Those who care for people at increased risk of heat-related harm tend to make decisions and take measures on their behalf, and it is a possible way to increase their own protection without feeling vulnerable themselves. For example, recommending measures for grandparents to take with their grandchildren may in turn prompt protective measures for themselves.

## 4.7 Resources

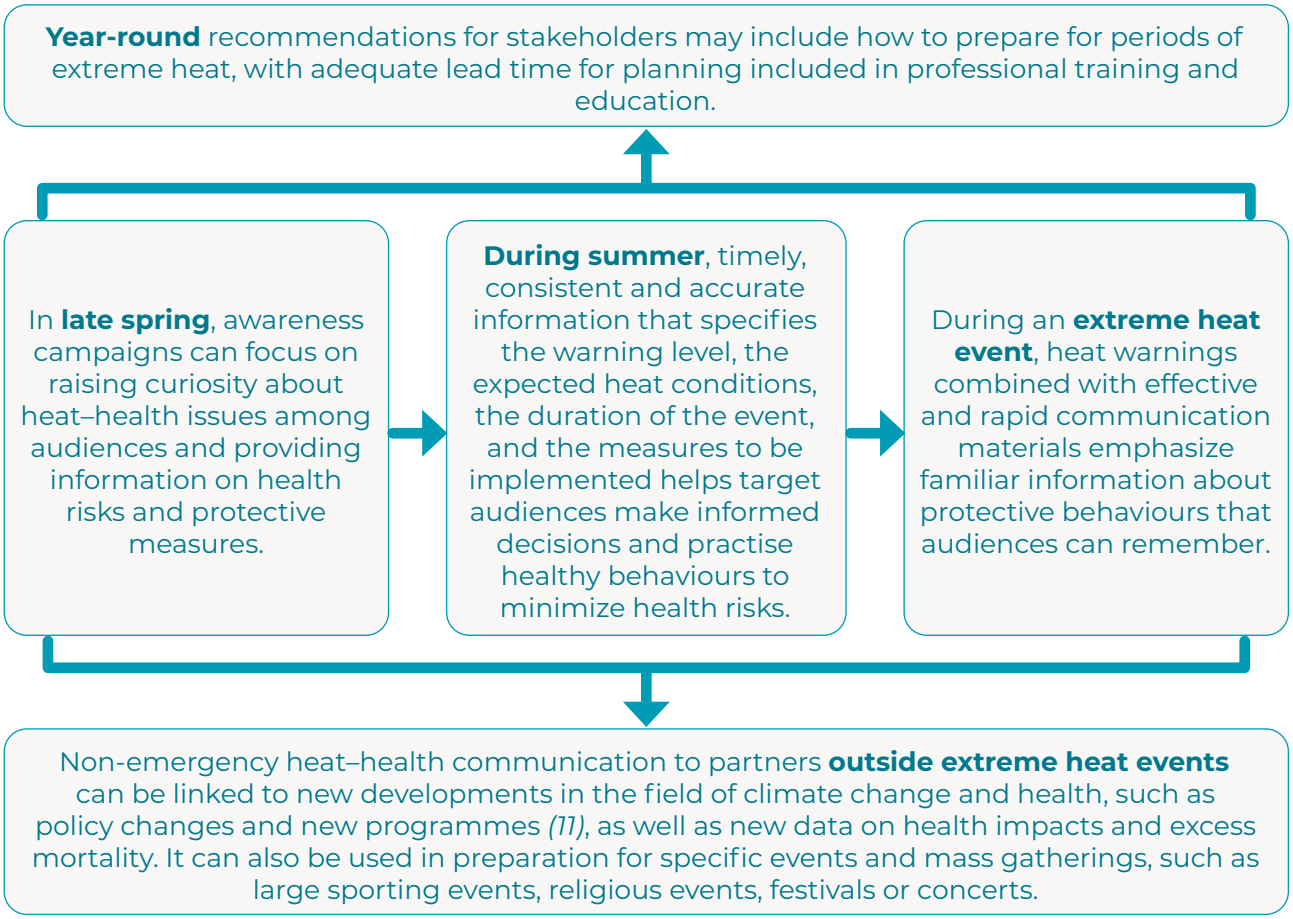
The ability to carry out a heat–health communication strategy relies on the human and financial resources available to be allocated to it. Having dedicated resources allocated within the HHAP is vital for effective planning and prioritizing of activities, ensuring that the communication strategy is feasible and practical, and achieves its intended impact.

Tapping into available national resources and established global networks is a strategic approach to leverage existing resources for heat–health communication campaigns. In addition to the resources provided in Part 3 of this guidance, the Global Heat Health Information Network (GHHIN) – co-developed by WHO and WMO – offers a valuable repository of heat–health impacts, evidence, interventions and messaging *(25)*. The GHHIN is a collaborative platform that connects experts, practitioners and policy-makers to advance knowledge and action on heat–health risks. It provides valuable tools, current data and good practices to support countries in their heat–health efforts.

## 4.8 Time frame

Appropriate timing for heat–health communication is important to ensure that key messages reach the appropriate audiences when they are needed most (Fig. 5) *(6,25)*. Delivering messages at the right moment ensures that the public is not only aware of an impending heat hazard but also remains engaged and ready to act when necessary (see also Core element 2 – Heat–health warning system, and specifically section 2.5 on warning dissemination and integration into a heat–health communication strategy).

**Fig. 5. Different messages to consider throughout the year**



Above used references to seasons (e.g. late spring, summer) should be interpreted according to local climatic conditions. In some settings, particularly in tropical or other non-temperate climates, heat–health communication may be better aligned with forecast heat events, recurring high-risk periods, or heat and humidity.

## 4.9 Monitoring, evaluation and learning for improving heat–health communication

It is important to incorporate monitoring, evaluation and learning directly into the planning stages of the communication strategy, and this should also feed into the iterative process for the HHAP (see also Core element 8 – Monitoring, evaluation and learning). To date, heat–health protection measures and communication campaigns have rarely been evaluated *(26)*, highlighting the need for accompanying evaluation efforts.

Monitoring the dissemination of communication materials and public engagement with the information provided can help authorities assess the needs for content development and updates. Key monitoring questions include:

- Is the heat–health communication strategy being implemented as planned?
- Is the messaging reaching the intended target audiences?
- What were the strengths and weaknesses of the implementation process?

Monitoring indicators may focus on the number of the outputs of the communication strategy that have been disseminated or broadcast, the number of partners and communicators engaged with the public health messaging, and the financial resources spent. Ideally, the strategy would also monitor the reach and receipt of the messaging to and by the intended audiences.

Evaluation assesses the communication plan's clarity, relevance and impact in raising awareness and promoting protective behaviours. It can both assess implementation of the strategy and evaluate changes in behaviours and achievement of longer-term objectives *(27)*. Key evaluation questions may include:

- Has risk perception and awareness among the defined target audiences increased?
- What proportion of the target audiences made positive behavioural changes?
- Were there any misinformation/disinformation challenges?

Evaluation indicators should be defined in advance so that the corresponding data can be collected throughout the campaign. Establishing a baseline through a knowledge, attitudes and perceptions survey right from the start will also allow assessment of how risk perception and awareness have changed because of the campaign. Feedback should be gathered from the different target audiences, and simple methods like community feedback, rapid surveys or front-line reporting can be used. This will mainly need to be performed at the local level; the results should be fed back into national plans where relevant.

Learning from the monitoring and evaluation can guide adjustment of activities for the subsequent year, and help stakeholders weigh the costs and benefits of different communication interventions to justify financial support. Ongoing adaptation of communication campaigns allows the HHAP to keep pace with new developments in communication channels, technology, changes in governance structures and the evolving needs of target groups. As definitions of target populations and preferred communication channels evolve, so should the communication strategy. Key learning questions may include:

- Have any changes been made to national or local policies?
- How can resources be utilized more efficiently?

Incorporating this feedback and lessons learned into future campaigns will help to improve their effectiveness. Learning indicators may include documented changes to communication messages, channels or target groups based on monitoring and evaluation findings, updates to communication materials following post-season or post-event reviews, improvements in targeting and message design, and adaptations of recommendations to reflect local conditions, co-exposures and the adaptive capacity of target groups.

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# Core element 5 – Health system resilience

**The aim of this core element is to strengthen preparedness, readiness, response and continuity in health services.**

## Key messages

- Extreme heat places pressure on all health system functions simultaneously, increasing service demand while constraining workforce capacity, facilities, infrastructure, technologies and supply chains.
- Health systems must be able to continue delivering safe and effective care during heat events – particularly for populations at increased risk of threats to health from extreme heat – to prevent avoidable illness, deaths and service disruption.
- Primary care plays a vital role in heat resilience by supporting early risk identification, providing timely advice, ensuring continuity of care and enabling targeted follow-up for populations at increased risk.
- Resilience to extreme heat cannot be achieved through emergency response alone; it needs to be embedded in routine health system planning, operations and infrastructure decisions.
- The health workforce is both a responder to heat-related health impacts and a population exposed to occupational heat risks that affect capacity, safety and performance.
- Strengthening health system resilience supports broader health objectives by reducing pressure on emergency services, maintaining continuity of care, and improving adaptive capacity over time.

## Core element output

The core element outputs are:

- a strategy and implementation framework for health system resilience to extreme heat, embedded within the HHAP and aligned with existing health system and emergency arrangements; and
- operational plans and business continuity arrangements at regional and local levels that enable health services to maintain priority functions and continuity of care during extreme heat events.

## Steps to implement the core element

The following steps collectively support the development of a comprehensive communication strategy. It is important to:

- assess how extreme heat affects core health system functions – including workforce availability and safety, service delivery, facilities, information systems, technologies and supply chains – taking into account local patterns of exposure and vulnerability;
- identify priority risks and vulnerabilities that threaten continuity of health services during extreme heat, using available data, staff experience and lessons from past heat events;
- integrate heat-related risks and response actions into existing health system arrangements rather than creating standalone plans;
- define how triggers identified in the HHAP, such as heat–health alerts and surveillance signals, translate into operational actions within the health system, including service adjustments, workforce protection and intensified care for high risk patients;
- strengthen coordination between the health system and meteorological services, civil protection and social care actors to support information exchange, aligned responses and continuity of care during extreme heat;
- support regional and local implementation by providing guidance, tools and flexibility to adapt national priorities into feasible service-level arrangements across different contexts and resource levels; and
- use monitoring, evaluation and learning from extreme heat events, exercises and seasonal reviews to refine health system preparedness measures, operational protocols and training over time.

## 5.1 Introduction

Extreme heat places significant pressure on health system actors and functions, requiring systems to remain operational while protecting the health and well-being of populations, patients and health workers during periods of high temperature. According to WHO's definition, health systems bring together "all the activities whose primary purpose is to promote, restore and/or maintain health" *(1)*. A health system includes the people, institutions and resources working to improve health while meeting societal expectations.

Health systems need to remain resilient to the disruptions, shocks and stresses associated with recurrent extreme heat *(2,3)*. This is implicit within WHO's definition of health system resilience: "the ability of all actors and functions related to health to collectively mitigate, prepare, respond and recover from disruptive events with public health implications, while maintaining the provision of essential functions and services and using experiences to adapt and transform the system for improvement" *(4)*. The concept of a climate-resilient health system further underscores the need for health system actors to understand climate risks and to anticipate, respond to and recover from climaterelated events. Within this HHAP guidance, the concept is applied specifically to extreme heat events *(5)*.

This core element focuses on actions within the health system, addressing actors commonly working within the mandate and operational responsibility of health authorities – including primary care, public health services, clinical settings and the health workforce. Nonetheless, there is strong interdependence between health and social care systems during extreme heat events. Social care services and community-based organizations play a critical role in protecting populations at increased risk of heat-related harm and supporting continuity of care, but are often governed by policy, administrative and financing arrangements distinct from those of the health sector. Actions specific to the social care sector are therefore addressed separately in User action brief 4 – Social care domain in Part 2, while actions related to identifying and reaching populations at increased risk are detailed in Core element 3 – Populations at increased risk.

> **Governance considerations**
>
> National HHAPs can describe how health system resilience to extreme heat is addressed through strategic and technical inputs that inform the overall plan, including system-wide assessments, priority setting, and alignment of health system functions with HHAP objectives and triggers.
>
> At regional and local levels, HHAPs can focus on how these inputs are operationalized within health services through service-level partnerships and arrangements, such as operational and business continuity plans, that enable health systems to respond to heat risks before, during and after extreme heat events.

This chapter outlines steps for strengthening health system resilience to extreme heat within an HHAP, taking into account governance levels and the roles and responsibilities of health sector

authorities and health-care providers across administrative levels and domains. It also sets out the key arrangements, strategies and operational measures within the health sector's remit, and examines selected health system functions, highlighting considerations to ensure continuity, safety and effectiveness of care during periods of extreme heat.

> Detailed actions for health authorities, public health practitioners, health facility managers and front-line health workers to implement before, during and after extreme heat events are presented in User action brief 1 – Health domain in Part 2.

## 5.2 Considerations for heat risk management within health system functions

Extreme heat affects four key operational functions of a health system: the health workforce; health information systems; infrastructure, technologies and supply chains; and service delivery, as defined by WHO's operational framework for building climate-resilient and low-carbon health systems *(5)*. These functions are most directly involved in maintaining continuity, safety and effectiveness of health system services during extreme heat events. Other functions such as governance and financing are cross-cutting elements; these are addressed in Core element 1 – Governance in the wider context of the health system, including HHAP development and implementation.

While limited progress has been made in planning for heat risks to health systems, and the evidence is predominantly drawn from high-income settings *(6,7)*, this core element applies across all levels of the system, and should include primary and community health-care facilities, first responders and the health workforce delivering care at home. When establishing the health system resilience component of an HHAP, it is important to recognize the important complementary role of social care services provided on formal and informal bases in supporting extreme heat response (for actions specific to social care actors, see also User action brief 4 – Social care domain in Part 2).

### 5.2.1 Building a heat-prepared and protected health workforce

Building and strengthening the capacity of the health workforce to recognize and manage heat-related illnesses in patients, and to promote preventive actions in different settings, are critical components of health system preparedness and response for extreme heat events to protect patients and the workforce alike *(8)*. This ensures that clinical staff, GPs, home visiting physicians, community nurses, emergency personnel and other first-contact providers, pharmacists, outreach workers, and other service providers are equipped to increase awareness of heat risks, assess vulnerability to heat, identify symptoms early, and provide appropriate preventive care or treatment. Health workforce training should aim to build and strengthen awareness to improve prevention, diagnosis and management of heat-related illnesses – including consideration of surveillance and community outreach approaches. This should ideally be incorporated into existing training requirements and/or offered as certified continuous professional development, with annual refreshers and drills to ensure adequate levels of engagement *(9,10)*. Effective training will also need to consider the provisions of existing HHAPs at local, regional and national levels,

and the role of the health workforce in their implementation (see also User action brief 1 – Health domain in Part 2; Annex 3 on signs and symptoms of heat-related illness).

Training needs to include the preventive measures that are activated when a heat–health alert is issued. This includes operational guidance, standards and protocols so that health workers know how to act when an alert is issued – particularly recognizing the different groups at increased risk of heat-related harm *(6)*. In this context, a well-functioning early warning system is critical (see also Core element 2 – Heat–health warning system), and lies at the heart of efforts to reduce heat-related health impacts (*11–13*). However, early warnings are only effective when they trigger timely action, which requires that health workers receive clear, actionable instructions on how to respond to these alerts *(14)*.

The capacity of the health workforce to act on such guidance is also shaped by broader system pressures. Many health systems are already experiencing sustained increases in demand driven by growing multimorbidity, ageing of the population and workforce shortages; this can lead to high demand for services, long waiting times and challenges in maintaining staff morale and retention *(15)*. Ensuring sufficient staffing during acute events – across community, primary care and facility settings – is therefore an important component of strengthening resilience to extreme heat and of supporting safe and timely care. Heat–health alerts can provide a useful early warning system for health system managers to adjust work schedules and prepare for a surge in demand.

Alongside workforce capacity, public education complements clinical and operational preparedness for extreme heat. Staff across the health system are often some of the most trusted figures in their communities, and are well positioned to disseminate key messages about heat-related risks and protective measures. Front-line health workers – including GPs as primary care providers – are often best placed to know which patient groups are particularly sensitive to heat and may be at higher risk when extreme heat is forecast, thereby facilitating implementation of targeted prevention measures. Providing clear, actionable information on how individuals can safeguard themselves, their families and neighbours can support reducing the number of heat-related emergencies (see also the public health message bank in Part 3).

Reducing heat exposure within the health system is also essential for maintaining safe care and protecting staff. Health systems must implement measures to reduce heat exposure for patients, clinicians and other staff groups (such as cleaners, porters, kitchen staff and others who are required to do physical work).

Overheating within health-care buildings has been known to lead to the closure of hospital wards, operating theatres and morgues, and to disrupt delivery of health care *(16)*. Indoor overheating in health settings can also lead to risks to patient safety and an occupational risk to health-care staff *(16,17)*, particularly if wearing personal protective equipment. Those providing care in the community may also face physical and mental health risks during home visits and outdoor activities because they are working under environmental and psychological stressors, experiencing dehydration, heat-related illnesses and emotional fatigue – particularly when community health needs increase and resources and infrastructure are limited *(18)*.

Protecting the health workforce during extreme heat therefore requires measures that reduce exposure and strengthen overall protection. The following measures used in combination help to

protect staff health, support workforce capacity and maintain continuity of care during periods of extreme heat *(19)*:

- providing heat-appropriate personal protective equipment and cooling aids;
- ensuring regular hydration and rest breaks with access to cool areas;
- adjusting work schedules and applying work/rest cycles;
- enabling simple self-monitoring and awareness of heat stress symptoms;
- implementing buddy systems or briefing staff to identify emerging risks; and
- supporting heat acclimatization planning for staff who need time to adapt to working safely in high temperatures.

In most countries, occupational heat risk is regulated under occupational health and safety legislation that require employers to undertake a risk assessment based on local context and (inter)national standards, and to report on heat-related incidents *(20,21)*. Additional operational guidance on protecting the health workforce can be found in User action brief 1 – Health domain and User action brief 2 – Occupational domain in Part 2, while measures to reduce heat exposure more broadly are outlined in Core element 6 – Reducing heat exposure and User action brief 3 – Urban and built environment in Part 2.

### 5.2.2 Using health information systems to anticipate and detect heat-related health impacts

Health information systems are complex, multilevel systems designed to generate health intelligence to support decision-making. They encompass the collection, integration, analysis and interpretation of data, as well as health reporting, knowledge management and governance. Drawing on data from the health and other relevant sectors, health information systems help to ensure that information is of sufficient quality, relevance and timeliness to inform public health and healthsystem action *(22–24)*.

In the context of extreme heat, robust and responsive health information systems are a critical enabling component of resilient health systems, while also supporting other core elements of the HHAP. They facilitate detection and interpretation of heat-related health impacts – particularly in populations at increased risk (see also Core element 3 – Populations at increased risk); guide the development of impact-based warnings (see also Core element 2 – Heat–health warning system); and provide the basis for reviewing performance and improving actions over time (see also Core element 8 – Monitoring, evaluation and learning).

Across these core elements, the health system has a role and responsibility, although its level of involvement in using health information systems for heat–health action planning may vary by administrative level and the scope of the HHAP. At the national level, the health system may provide guidance on overall standards for data collection, define key heat–health-related indicators, support meteorological and health information integration, and establish consistent approaches for interpreting and communicating heat-related risks. In contrast, regional and local authorities typically apply these national parameters, where available, to generate more detailed analyses, drawing on higher-resolution environmental and epidemiological data to identify local patterns of exposure, vulnerability and service capacity. At these levels, health information systems

support tailoring of warnings, targeting of interventions, and real-time monitoring of impacts, enabling responses that reflect the specific geographical and demographic context *(25,26)*.

To identify populations at risk, health authorities can use health information systems for a range of relevant dimensions. These may include assessing demographic factors, analysing the distribution of heat-sensitive health conditions (such as diabetes and schizophrenia) in a population, and estimating future heat-related health burden. Determining socioeconomic barriers and reviewing health system capacities at national, regional and local levels are also essential to anticipate medical expertise, service needs and surge readiness, and to enable coordination with other sectors – such as social care, housing or emergency services – to manage heat-related health risks effectively (see also Core element 3 – Populations at increased risk) *(5)*.

Health information systems also support heat–health surveillance through the systematic collection and integration of heat-related health data and indicators within the health system. This enables health authorities to anticipate potential impacts before they occur, monitor them as they unfold, and evaluate them afterwards to inform longer-term decision-making (see also Core element 7 – Heat–health surveillance). Modern information systems, which increasingly rely on digital and web-based platforms, can incorporate insights from behavioural data and other large-scale information sources and complement traditional surveillance approaches *(6)*.

Surveillance data should also inform – and be integrated with – early warning systems, alongside meteorological, epidemiological and demographic data, to support impact-based thresholds and context-specific triggers for action (see also Core element 2 – Heat–health warning system; Core element 7 – Heat–health surveillance). Surveillance data generated within the health sector – such as data on all-cause mortality, heat-related hospital visits and admissions, GP/family doctor consultations and other syndromic indicators – can be particularly valuable when interoperable information systems share and align these data with meteorological variables across different administrative levels to strengthen impact-oriented warnings and enable targeted and timely responses to extreme heat events *(5,27)*.

Finally, heat–health information systems can also support monitoring, evaluation and learning by providing data to track the impacts of extreme heat, assess health system capacity, and review the effectiveness of interventions over time. For more details see section 5.4 and Core element 8 – Monitoring, evaluation and learning.

### 5.2.3 Heat-resilient infrastructure, technologies and supply chains

Health systems rely on physical structures, environmental control systems – such as ventilation and cooling – that maintain safe indoor conditions, and medical equipment, information technologies and supply chain functions that may all be affected by extreme heat. Therefore, heat-resilient infrastructure, technologies and supply chains provide the foundation for maintaining safe, effective and continuous service delivery across hospitals, primary care and community-based services during periods of extreme heat.

During extreme heat events, rising temperatures can strain essential system functions that support health system delivery, including food, water and energy supplies *(28)*. This strain can adversely affect health system operations owing to infrastructure damage, disrupted supply chains, and power outages that affect cooling and compromise critical equipment *(29–31)*. These

conditions can have cascading effects, hindering the safe storage of temperature-controlled medicines, reducing capacity to discharge hospital inpatients, and impairing the functioning of critical technologies – such as medical imaging (including magnetic resonance imaging scanners) and information and communication systems *(16)*.

In addition to maintaining routine service delivery, health systems must also be prepared for surges in patient presentations commonly observed during episodes of extreme heat, as demand for care may exceed the system's capacity to respond *(32,33)*. Surges in health-care system demand may also coincide with impacts on wider supporting community infrastructure and services, with cascading impacts on workforce availability due to transport disruption and the closure of schools or childcare facilities.

Within the HHAP, this core element requires health facilities to develop processes to identify, anticipate and manage concurrent and cascading risks to operational resilience, including interdependencies with external systems (such as transport disruptions, power outages or school closures) that can affect access to services, supply chains and workforce availability. Health systems should conduct regular risk and vulnerability assessments to quantify and prioritize heat-related risks and to sequence adaptation measures across the short, medium and long term. This assessment should be embedded in routine health system planning and governance – including capital investment and maintenance plans, infrastructure upgrades, and procurement standards – to ensure that decisions made today strengthen heat resilience over time.

In terms of infrastructure, facility-level assessments can be used to identify overheating risks and inform structural and procedural adaptations. Measures to address overheating in buildings – such as passive cooling, improved ventilation, shading and heat-conscious building design – are widely documented and effective in reducing indoor heat exposure, although they are not specific to hospital buildings *(6)* (see also Core element 6 – Reducing heat exposure).

Conducting real-time facility checks to identify overheating risks in wards, waiting areas and high-occupancy zones is beneficial during episodes of heat. Operating and monitoring cooling systems, or deploying portable cooling units where fixed systems are not available, can reduce overheating risk. Backup power systems are needed to ensure provision of cooling and critical services during outages *(31,34,35)*. In addition, HHAP implementation requires health facilities to ensure continuity of essential services such as water, energy and food supplies during extreme heat, as disruptions in these lifeline systems can further compromise health service delivery and operational resilience.

Among technologies, heat-resilient and thermally tolerant equipment – including digital systems, diagnostic devices, clinical technologies and cold chain equipment – should be prioritized *(5,36)*. Thermal thresholds and heat stress susceptibility should inform procurement, maintenance and backup protocols, ensuring that technologies remain functional during extreme heat events (see Box 11 for an example of how extreme heat can undermine critical information technology systems and affect health service delivery). To strengthen health system resilience, regular stress-testing of technologies, robust serverroom cooling management and redundancy measures (such as cloudbased backups and dual-site data centres) should be included in the HHAP to reduce risks of overheating related failures *(37)*. During heat events, sensitive technologies should also be protected through active temperature management of rooms and cabinets (such as heating, ventilation and AC performance checks, shading and portable cooling, where appropriate),

continuous environmental monitoring with alarms, and operational measures such as switching off or reducing use of non-essential heat-generating equipment, and rescheduling elective procedures if safe operation cannot be ensured *(38)*.

### Box 11. Heat-related information technology infrastructure failure in London hospitals, United Kingdom

Guy's and St Thomas' NHS Foundation Trust is one of the largest secondary and community health-care providers in England, United Kingdom, employing more than 22 000 staff and delivering around 2.6 million patient contacts each year. On 19 July 2022, London experienced record-breaking temperatures reaching 40 °C. As forecast in the preceding days, the extreme heat placed substantial stress on the Trust's digital infrastructure. Over the course of the day, two separate onsite data centres – one at Guy's Hospital and one at St Thomas' Hospital – experienced heat-related failures.

These failures led to a widespread outage of critical information technology systems across Guy's, St Thomas' and Evelina London Children's hospitals, as well as associated community services. In total, 371 clinical and non-clinical systems were affected, including:

- electronic patient records, leaving clinicians unable to access the medical records of patients they were treating;
- electronic prescribing systems, disrupting generation and dispensing of electronic prescriptions;
- electronic investigation ordering, requiring clinicians to order tests and investigations through more cumbersome paper processing; and
- electronical clinical documentation, preventing electronic inpatient and outpatient clinical note taking.

The Trust declared a critical incident on 19 July 2022, and although essential services were gradually restored, the incident did not stand down until 21 September 2022. The response required approximately £1.4 million in unplanned technology spending, including establishment of a cloud-hosted data environment to strengthen backup resilience and engagement of specialist recovery services to retrieve data from disks damaged during the data centre failures.

*Source*: Guy's and St Thomas' NHS Foundation Trust *(30)*.

Strengthening supply chains and supply management is equally essential to ensure access to clinical supplies during extreme heat. This includes proper temperature management of heat-sensitive pharmaceuticals such as antipsychotics during transportation and storage *(16)*. Stocking and releasing prepositioned supplies – such as intravenous fluids, oral rehydration salts and cooling packs – to emergency departments and outreach teams can help to ensure supply chain resilience. Monitoring supply levels in real time and coordinating with logistics teams enables rapid replenishment during surges in demand *(34)*. Additional measures include:

- evaluating supply chain vulnerabilities to extreme heat;
- issuing patient advice on keeping medicines cool at home;

- ensuring refrigerated transport resilience;
- diversifying suppliers to avoid single point failures; and
- mapping dependencies on external systems such as fuel, transport and warehousing temperature controls.

### 5.2.4 Maintaining service delivery during extreme heat

To ensure health system resilience, service delivery must remain functional, safe and responsive during periods of extreme heat. Extreme heat can simultaneously affect patient demand, staff capacity, facility infrastructure and supply chains. Hence, it is crucial to ensure that all components of service delivery are planned for, resourced and operationalized across the entire health system, protecting patients and planning for demand surges while triaging heat-related service disruptions due to power cuts, malfunctioning medical equipment and other factors.

Protecting patients at increased risk of threats to health from extreme heat is equally critical. This includes close monitoring of older adults, patients with chronic, mental health or substance-use conditions, those unable to modify their environment (for example, because of limited mobility or being unhoused) and patients on medications that impair thermoregulation or fluid balance *(39,40)*. These groups experience heightened vulnerability during extreme heat; they require proactive outreach, individualized care plans, and coordinated follow-up across primary care, social care and community services (see also Core element 3 – Populations at increased risk; User action brief 1 – Health domain in Part 2).

To coordinate action across levels of care, the HHAP should mandate that primary care, community outreach services and home-based support teams are integrated into heat response efforts. Identifying and prioritizing high-risk populations, pre-season medication reviews and proactive follow-up measures – such as phone calls and home visits – are essential to identify individuals at risk and provide timely, targeted support *(6,41–43)*. Community-based preparedness and empowerment *(5)* are critical for ensuring that individuals at increased risk of heat-related harm receive continuity of care where they live. Box 12 illustrates some low-cost locally adapted measures that can support continuity of health service delivery across health-care and community settings.

## Box 12. Building health system resilience to cope with extreme heat in North Macedonia

To strengthen preparedness for crisis situations and extreme heat-related emergencies, a simulation exercise was conducted in the Strumica region of North Macedonia. Key stakeholders involved included representatives from the Ministry of Health, Strumica General Hospital (the regional hospital centre), emergency medical services, the Crisis Management Centre, the Red Cross, fire and rescue units, the Ministry of the Interior, the Ministry of Defence, and the WHO Country Office in North Macedonia.

Ahead of the simulation, preparatory meetings were held to define key parameters, including expected casualty numbers, trigger indicators for activating the emergency response plan, triage procedures and patient flow, and the respective roles and responsibilities of hospital and emergency medical services staff. The simulation enabled authorities to test overall preparedness and implementation of the national HHAP. It also identified several opportunities to strengthen management of heat–health risks within the existing hospital crisis preparedness plan – notably in areas such as command and leadership, staff preparedness, and effective management of incoming patients.

*Source:* adapted from WHO Regional Office for Europe *(6)*.

Maintaining effective service delivery during extreme heat also requires facilities to implement a pre-prepared and tested business continuity plan, as stipulated by the HHAP. Business continuity plans position services to manage predictable increases in heat-related emergency room visits and admissions, and ensure continuity of clinical care that also accounts for heat-related disruptions. This plan should outline clear operational steps – such as adjusting staffing levels, reviewing medication protocols, securing additional supplies and modifying treatment approaches (for example, increased monitoring and hydration support) – so that responses are timely and clinically appropriate.

Collaborative development and regular review of business continuity plans – drawing on lessons learned from previous emergencies, and co-produced with response services and other health system partners – enhances their feasibility, contextual relevance and usability. In the broader governance setup for the HHAP, particularly at the local level, this collaboration should be clearly established, ensuring that service delivery plans are risk-informed, context-specific and adaptable to rapidly changing heat conditions (see also Core element 1 – Governance).

In line with readiness principles *(44)*, business continuity plans should ensure that planning transitions quickly into action, explicitly to account for heat-related disruptions – including surge procedures, real-time triage pathways and backup arrangements with other health providers if a certain site or service is compromised (for example, via diversion of patients, staff deployment, and provision of medications and equipment). Designated focal points for coordination are needed to oversee implementation, ensure internal communication, and monitor operational pressures across the system. Regular simulations and multiagency drills, aligned with national standards, are essential to maintain readiness and identify gaps *(45)*. Box 13 illustrates how a health system-wide simulation exercise can be used to test and strengthen HHAP implementation, including hospital-specific emergency and preparedness plans.

### Box 13. Supporting continuity of health service delivery during extreme heat in Canada

In Canada, a national initiative led by the Canadian Coalition for Green Health Care was developed to address the impacts of indoor heat on health service delivery in longterm care, acute care and community settings, with a particular focus on older adults and other populations at increased risk *(46)*.

During increasingly frequent periods of extreme heat, many health-care settings were unprepared to manage the extreme indoor temperatures *(47)*. In response, participating facilities and services undertook sitespecific assessments using temperature and humidity data loggers to understand heat conditions in sites in British Colombia, Nova Scotia and Ontario. These assessments were complemented by input from residents, patients, health-care workers and caregivers.

Based on the findings, low-cost, practical and locally adapted measures to manage heat during hightemperature periods were identified. For longterm and acute care settings, these included introducing green infrastructure, solar shades or shutters, and scheduling prompts to manage heat. In community settings, measures to support safe care delivery included portable fans and sunlight-blocking curtains.

These measures illustrate how relatively low-cost non-structural interventions can be integrated within existing service arrangements to help maintain safe care environments during extreme heat. By reducing heat-related stress for patients, residents and staff, such measures have the potential to support continuity of health service delivery during extreme heat events – particularly in settings where more resourceintensive adaptations may not be feasible in the short term.

## 5.3 Operationalizing health system resilience within the HHAP

This section sets out considerations for action to operationalize health system resilience within the HHAP across governance levels. The purpose is to set out how health authorities can translate HHAP objectives into technical and operational arrangements that enable health services to remain fully functional, safe and effective during periods of extreme heat. This may also include integration of heat–health considerations into routine health system planning and infrastructure decisions – for example, in planning of new health-care facilities or building upgrades. For specific actions that can be taken by the health workforce before, during and after extreme heat events, see also User action brief 1 – Health domain in Part 2.

At the national level, the HHAP may describe strategic and technical inputs that provide a common basis for action across the health system. At regional and local levels, the focus is typically on operationalizing these inputs through service-level arrangements that are activated before, during and after extreme heat events. Both national and local levels should include shorter- and longer-term actions, and should seek to align with decarbonization strategies – particularly where these can reduce indoor overheating, improve thermal performance and strengthen operational resilience.

### 5.3.1 Considerations for action at the national level

At the national level, operationalizing health system resilience within the HHAP focuses on creating the policies and conditions that enable consistent, sustained and coordinated action across the health system during extreme heat. The main output is a strategy and evidence-informed implementation framework for health system resilience to extreme heat that is embedded within the HHAP and supported by technical guidance and actions. This framework does not constitute a separate or parallel plan for the health sector but takes place within the broader governance of the HHAP. It is typically led by the ministry of health and national health authorities in collaboration with meteorological services, civil protection or emergency response authorities and social care actors, in recognition of the interdependences during extreme heat events.

The following considerations can inform and guide development of the strategy and implementation framework.

- The process begins with agreeing the scope and purpose of the strategy and defining roles and responsibilities. This involves confirming that the strategy focuses specifically on strengthening health system resilience to extreme heat, and clarifying how it supports – rather than duplicates – other elements of the HHAP. At this stage, national health authorities engage with relevant actors to agree which health system functions are within the scope, how the strategy relates to social care systems, civil protection or emergency response arrangements, and the role of meteorological services (see also Core element 1 – Governance). Establishing this shared understanding at the outset supports coordination and helps to ensure that the strategy is positioned as an enabling instrument within the broader HHAP.
- The strategy should be informed by an assessment of health system risks, capacities and interdependencies to establish how extreme heat affects the health system's ability to function. This assessment focuses on system-level issues, such as impacts on the health workforce, service demand, infrastructure, information systems and supply chains, as well as interdependencies with social care services and civil response systems. In contexts where data or analytical capacity are limited, this assessment may rely on qualitative methods, expert consultation, reviews of previous extreme heat events, and existing emergency and climate risk assessments. The objective is to develop a fit-for-context understanding of priority vulnerabilities that require national coordination.
- Based on the assessment, national authorities should define a set of strategic priorities and objectives for strengthening health system resilience to extreme heat. These priorities help to focus action on areas where national guidance, coordination and alignment offer the greatest added value. Strategic objectives can relate to maintaining continuity of priority health services, protecting the health workforce, enabling timely action in response to heat–health alerts, and strengthening coordination across health, social care and emergency response systems. Keeping objectives concise supports implementation and allows adaptation to available resources.
- Next, an implementation framework should be designed. This translates the strategy into a structure that supports action across the health system. It sets out how responsibilities are distributed across national, regional and local levels, how HHAPs trigger such as heat–health alerts and surveillance signals relate to health system actions, and which core health system functions require attention at a subnational level. The framework should be flexible, allowing regional and local actors to adapt actions to their context and capacity.

In resource-constrained settings, it may emphasize minimum actions or progressive implementation over time.

- Coordination arrangements across sectors should be established. Effective national level application requires clarification of how the health sector coordinates with other actors during periods of extreme heat (see also Core element 1 – Governance). This step focuses on practical arrangements for collaboration with meteorological services, civil protection or emergency response authorities, social care systems, and other governmental authorities that share responsibility for management of concurrent and cascading impacts of extreme heat. Coordination mechanisms may address information exchange, alignment of preparedness and response actions, and joint support for populations at increased risk of heat-related harm, while respecting differences in mandates, governance structures and financing arrangements. Where possible, these mechanisms should build on, and align with, existing emergency coordination structures.
- Technical guidance and enabling support for subnational action should be provided. To support consistent implementation, national authorities should develop or adapt technical guidance and reference materials to assist regional and local actors. Depending on capacity, this may include national indicators and standards, example operational protocols, and adaptable tools that translate strategic priorities into practical considerations for services and facilities. In resource-constrained settings, guidance may focus on feasible minimum actions and adaptation of existing tools rather than comprehensive new requirements.

### 5.3.2 Considerations for action at the regional and local levels

Regional and local HHAPs can focus on practical measures that operationalize health system resilience across health services, facilities and community-based care. The emphasis is typically on adapting national guidance to local systems and stakeholders – reflecting the climatic, demographic and service delivery context – and on ensuring that operational actions are activated as heat-related risks escalate. The main outputs at regional and local levels are an operational plan that sets out how the health sector organizes and coordinates its response, aligned with the strategy and implementation framework, and business continuity plans and protocols that focus on maintaining priority health services and critical functions when extreme heat causes disruption.

The following considerations can inform and guide the development of local and regional plans.

- Regional and local health actors can begin by identifying locally relevant heat-related risks and constraints, and establishing how extreme heat affects health services and facilities in their specific context. This may include risks related to workforce exposure, service demand, facility overheating, equipment performance, access to supplies, and dependencies on external systems such as water, energy and transport. In settings with limited data or analytical capacity, this understanding may be developed through facility walkthroughs, staff experience, routine service data and lessons from previous extreme heat events.
- Based on the risks identified, regional and local health authorities and providers should use local information to prioritize feasible actions within existing capacity and resources. This prioritization can focus on protecting the health workforce, maintaining priority services, addressing the most significant overheating risks and ensuring continuity of essential supplies during extreme heat events.

- Heat-related considerations and protective measures should be embedded in existing service delivery models and service-level instruments – such as business continuity plans, emergency procedures, standard operating protocols and simple checklists. Where formal plans are limited, concise action cards or facility-level checklists may serve a similar function. User action brief 1 – Health domain in Part 2 provides details of practical steps that health sector practitioners can consider taking before, during and after heat events to protect communities.
- HHAP alerts should be translated into operational service responses. Regional and local arrangements can clarify how heat–health alerts issued under the HHAP are received within health services, and how they trigger concrete actions. Examples include adjustments to staffing patterns, modified clinical workflows, additional monitoring of patients at increased risk, targeted outreach through primary and community care services, and activation of facility-level heat reduction measures.
- Workforce protection and service adaptation measures should be applied. Protecting the health workforce supports continuity of care during extreme heat. Locally feasible measures may include adjusted work schedules and task allocation, hydration and rest breaks, access to cooler or shaded areas, peer support or buddy systems, and simple approaches to recognizing and responding to heat stress. These measures can be tailored to different care settings – including hospitals, primary care, community outreach and home-based services.
- Facility, technology and supply pressures should be managed during extreme heat events Facilities and services can apply practical measures to reduce overheating and maintain functionality – such as monitoring indoor temperatures, managing ventilation and shading, operating cooling systems where available, or deploying portable solutions during extreme heat episodes. Attention to supply continuity may include monitoring stocks of temperature-sensitive medicines and essential supplies, prepositioning items used in extreme heat response, and coordinating replenishment using available logistics mechanisms.
- Primary care and community-based response should be strengthened. In many settings, primary care providers play an essential role in protecting health during extreme heat – not only by supporting continuity of care but also by providing early advice, preventive guidance and timely clinical support. GPs, community nurses and outreach workers are often the first point of contact for people at increased risk, and are well placed to identify emerging heat-related health issues, adjust treatment or medications where needed, and use proactive outreach methods to identify individuals at increased risk. Close coordination with community-based and home-based care services, as well as with trusted community actors, facilitates delivery of advice, care and support before deterioration occurs, helping to reduce avoidable illness and pressure on acute and emergency services during heat events.

## 5.4 Monitoring, evaluation and learning for improving health system resilience

Within this core element, monitoring, evaluation and learning ensure accountability and continuous improvement to strengthen the resilience of the health system to extreme heat. The

focus is on how health system functions anticipate, prepare for, respond to and adapt to heat-related shocks effectively while maintaining essential services, and on whether lessons from extreme heat events are systematically used to strengthen preparedness and response over time.

Monitoring supports routine tracking of preparedness and readiness across key health system functions during and between heat seasons. It focuses on whether agreed measures for workforce protection, service delivery, infrastructure performance, supply chain continuity and use of health information systems are implemented and functioning as intended. Key monitoring questions include:

- Are agreed preparedness and readiness measures implemented across health services and facilities before, during and after periods of extreme heat?
- Do health information systems provide timely and usable data to anticipate and manage heat-related pressures on services and the workforce?
- Are health services able to maintain safe and continuous operations during periods of extreme heat?

Monitoring draws on indicators such as availability and application of heat-related clinical and operational protocols; staffing levels and workforce protection measures during extreme heat events; monitoring of indoor temperatures in health facilities; availability of essential supplies and temperature-sensitive medicines; and use of heat–health information and surveillance data to support operational decision-making.

Evaluation provides a more in-depth assessment of how effectively the health system performs during and after extreme heat events. It examines the extent to which health services maintain continuity of care, manage heat-related illnesses, protect the health workforce and sustain critical infrastructure, technologies and supply chains under extreme heat conditions. Evaluation may draw on both quantitative and qualitative evidence, recognizing variation in data availability and capacity across settings. Key evaluation questions include:

- How effectively did the health system manage increased demand and operational stress during extreme heat events?
- Where were the main constraints or failures across health system functions, including workforce, infrastructure, information systems and supply chains?
- To what extent did preparedness and response measures reduce avoidable health impacts and service disruption?

Indicators may include assessments of service continuity during extreme heat events, trends in heat-related morbidity and service utilization, workforce impacts, infrastructure or technology disruptions, and the effectiveness of operational responses triggered by heat–health alerts.

Learning ensures that evidence generated through monitoring and evaluation is systematically used at all levels to strengthen health system resilience over time. It is supported by post-event reviews, end-of-season reflections, and regular exchange across levels of the health system to identify enablers, barriers and priority actions for improvement. Key learning questions include:

- What worked well and what gaps were identified across health system functions during extreme heat events?
- What changes are needed to strengthen preparedness, workforce protection and service continuity?
- How should health system arrangements be adapted to respond to evolving heat risks, population vulnerability and system capacity?

Indicators of learning may include documented lessons from extreme heat events and exercises; revisions to clinical guidance, operational protocols or training curricula; updates to risk assessments and contingency arrangements; and improvements to integration and use of health information systems to inform preparedness and response in subsequent heat seasons.

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# Core element 6 – Reducing heat exposure

**The aim of this core element is to protect people from extreme heat exposure across all relevant settings and scales.**

## Key messages

- Reducing people's exposure to extreme heat is essential to protect their health; for populations at increased risk of threats to health from extreme heat, it can be life-saving.
- Effective cooling at the room or dwelling level depends on the space's characteristics and intended use and the local climate; it combines appropriate cooling strategies to improve thermal comfort and reduce health risks.
- Buildings can contribute to overheating, but design improvements, retrofitting and passive cooling interventions can significantly reduce indoor heat exposure.
- Cities can increase residents' heat risks, but planning measures and interventions such as green and blue infrastructure, shading, and cooling strategies can reduce urban heat island effects and improve population health, well-being and resilience.
- The safest and most sustainable population-based approach to reducing extreme heat exposure is to avoid heat gains through measures such as heat-conscious urban planning, building design and nature-based solutions.

## Core element output

The core element output is a roadmap for heat exposure reduction that maps relevant and feasible interventions in the local context for immediate heat exposure reduction and preventive, medium- and longer-term interventions, focusing on priority populations and settings.

## Steps to implement the core element

The following steps collectively support the development of a comprehensive roadmap for heat exposure reduction. It is important to:

- assess the main settings where people are exposed to extreme heat – including homes, workplaces, schools, care settings, public spaces and outdoor environments;
- identify short-term measures at the individual and room levels that can be promoted before and during the heat season – including through public advice and targeted outreach to populations at increased risk of heat-related harm;
- identify medium- and long-term measures for reducing heat exposure at the dwelling, building, urban and metropolitan levels;
- clarify which sectors and actors are responsible for each measure – including health, housing, urban planning, energy, labour, education, social care, transport and civil protection;
- develop a roadmap that links immediate seasonal actions across scales with longer-term planning, investment, regulation and infrastructure measures, and assigns responsibilities, timelines, investment needs and implementation mechanisms across health and non-health sectors;
- promote stakeholder engagement and incentives to support implementation – including partnerships with local authorities, communities, civil society and private sector actors; and
- monitor and evaluate the implementation and effectiveness of heat exposure reduction measures, and update strategies based on lessons learned.

## 6.1 Introduction

No amount of isolated action by public health departments can fully protect the population from extreme heat exposures. To build heat-resilient societies, public health stakeholders must work closely with other sectors, such as urban planning departments, local governments, housing departments, statistical agencies and education authorities. This kind of integrative coordination is crucial to ensure health protection against heat in a changing climate. The exposure to extreme heat of individuals, populations and specific subgroups is shaped by many factors: local climate; urban landscape and housing characteristics; access to cooling technologies, services or spaces; and behaviour, among others. Reducing exposure requires a range of strategies that target these elements.

Choosing the right heat reduction strategies depends on context. For example, most heat-related deaths happen indoors, especially among older adults or people with disabilities *(1–4)*. Therefore, an effective heat exposure reduction strategy needs to address indoor air temperatures, indoor radiant temperature, air movement, humidity, and personal factors such as activity level and clothing. Some populations at increased risk typically face greater heat risks outside (see also Core element 3 – Populations at increased risk). Urban cooling interventions – such as greening, street shading, public access to cooling spaces and drinking-water, and specific occupational safety measures – benefit the whole population by lowering ambient exposure in shared environments while offering particular protection to people who spend long periods outdoors or have limited access to cooler indoor spaces.

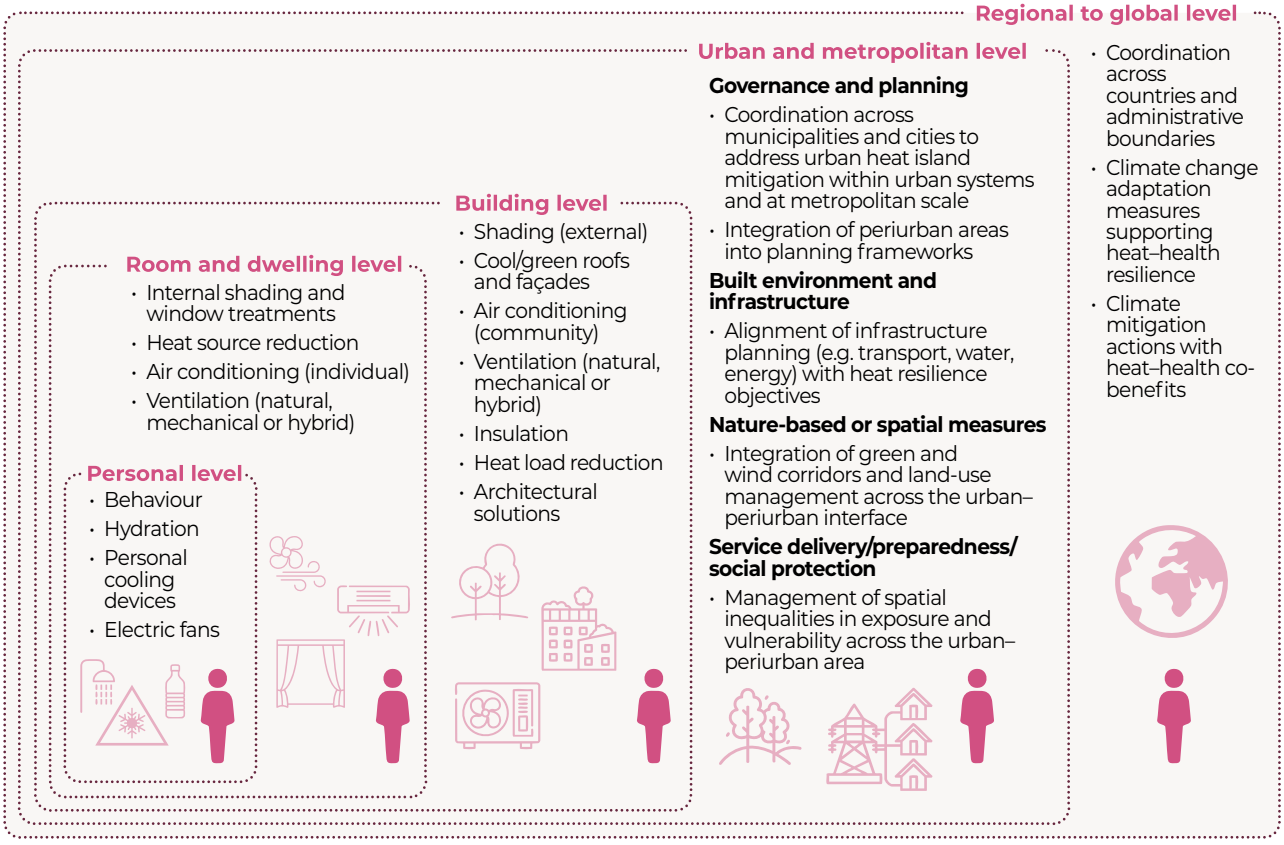
> **Governance considerations**
>
> Many exposure-reduction measures fall outside the direct mandate of the health sector, requiring HHAPs to define how health authorities work with sectors responsible for housing, urban planning, social care, education, labour, transport and civil protection.
>
> At the national level, HHAPs can help to set priorities, coordinate action across sectors, and connect heat–health objectives with wider urban planning, housing and climate adaptation processes. At the regional and local levels, HHAPs are often more directly concerned with implementation, including action on buildings and public spaces, access to cooling and drinking-water, and protection of populations at increased risk during extreme heat events.

This chapter provides an overview of the main heat reduction strategies that can be implemented within HHAPs. The interventions described operate across multiple levels of an HHAP. National authorities may set policy, standards and financing frameworks; subnational and local authorities may adapt these to local conditions through planning, housing, social care and public space measures; and institutions, communities and households may implement practical actions that directly reduce exposure. Together, these interventions and their enabling factors can form a roadmap for heat exposure reduction, linking immediate actions with longer-term measures across sectors and scales as part of the HHAP.

## 6.2 Roadmap for heat exposure reduction

Protection against extreme heat starts at the individual level and extends outwards to the room and dwelling level, the building level, the urban landscape and beyond (Fig. 6). While not all interventions addressed in this chapter were originally designed to reduce heat exposure, all contribute to it.

### Fig. 6. People-centred heat exposure reduction across settings and scales




*Source:* adapted from Martinez, Camarasa & Kazanci *(5)*. Reproduced with permission from Springer Nature Customer Service Centre.

Various technologies and actions can help to protect people from extreme heat wherever they are – at home, at work, at school or outdoors. Each level illustrated in Fig. 6 involves different players, who either have responsibility for implementing or are in the best position to implement protective technologies and actions. These include individuals and caretakers at the personal and household level; landlords and building managers at the building level; and local and national authorities at larger scales, among others. This people-centred approach is adapted from the scientific literature *(5)*, drawing on existing frameworks covering various angles – from urban resilience *(6)* to city operations *(7)* – and public health frameworks that inform this guidance *(8)*. A people-centred heat exposure reduction framework integrates the angles of indoor heat exposure reduction and heat-conscious long-term urban planning, protecting people seamlessly wherever they are.

This can support other core elements of an HHAP – notably care for populations at increased risk (Core element 3) through targeted heat exposure reduction interventions, and the physical

infrastructure dimension of social and health system preparedness for heat as part of health system resilience (Core element 5). Conversely, governance (Core element 1) – and particularly engagement of local and non-state actors – is crucial for the coordination needed for effective population-level reductions in exposure to extreme heat.

Overall, reducing exposure to extreme heat requires both immediate protective measures and longer-term preventive action. Measures at the individual and room levels can often be implemented before or during the heat season. However, many interventions effective in reducing heat exposure at the dwelling, building, neighbourhood, urban and metropolitan levels require longer-term planning horizons, sustained investment, regulatory action and implementation by sectors outside the direct mandate of health authorities.

HHAPs should therefore not be limited to framing short-term responses to extreme heat. Optimally, an HHAP should also define a comprehensive roadmap for heat exposure reduction, linking immediate seasonal actions with medium- and long-term measures in housing, building design and urban planning, as well as in the energy, transport, education, labour and social care sectors. Such a roadmap is most effective if it clarifies priorities in heat exposure reduction, actors responsible for the implementation of identified measures, financing needs and incentives, implementation timelines, and monitoring arrangements. The roadmap should translate the layered approach shown in Fig. 6 into an operational HHAP-anchored process, while also distinguishing between measures that can be implemented immediately with the resources available and those requiring medium- or longer-term planning and investment. In this way, individual-level protection becomes an entry point for a broader roadmap that links short-term seasonal action with medium- and longer-term interventions that address structural drivers of heat exposure and lead to progressive reduction of heat exposure over time.

Development or updating of an HHAP roadmap for heat exposure reduction can start with an assessment of where people are most exposed to extreme heat. This includes homes, workplaces, schools, care settings, public spaces and outdoor environments. The assessment will help authorities identify priority settings, populations at increased risk of threats to health from extreme heat and the most appropriate level of intervention. It can also identify which populations and settings require immediate individual-level protection, and which risks require action at the dwelling, building or urban levels. Local authorities are central to this process, as they can help to identify priority neighbourhoods, public spaces, institutional settings and workplaces, and can support coordination with housing, urban planning, education, labour, social care, civil protection and community actors.

The assessment can inform both short-term measures (such as public advice, community outreach, access to drinking-water, shade and cooling spaces) and longer-term adaptation measures (such as building retrofits, passive cooling, urban greening and heat-conscious planning). The measures and interventions presented in this core element can support identification and selection of actions within the roadmap.

## 6.3 Heat exposure reduction at the individual level

Protecting people from extreme heat means protecting their health and well-being, whether they are at home, at school, working, exercising, outdoors or at an institution, among others. It also means

protecting them over time. Although healthy adults may adapt somewhat to heat over the season, this is a passive physiological process rather than an intentional protective action, and should not be relied on as a heat protection strategy *(9,10)*. Thus, the emphasis is on reducing individual exposure through the following approaches, among others.

- Behavioural advice is the most common method used. The majority of public health advice during high temperatures is aimed at ensuring individual-level cooling through safe behaviours, consistent with the recommendations of the WHO #KeepCool campaign *(11)* (see also Core element 4 – Communication; the public health message bank in Part 3; Annex 3 on signs and symptoms of heat-related illness). Implementation of this individual-level advice is supported by a broader "culture" of protection against heat *(12–14)*, which can be promoted by public health authorities, primary care and social care service providers, employers, schools and other relevant community organizations. Some populations at increased risk of heat-related harm, including those with certain bodily and cognitive disabilities, may need help to implement this individual-level advice (see also Core element 3 – Populations at increased risk; the public health message bank in Part 3). Workers in informal employment or who are illegally employed (such as undocumented migrants) may not be able to adopt heat-protective action or demand it, and therefore require targeted attention. Additional behavioural tailored advice should be provided to those spending significant amounts of time outdoors – particularly working or exercising – with specific attention to groups at increased risk like homeless people. A broad group of actors could support those less able to protect themselves against heat. These include carers (whether formal or informal), social workers, unions, health and safety inspectors, NGOs, teachers, staff and coaches at sporting facilities. These actors can provide support by checking on populations at increased risk, adapting schedules and activities, facilitating access to hydration and cooling, identifying early signs of heat-related illness, sharing trusted advice, and escalating concerns to health or emergency services when needed (see also the user action briefs in Part 2; the public health message bank in Part 3). Social capital – and specifically countering social isolation of older adults before and during extreme heat – also contributes to reducing the impact of extreme heat events *(15,16)*.
- Using electric fans against the heat – whether handheld, desktop or mounted on ceilings or walls – has been a widespread practice at both the individual and institutional levels for a long time. The effectiveness and safety of fan use depend not only on environmental conditions but also on the characteristics and vulnerability of the population using them. During extreme heat (≥35 °C), the protective effect of fans alone may be limited and may not be sufficient to prevent heat-related illness – particularly among populations at increased risk such as older adults, individuals with chronic conditions and those taking medications that affect thermoregulation *(17)*. While fan use may still be beneficial above 35 °C in specific circumstances (for instance, in healthy populations, when no better cooling options are available, and when combined with measures such as skin wetting) *(18,19,20)*, the practice should not be interpreted as generally suitable for all population groups *(20,21)*. In line with a precautionary and people-centred approach, particular caution is warranted when recommending fan use for populations at increased risk, for whom lower temperature thresholds may remain more appropriate.
- "Personal cooling systems" are designed to cool individuals directly, or the immediate micro-environment around them, rather than the broader spaces they occupy. They are an emerging set of solutions to hazardous heat exposure, which may include portable shade structures, water-based cooling such as misting or evaporative systems, smart textiles, ventilated clothing, personal ventilation, personal humidifiers and fans, personalized targeted cooling

of micro-environment and clothes cooling using air or liquids *(22,23)*. There is some laboratory and occupational evidence of thermal comfort improvements from personal cooling systems *(24,25)*. However, while personal cooling devices may provide benefit in selected settings, before a broader deployment they should be evaluated – based on equity, acceptability and environmental impacts, among other considerations *(26,27)*. Moreover, individual protection from heat may not necessarily require sophisticated technology. For example, both traditional and UV-protective parasols can reduce hazardous heat exposure *(28)*, although their cultural acceptability varies widely globally *(29)*.

## 6.4 Heat exposure reduction at the room and dwelling level

At the room or dwelling level, cooling strategies (passive and active) work best when tailored to the space design, its intended use and occupancy profile, and the local climate conditions. Occupants may be able to apply these strategies themselves, depending on whether they rent, own or manage the space. However, in most workplaces, institutions (such as schools, care homes, prisons and hospitals) and others, occupants cannot implement any interventions at this level. Instead, landlords, employers or caretakers may be in the best position or mandated to do so.

Most mainstream cooling strategies for rooms and dwellings can be categorized into four broad categories.

- Indoor shading and window treatments – such as internal blinds, curtains or films – can help to block heat, especially on sunny sides of a building (south- or west-facing rooms) *(30,31)*. External shading, such as shutters or awnings, is even more effective *(32)*. Where feasible, external shading should be prioritized over internal shading because it prevents solar heat gain before it enters the room. Nevertheless, internal shading can still provide some benefit, especially where exterior options are not possible *(31)*.
- Reducing internal heat sources by avoiding or minimizing the use of heat-producing appliances (such as ovens and washing machines) during hot periods helps to limit indoor heat. In hotter climates, long-term energy-efficient building designs and passive cooling, insulation of cooling ducts and hot water pipes, kitchen extractor hoods, and using energy-efficient equipment that emits less heat than standard products may be needed to mitigate heat gains *(33)*.
- Natural ventilation, created for example by opening windows during cooler times of day (especially at night and in the early morning), helps to refresh indoor air as long as outdoor temperatures are lower *(34,35)*. Real-time measurements of indoor and outdoor temperatures can help to optimize natural ventilation as a cooling strategy. In humid climates, ventilation can be combined with nature-based solutions, such as natural shading from greenery outside the building (see section 6.5) to enhance the effectiveness of airflow while minimizing heat entry into buildings *(36)*. In addition to its thermal comfort benefits, natural ventilation may also help to improve indoor air quality – depending on the air quality outdoors – and reduce the risk of mould; however, possible drawbacks (including mosquitoes, as vectors of disease, and safety concerns) should also be considered.
- AC and other active cooling technologies can provide life-saving relief from extreme heat – especially for populations at increased risk of threats to health from extreme heat.

However, while active cooling is an effective way to reduce hazardous heat exposure, it can be balanced with and gradually replaced by passive cooling strategies adapted to the local climate (Box 14). For example, integrating shaded areas with AC systems or installing cool or green roofs can help to reduce the overall cooling load, making use of AC more energy-efficient and environmentally sustainable. In addition to AC, other cooling solutions such as water-based high temperature radiant cooling (for example, in floors or ceilings) can be suitable solutions, especially in dry regions. Geothermal heat pumps use the Earth's stable underground temperature to provide energy-efficient heating and cooling. They can be used for single buildings or larger setups like building complexes and district systems, offering a sustainable alternative to traditional heating, ventilation and AC *(37)*. Smart use of AC in public transport – like cooled buses, trains and stations – can help to lower heat exposure and exposure to some air pollutants for commuters. These spaces can also serve as informal cooling shelters during extreme heat events *(38)*.

## Box 14. A nuanced policy approach to AC

AC is not a sustainable (in time or environmentally) societal solution for hazardous heat exposure reduction. It is inequitable and unaffordable for those with low incomes *(39–41)*; it increases energy demands and heightens the risk of blackouts *(42–44)*; it promotes individual and societal dependency and overcooling, and may impair heat acclimatization *(45–48)*; and it contributes to both the urban heat island effect *(49–52)* and climate change *(53)*, thus worsening heat exposures in the medium and long term.

Despite these drawbacks, AC remains crucial to protect populations at increased risk from high temperatures, as well as for refrigerating essential medicines and other health-protecting technologies (such as technology-based health information systems). In the absence of other options, AC – or another equally effective active cooling technology – should be available to those who need it most as if it were a medical necessity. A nuanced approach towards the use of AC can equitably ensure its protective benefits for groups at increased risk, while promoting increasing sustainability requirements in AC technologies and aiming for widespread deployment of passive cooling interventions.

Given the disproportionate impact of heat on populations at increased risk, it is crucial to address existing inequalities in access to cooling. Possible interventions include *(40)*:

- facilitating access, financing and knowledge about AC for populations at increased risk;
- addressing energy insecurity and poverty, including during summer months;
- identifying individuals at increased risk for whom AC amounts to life-saving medical equipment; and
- addressing inequities in cooling use, while discouraging demonstrably excessive AC use and overcooling in public spaces and work settings.

To mitigate the impact of AC on energy infrastructure, it is essential to enhance grid resilience, to invest in energy efficiency and renewable energy sources, and to implement demand-response programmes that encourage energy conservation during peak periods *(44)*.

### Box 14 contd

Moreover, there is room for improvement in the overall environmental performance of AC – from a global average baseline of inefficient, high-energy-use, individually installed and operated, and often poorly maintained equipment. Alternatives with lower greenhouse gas emissions include district cooling and solar-powered AC. Increasingly stringent energy efficiency standards and the progressive replacement of hydrofluorocarbons with other chemicals as promoted by the global Kigali Amendment to the Montreal Protocol *(54)* can also contribute to relative reductions in greenhouse gas intensity.

## 6.5 Heat exposure reduction at the building level

Certain characteristics of a building can lead to overheating, and some of those characteristics can be modified to reduce heat gains. While some aspects (like orientation) can only be considered in new construction, others (such as adding shading) can often be retrofitted. Tailoring measures to both local climate and building type is key. Retrofitting existing buildings with passive cooling strategies improves comfort and reduces energy use, and implementation can be facilitated by public incentives.

Most passive cooling strategies at the building level fall into the following categories *(5,55)*.

- Cool roofs and façades using reflective materials or light-coloured surfaces reduce heat gain – especially in hot climates. Their potential health benefits depend on the local climate and geography *(56–58)*. Their heat exposure reduction potential has been observed in a multitude of locations, including in low-resource settings *(59,60)*. Reductions of indoor temperatures due to cool roofs are most noticeable in non-air-conditioned buildings and for the top floors – particularly attics *(61)*.
- Green roofs and walls are building surfaces over which a waterproofing membrane, soil and vegetation are typically overlaid. Adding vegetation on building surfaces helps to cool buildings and offers extra benefits like noise reduction *(62)*, improved air quality *(63)* and well-being *(64–66)*, if maintained properly and suited to the local climate *(61,67,68)*. Careful planning of vegetation placement is essential to balance shading benefits with preservation of effective natural ventilation *(69)*.
- Shading and shutters can be a highly effective option for decreasing internal heat gains and hazardous heat exposures. External shading is generally more effective but, where possible, using both external and internal shading (such as shutters and curtains) more effectively blocks sunlight and reduces indoor heat *(70–72)*. Nature-based solutions like climbing plants on walls or green screens can also serve as natural shading, reducing indoor temperatures *(73)* while improving air quality in the immediately surrounding area *(74)*.
- Insulation and thermal mass (storage of heat within the building envelope) can help to reduce the risk of overheating. However, their effectiveness is heavily reliant on overall building design: in poorly designed buildings – especially those with limited ventilation or shading – insulation alone can trap heat and exacerbate overheating. Proper

insulation helps to regulate indoor temperature but needs good ventilation to avoid overheating *(72,74–76)*.

- Reducing internal heat gains via decreasing the heat contribution of appliances and other sources at the building level – as at the room level (see section 6.4) – can help to reduce heat exposure *(77)*. Using efficient lighting and equipment (such as light emitting diode lighting, energy-efficient appliances, and insulating cooling and heating ducts and pipes) and turning off appliances when not needed lowers heat build-up, especially in offices *(78–81)*.
- Ventilation[8] can help to provide better indoor environments in terms of thermal conditions and air quality *(82)* also at the building level. Natural ventilation (like opening windows when it is cooler outside) is effective in suitable climates, although this situation may increasingly become less frequent under a warming climate *(83)*. Furthermore, it can be limited by poor design or outdoor pollution *(84,85)*. Mechanical or hybrid ventilation systems (e.g. controlled mechanical ventilation, mixed-mode systems combining natural and mechanical airflow, and mechanically assisted night ventilation) can help to maintain good thermal conditions and air quality *(86)*. The best timing for natural ventilation, or mechanical ventilation if uncoupled from cooling, is generally in the early morning and during the night *(82)*, especially when night temperatures are substantially lower than daytime temperatures *(87)*.
- Traditional (often called "vernacular") architectural solutions for heat, like thick walls, light colours, courtyards, narrow shadowed streets, sky wells, wind towers and others show promise as passive, sustainable cooling solutions. Heat reduction at the building level also depends on material and envelope properties, including solar reflectance, insulation, thermal mass and other design choices that influence heat gain, storage and release *(88–90)*. However, as the evidence for their health protection potential against heat has not been systematically assessed, their suitability for specific settings needs to be carefully considered.
- Heat-conscious design can often be planned for new buildings to reduce heat exposure through site selection, building orientation, spatial ratios, interior zoning and space distribution – including depth of the zones, window-to-wall and window-to-floor ratios, shading, thermal mass, and ventilation and AC systems *(91)*. Planning new buildings with orientation, layout and passive cooling in mind (for example, using overhangs, natural shade and green roofs) can reduce heat exposure and energy demand *(91–93)*.
- In addition to technical building measures, institutional settings may require operational measures during extreme heat, particularly where buildings are not yet heat-resilient. Childcare settings, schools, care homes, health and social care facilities, and other public buildings may need to take short-term measures – such as schedule adjustments, activity restrictions, access to cooled spaces and hydration, and building-based cooling interventions. These settings require particular attention because they serve populations at increased risk of threats to health from extreme heat *(1–4,82–87,94–96)*.
- In schools and childcare settings, heat can disrupt learning, play and daily routines *(97)*. Children and adolescents (see also Core element 3 – Populations at increased risk) are more susceptible to health risks from heat. Many school buildings and facilities lack the passive and active cooling interventions needed to ensure thermal comfort during extreme heat; teachers are increasingly forced to implement early dismissals during the

[8] "Ventilation" is used here as a generic term for building conditioning solutions that provide fresh air to indoor spaces, most often also heating and cooling, collectively referred to as heating, ventilation and AC.

school day, as well as shortening the school year. In addition to the health risks, heat affects learning *(98–100);* school time reductions may result in educational losses, particularly for disadvantaged students and communities *(101)*. Tree planting, shading, cool materials, and water fountains and misters are possible school cooling measures *(102)*. Classroom temperature measurement is a basic, low-cost measure *(103)*. Specific precautions are needed to avoid heat-related illnesses in school sports and physical activity *(104,105)*. Shifts in school schedules and modes of work *(106,107)* need to be considered and are likely to become more common. Further details on interventions are explored in User action brief 5 – Education and childcare domain and User action brief 2 – Occupational domain in Part 2.

## 6.6 Heat exposure reduction at the urban and metropolitan levels

Cities can increase residents' heat risks owing to dense populations and heat-trapping materials and infrastructure, although with thoughtful planning they can also be protective *(108,109)*. However, the institutions typically in charge of HHAPs do not hold competences over buildings beyond health and social care facilities, and are seldom able to promote such changes effectively in cities beyond – in some cases – public buildings *(110,111)*. Where coordination mechanisms are not yet formalized, HHAPs can establish or strengthen them to support implementation across sectors *(112)*.

Effective implementation at building and urban levels requires acceptance of ownership of heat stress as a problem by municipalities. Stronger coordination among key actors, such as local and regional governments, health authorities, urban planners, housing agencies, education departments, transport and civil society is also needed *(113,114)*. Notably, urban development patterns that contribute to the urban heat island effect also need to be addressed at the metropolitan scale: across the functional urban area, including periurban municipalities beyond the administrative city boundary.

Heat exposure reduction at the urban and metropolitan levels requires attention to the physical landscape and systems – for example through urban greening, water bodies, urban structure and materials, and housing quality. It also includes organizational and institutional responses like establishing cooling centres and school scheduling. Main strategies include the following.

- Creating and maintaining urban green and blue spaces, replacing typical urban surfaces and materials with greenery – particularly trees – contributes to decreasing the urban heat island effect and average temperature of cities, and reduces the risk of heat-related mortality *(115–122)*. Moreover, well-designed, accessible and maintained urban green infrastructure has additional benefits; it can support mental well-being, physical activity, social interaction and the quality of public space, provided benefits are distributed equitably *(123,124)*. Other benefits of urban green infrastructure may include air quality regulation, flooding protection, biodiversity protection and recreational value *(125)*. The location and distribution of green spaces can make a significant difference in terms of cooling potential, and the vegetation structure (from grass or isolated trees to full urban forests), composition and management matter greatly for the cooling effect of urban greening, highlighting the

importance of locally tailored planning and solutions *(126–128)*. WHO provides direction and examines important factors that can be used in decision-making in this area *(124)*. Water bodies – also known as "blue spaces" – have the potential to reduce urban temperatures and heat exposure, particularly in cities, although their effect is not as well established as that of urban green spaces *(129–131)*. Moreover, some health risks may increase through use of inadequately managed water bodies – including drownings and injuries, infectious illnesses associated with recreational water, and vector breeding *(132,133)*. Box 15 illustrates how cities have translated such approaches into practical interventions, including nature-based solutions, cooling streets and public space adaptation.

## Box 15. Urban heat mitigation through nature-based solutions at the city level

Targeted interventions to reduce heat exposure and improve thermal comfort include large-scale urban greening, blue infrastructure and other nature-based solutions. Such interventions can contribute to reducing urban heat exposure while providing co-benefits for air quality, mental health and biodiversity *(134)*. Several cities have embedded such measures within local health and planning strategies *(135)*, often linked to broader climate and health agendas. Examples include the following.

- In Vienna (Austria), in response to rising urban heat, temporary and more permanent neighbourhood-level heat mitigation interventions have been implemented through "cool streets" redesign that combine shading, greening and public space adaptation. In selected streets and squares, measures include tree planting, planters and other greening elements, seating, shading structures, drinking-water access and, in some locations, fine water spray systems. Vienna has framed these measures as part of a broader approach to improving thermal comfort in dense neighbourhoods, especially where residents may have limited access to private outdoor space or cooling at home *(136)*.
- In Paris (France), heat mitigation measures have included expansion of urban green and blue infrastructure, cooling streets, shaded public areas and increased access to water features, as part of broader urban climate adaptation strategies. These measures were further emphasized in preparations for major international events such as the Olympic Games, demonstrating how cities can align heat mitigation, public health protection and urban operations under one planning framework *(137)*.

City-level interventions to reduce heat exposure are most effective when implemented as part of a broader, people-centred HHAP. Urban green and blue infrastructure interventions are most effective when integrated into broader heat risk reduction strategies alongside early warning systems, health system preparedness and targeted protection of populations at increased risk of heat-related harm.

- Mitigating the urban heat island effect at the metropolitan scale can be achieved through interventions beyond city limits, including through periurban greening, which can also contribute to reducing risks related to floods and droughts *(138,139)*. Another possible intervention is incorporating green and wind corridors into periurban and urban planning

to enhance airflow and reduce heat accumulation (see Box 15) *(78,140–142)*. In some cities, residents who are at increased risk of heat-related harm reside in the periphery *(143)*, where lack of planning, poor-quality dwellings and the underserved status of informal settlements beyond city limits often make their residents vulnerable to heat. These challenges can be addressed through coordinated policies and initiatives at the metropolitan or regional level, where several HHAPs may need to be aligned across municipalities within the same functional urban area.

- Street shading, particularly of walking paths, is an effective strategy to reduce hazardous heat exposure and improve the thermal comfort of pedestrians during hot weather. If buildings do not provide shading, it can be achieved through natural and artificial devices. Planting deciduous trees and setting up seasonal artificial solutions facilitates shading during the hot season while allowing pedestrian exposure to solar radiation in winter *(145)*. Shading may also encourage walking and cycling (physical activity) of urban settings *(146)*, with potential associated health gains.
- Housing quality, maintenance and regulations can play an important role in reducing heat exposure. Inadequate insulation, degraded building materials, inadequate shading and limited ventilation can increase indoor temperatures and heat stress, especially in older or poorly maintained homes *(147,148)*. Building policies and regulations can help to address these risks by integrating overheating prevention, passive cooling and climate resilience into housing standards, renovation programmes and inspection procedures *(149)*. Such regulatory frameworks, specialized technical knowledge and standard operating procedures for assessing overheating risks can help housing authorities and inspectors identify and address building overheating as a public health risk *(150)*.
- Urban landscape materials can be designed or upgraded using materials that reduce heat absorption and retention – for example, reflective materials such as cool roofs, reflective coatings, light-coloured façades and high-albedo surface materials where appropriate to the local context – resulting in decreases in effective temperatures *(151,152)*. Although it may also increase concentrations of ozone, whose formation is aided by sunlight – both direct and reflected on surfaces *(153)* – increasing albedo may be an effective citywide strategy in some types of urban settings for reducing heat-related health risks *(154)*, particularly in areas where substantially increasing green spaces may not be possible. These modifications are especially effective when applied systematically across large areas, such as in urban centres or industrial parks *(155)*.
- District cooling is a comparatively energy-efficient system that provides cooling to multiple buildings through a centralized plant, distributing chilled water – often from natural water bodies – or other refrigerating agent via pipes buried underground. During extreme heat events, it can maintain consistent indoor temperatures, reducing the risk of heat-related illnesses. Populations at increased risk may particularly benefit from stable and reliable cooling. District cooling, particularly if powered by renewable energy, improves air quality by reducing the number of individual AC units, which can systemically contribute to urban pollution *(156)*. Its energy efficiency also reduces the strain on power grids during peak demand, preventing blackouts that could pose health risks (see also Box 14). By mitigating the urban heat island effect and reducing greenhouse gas emissions, district cooling promotes a healthier and more sustainable urban environment, offering long-term protection against the increasing frequency of extreme heat events *(157)*.
- Urban form and structure influence their inhabitants' heat exposure. Wider streets are generally warmer in daytime, and cool down more quickly at night than narrower ones;

upper walls receive more radiation in daytime but cool down more quickly than lower walls *(158,159)*. Also important are the orientation of buildings and streets *(160)*, as well as wind corridors. Urban planning and building codes that explicitly include heat exposure considerations can help to promote ventilation corridors, expand shaded areas, reduce heat-retaining sealed surfaces, and integrate heat risk considerations into land use and development decisions.

- Heat refuges or cooling centres are publicly accessible cooled spaces that are typically air-conditioned – such as libraries, schools and community centres, religious centres, and even privately owned businesses such as shopping malls and stores *(94)*. They can help to reduce heat risks *(95)*, and it is important that they are accessible to populations at increased risk and those with impaired mobility, who may need help and transportation to get there *(96,161–163)*. There may be a need for staff or volunteers to run these spaces safely and make them welcoming to homeless people or people with mental health conditions. Cooling common areas have the potential additional benefit of promoting social interaction *(164)*. Cooling centres are typically part of locally deployed HHAPs, along with extended opening hours for swimming pools, parks and homeless shelters, ensuring supply of water to public fountains, and misting machines that may offer short-term relief. The suitability of all these facilities depends on humidity, water availability, maintenance requirements and local public health considerations, among others. Cooling centres should be publicly identifiable in advance, with up-to-date information for the public or via internet apps; easy to reach and physically accessible; stigma-free; and linked to referral and transport arrangements for those who may not be able to access them independently (see also Core element 3 – Populations at increased risk; Core element 4 – Communication; the public health message bank in Part 3).
- Reducing heat risks through intersectoral action in urban planning to include health considerations can make long-lasting differences to health and well-being. At the general urban planning and management level, inclusion of health in strategic environmental assessments is a good opportunity to influence the urban planning and policy cycle *(165)*. Although still rare, in some places in the WHO European Region it is mandatory for developers to present a health impact assessment of urban interventions to the approving authority *(166)*. Because many urban heat reduction measures lie outside the direct mandate of health authorities, effective implementation depends on structured collaboration with planners and municipal services. Box 16 summarizes practical entry points for that collaboration.
- Heat–health risk prevention and response at mass gatherings need to be planned. Held at regular intervals, mass gatherings at religious, cultural and sporting events involve many thousands – in some cases, millions – of participants and attendees. These participants may be exposed to various health hazards, among which heat-related illnesses and heat-related aggravation of pre-existing illnesses have become of increasing concern (see also Core element 3 – Populations at increased risk) *(167,168)*. In addition to a robust health surveillance and response plan that includes heat, locally tailored preventive measures could combine several of the interventions listed under the individual, room, building and urban levels. For example, these may include temporary shading, greening, free water and umbrellas, education and advice for participants, air-conditioned shelters and transport, and water mist *(167,169,170)*. Several of these interventions are also applicable to transient populations like tourists, migrants, temporary workers and pilgrims. Annex 2 provides practical advice on actions to consider for mass gatherings during extreme heat events.

### Box 16. How health authorities can collaborate with urban planners at the local level – and what they need to know to stay informed

Local health authorities play a critical role in shaping environments that protect communities from heat – not only during extreme events but throughout the summer season. Effective collaboration with urban planners and municipalities is essential to reduce heat exposure and promote long-term resilience. In this context, health authorities can:

- start by building relationships with planning departments and municipal managers;
- join local planning discussions, share health data on heat-related risks, and lobby for design features that support summer comfort – such as shaded public spaces, green roofs, water features and well-ventilated buildings;
- stay informed about local development plans, zoning changes and climate adaptation strategies;
- monitor planning processes and identify opportunities to integrate health considerations;
- proactively propose joint initiatives – such as summer heat–health campaigns, walkability audits or the co-design of cooling spaces in underserved areas; and
- emphasize the year-round benefits of heat-resilient design, including improved well-being, reduced energy use and greater equity.

By embedding health into urban planning, local health authorities can help to ensure that public spaces and buildings are safe, cool and inclusive both during emergencies and throughout every summer.

## 6.7 Cross-border and global action for heat exposure reduction

Action at the local level alone is not sufficient to address societal exposure to hazardous heat, particularly in a warming climate. Effective responses need to address both the immediate impacts of extreme heat and the underlying drivers, including broader climate change trends. This requires coordination across multiple levels of governance, aligning strategies across local, metropolitan, national and international scales. Coordination across national boundaries, implementation of international commitments and alignment of policy frameworks are critical to achieving effective and sustained outcomes.

- Cross-border heat action is required, as extreme heat events are often cross-border phenomena that could benefit from a collective response and preparedness to reduce the associated health effects and impacts on communities *(171,172)*. Cross-border collaboration may include shared warning criteria, data exchange, coordinated public messaging, traveller information and mutual support arrangements between neighbouring jurisdictions during severe heat events. Responses to severe extreme heat events could

be facilitated by transnational mechanisms like those under Regulation (EU) 2022/2371 on serious cross-border threats to health, as well as bilateral or multilateral mutual assistance agreements. Another example is the need to renovate ageing building stock, which is addressed within the European Union through the Renovation Wave and the New European Bauhaus *(173,174)*.

- Climate change adaptation is essential to strengthen protection against heat, and mitigation remains critical to limit future heat-related health risks. Climate change has already significantly increased the frequency, intensity and duration of extreme heat episodes. It is therefore essential to address both current and future heat impacts through coordinated heat–health action planning. However, effective heat adaptation for health requires comprehensive action *(175,176)*, commitment at the highest level of governments and effective intersectoral action, as well as systemic changes like urban greening, building retrofitting and urban heat island reduction strategies. Because of the interconnection of physical, economic, environmental and social systems, efforts towards climate change adaptation need to be integrated into sectoral regulations, as well as having their own legislative framework.
- While it is essential to address heat impacts through adaptation, reducing greenhouse gas emissions remains critical to averting the worst of climate change-aggravated health impacts of heat. The energy required for active cooling contributes to greenhouse gas emissions. Without urgent action, emissions from cooling are projected to surge to 6.1 billion tonnes of carbon dioxide equivalent in 2050 – equivalent to more than 10% of global projected emissions that year *(177)*.

## 6.8 Monitoring, evaluation and learning for reducing heat exposure

Monitoring, evaluation and learning are an integral part of the overall HHAP cycle. For heat exposure reduction, they should assess whether the measures included in the HHAP roadmap are being implemented, whether they reach priority populations and settings, and whether they contribute to reducing exposure over time. This includes attention to both short-term seasonal measures and longer-term interventions, as well as coordination across key stakeholders responsible for implementation.

Monitoring should track whether planned exposure reduction measures are being implemented as agreed, focusing on progress, coverage and reach. Key monitoring questions include:

- Do populations at increased risk of threats to health from extreme heat and priority settings (such as care homes and schools) have access to cooling, drinking-water and shaded spaces?
- Are coordination activities with municipalities, urban planners and other relevant stakeholders taking place?
- Are planned heat exposure reduction interventions at various scales implemented?

Monitoring indicators include proportion of public buildings (such as schools and care homes) with heat protection measures in place; availability and accessibility of cooling centres or cooled

public spaces; coverage of shading, greening or cooling interventions in high-risk areas; number of households or individuals reached with cooling support; and number of coordination meetings held involving health, urban planning and other relevant actors.

Evaluation should assess whether heat exposure reduction measures implemented are effective, feasible, equitable and sustainable, examining whether they improve access to protection, reduce heat exposure and support populations at increased risk. Key evaluation questions include:

- Were the measures feasible, acceptable, equitable and sustainable in the local context?
- Are coordination arrangements across sectors effective in supporting implementation?
- Have heat exposure reduction measures contributed to lower indoor or outdoor heat exposure in priority settings or areas?

Evaluation indicators include number of priority settings with heat exposure reduction measures in place; measured changes in indoor temperatures in priority settings; use of cooling centres or cooled public spaces during heat events; and comparison of intervention coverage between high-risk and lower-risk areas.

Evaluation should also recognize that many heat exposure reduction measures – particularly those related to buildings, urban planning and infrastructure – are long-term investments whose effects may not be immediately observable. Annual evaluation should therefore focus not only on outcomes but also on progress towards implementation. This can include tracking the adoption of policies and standards; progress in retrofitting buildings and urban spaces; and expansion of cooling access.

Learning could use annual review findings to improve future HHAP cycles and maintain progress on long-term heat exposure reduction measures. It should identify what worked, what did not work, why, and what should be adapted before the next heat season. Key learning questions include:

- Which measures should be maintained, scaled up, adapted or discontinued?
- What good practices can be replicated in other settings or municipalities?
- What changes are needed in roles, responsibilities, guidance or planning processes before the next heat season?

Examples of learning indicators include an annual heat season review; an updated HHAP roadmap for heat exposure reduction; revised list of priority settings and populations; documented lessons learned from municipalities and sectors; and agreed follow-up actions with assigned responsibilities and timelines.

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# Core element 7 – Heat–health surveillance

**The aim of this core element is to establish a heat–health surveillance system that informs timely decision-making and action.**

## Key messages

- Heat–health surveillance is essential for detecting, monitoring and responding to health impacts of extreme heat in a timely and evidence-based manner.
- Effective surveillance integrates meteorological, environmental and health data, including near-real-time information on mortality, morbidity and syndromic and health service use indicators to guide HHAP activation and rapid public health action.
- Integration with heat–health warning systems ensures that surveillance data informs thresholds, triggers and response measures.
- Surveillance systems should be scalable, flexible and interoperable, supporting adaptation to local contexts and coordination across governance levels.

## Core element output

The core element output is an operational heat–health surveillance system with defined indicators, data sources, reporting timelines and data-sharing arrangements linked to the heat–health warning system and used to inform HHAP activation and response decisions.

## Steps to implement the core element

The following steps collectively support the development of an operational heat–health surveillance system. It is important to:

- define the scope and design of the heat–health surveillance system, including key indicators (such as mortality, morbidity, syndromic and health service use data), data sources, geographical coverage and reporting frequency;
- define institutional roles and responsibilities for data collection, analysis, reporting and use across relevant sectors and levels of governance;
- establish data-sharing and access arrangements that enable timely, secure and routine exchange of near-real-time or regularly updated data across relevant sectors;
- define how relevant health, meteorological and environmental data will be brought together within the heat–health surveillance system for integrated analysis and interpretation;
- ensure data quality, timeliness and comparability that enables timely interpretation of surveillance findings and their use to guide public health action during extreme heat events;
- link surveillance outputs to heat–health warning systems, as well as HHAP activation and response procedures;
- review and refine the surveillance system regularly through monitoring, evaluation and learning; and
- develop reporting products for HHAP stakeholders to guide decision-makers in adapting and reinforcing prevention and emergency measures.

## 7.1 Introduction

Extreme heat can lead to rapid and significant impacts on population health, which often emerge within hours or days *(1)*. These impacts may first become visible through increases in health service use – such as emergency department visits or ambulance dispatches – before they are reflected in routine mortality, morbidity or hospital statistics. For this reason, availability of timely health data during extreme heat events and emergency situations is essential for an effective public health response.

Public health surveillance is the continuous and systematic collection, analysis and interpretation of health-related data needed for planning, implementation and evaluation of public health practice *(2,3)*. Heat–health surveillance is the continuous and systematic collection, analysis and interpretation of data on heat exposure, heat-related health outcomes and population vulnerability. Its aim is to support timely public health action, guide preparedness and response measures, and evaluate the effectiveness of heat–health interventions.

> **Governance considerations**
>
> Heat–health surveillance is typically coordinated at the national level, often through public health authorities in collaboration with other relevant sectors. Depending on the governance arrangement, data availability and technical capacity, regional and local HHAPs may complement national surveillance with additional monitoring of indicators such as emergency department visits, hospital admissions and ambulance dispatches to strengthen situational awareness and support timely action.

Within an HHAP, heat–health surveillance serves a distinct but complementary function to the heat–health warning system (see also Core element 2 – Heat–health warning system). Heat–health warning systems use meteorological and health information to anticipate periods of increased risk of threats to health from extreme heat and trigger preparedness and early action. In contrast, heat–health surveillance is observation-based, using real-time or near-real-time data to detect actual health impacts, assess their severity and distribution, and provide information about whether response measures need to be maintained, intensified or adjusted. Together, these systems support both anticipatory and impact-informed decision-making *(1,4,5)*.

Heat–health surveillance data may also be used to evaluate how health services respond during extreme heat events. For example, data showing increases in medical helpline calls, primary care consultations, ambulance call-outs, emergency department visits and bed occupancy can indicate rising demand, and can help authorities to adjust interventions and service delivery. Different types of data within a surveillance system often involve different institutional responsibilities. The system may combine mortality data, morbidity data, meteorological data and selected indicators of health service use, each of which may be generated, managed and analysed by different actors. For example, mortality data are often generated through civil registration, vital statistics or national mortality surveillance systems, and are usually processed and analysed by national statistical offices, public health institutes or ministries of health.

Thus, a heat–health surveillance system should be established as an integral part of the HHAP, linked to its governance, warning, activation, communication and response arrangements. Surveillance and health outcome data can be used to evaluate the effectiveness of HHAPs in reducing heat-related deaths and improving adaptation and awareness. In practice, however, measuring the health impacts of extreme heat remains challenging due to data gaps, reporting delays and methodological differences across settings. In addition to tracking heat-related health impacts, surveillance data can also be used for monitoring, evaluation and learning to assess whether HHAP actions across other core elements – such as alerts, communication activities, outreach to populations at increased risk of heat-related harm, cooling interventions and health system actions – were implemented as intended and contributed to reducing health impacts (see also Core element 8 – Monitoring, evaluation and learning).

This chapter outlines the key concepts of heat–health surveillance, including system design, data sources, operational approaches and integration with warning systems and public health action within HHAPs.

## 7.2 Key principles of an effective heat–health surveillance system

Surveillance of population health and well-being is identified by WHO as one of the 10 essential public health operations *(6)*. Effective heat–health surveillance systems provide relevant, timely and actionable information to support decision-making before, during and after periods of extreme heat. Such systems must therefore not only collect data but also ensure that the data can be interpreted and used to guide action within the HHAP. Core attributes of surveillance systems include suitability, availability and accessibility, timeliness, quality and comparability of data, and reporting arrangements.

- Suitability refers to whether the selected data, sources and indicators are capable of capturing heat–health impacts and health system pressure. Data are the raw information collected from different systems; data sources are the locations from which information is obtained; and indicators are the measures derived from those data. In the context of extreme heat, suitable indicators should reflect a range of outcomes, ranging from early signs of heat stress to severe health consequences. Depending on the context and data availability, these may include mortality, morbidity, syndromic and health service use data, interpreted alongside meteorological data (see section 7.5 for further details).
- Availability and accessibility of data refer to whether relevant data can be accessed and used in practice, taking into account legal, technical and institutional arrangements. Effective heat–health surveillance requires clear protocols for data sharing, access, linkage and use across relevant actors. In some settings, data ownership, privacy regulations and technical infrastructure or interoperability challenges may limit access. Where routine heat–health surveillance systems are incomplete or delayed, approaches such as reporting from a selected number of reporting sites (for example, hospitals and clinics) or on selected syndromic indicators, or community-based reporting through local health or social care workers may still provide useful situational awareness.
- Timeliness of data and reporting is critical if surveillance is to support action during a heat event rather than retrospective analysis alone. In heat–health surveillance, real-time

monitoring refers to data that are available and reviewed on the same day, while near-real-time monitoring refers to data reported and analysed within approximately 24–48 hours. In settings with automated reporting systems, such as electronic dashboards or rapid reporting from emergency departments, health authorities can act more quickly during extreme heat. Increases in emergency department visits, ambulance dispatches, GP consultations or medical helpline calls may signal rising heat-related illness; this may help services to anticipate additional workload and demand. This allows authorities to respond quickly during extreme heat and deploy health services effectively. Where such systems are not available, selected syndromic indicators, a selected number of reporting sites or basic paper-based rapid reporting may still support timely action.

- Quality and comparability of data are essential to ensure that surveillance findings are accurate, complete, consistent and interpretable. Where relevant, use of internationally recognized disease classification systems – such as the International Classification of Diseases, tenth revision (ICD-10) or latest available – can improve comparability across settings. Routine checks for missing or inconsistent data, transparent documentation of methods, and training for staff involved in coding, reporting and interpretation are important for maintaining data integrity.

In practice, development of an effective heat–health surveillance system is sometimes constrained by data and methodological challenges. Differences in data availability, case definitions, indicators, coding practices, analytical methods and reporting formats can limit comparability across settings, and can make interpretation of findings difficult for public health professionals and policy-makers. These challenges may also affect confidence in reported data and, in some cases, may hinder effective action. At the same time, relatively simple surveillance arrangements – such as use of a limited set of indicators, rapid reporting from selected facilities, or brief surveillance bulletins linking key heat–health and meteorological findings – can provide useful information to inform public health action in settings with limited resources; this is preferable to having no surveillance at all *(5)*.

To detect, interpret and communicate heat-related health impacts effectively and support public health decision-making, surveillance systems also require integration with warning and response arrangements, cross-sectoral coordination and data integration, scalability and flexibility, and attention to equity and inclusiveness *(5–10)*.

- Heat–health surveillance is most effective when it is integrated with heat–health warning systems and response arrangements within the HHAP (see also Core element 2 – Heat–health warning system). In practice, this means that alerts issued by the heat–health warning system for forecast extreme heat are interpreted alongside observed surveillance findings, so that authorities can assess whether impacts are emerging as expected, whether populations at increased risk of heat-related harm are being affected disproportionately, and whether response measures need to be intensified or adapted. If surveillance shows that health impacts are greater than expected for the forecast heat conditions, authorities may need to reinforce public communication, expand outreach to populations at increased risk, boost service capacity, or review whether warning thresholds or activation levels remain appropriate. Linking surveillance outputs to such escalation pathways helps authorities ensure that surveillance supports action rather than reporting alone.

- Cross-sectoral coordination and data integration are essential. Heat–health surveillance is most effective when relevant institutions contribute, share and interpret data through agreed arrangements. This may include health authorities and service providers, meteorological services, environmental and urban planning agencies, social services, and civil protection actors. Meteorological services provide forecast and observational data on temperature and other relevant exposure conditions. Environmental and urban planning actors contribute spatial and environmental data, such as on land use, urban heat island patterns, housing characteristics and distribution of green space. Social services can help to identify and follow up with population groups at increased risk. Civil protection actors provide operational data – including emergency calls, dispatch information and field reports – which support real-time situational awareness during heat events. When combined with health data, these inputs support identification of high-risk areas and populations at increased risk, and inform more targeted prevention and response measures. In some settings, data may be brought together in a shared platform or dashboard; in others, institutions may exchange agreed indicators, summaries or reports through defined reporting pathways. The aim is not necessarily to create a single centralized information system but to ensure that relevant data can be combined or interpreted together to support timely decision-making.
- Heat–health surveillance systems must be scalable and flexible. They should be designed so that they can operate at different levels of complexity and across national, regional and local contexts. A basic system may begin with a small number of feasible indicators and reporting sites, while more advanced systems may incorporate additional data sources, automated reporting, higher spatial resolution or more frequent analysis. Systems should also be flexible enough to adapt as heat risks, population vulnerability, data availability and institutional capacities change over time.
- Equity and inclusiveness are necessary components of surveillance systems. Heat–health surveillance should, where feasible, capture disparities in exposure, vulnerability and outcomes across population groups and geographical areas. This includes differences related to age, chronic conditions and disabilities, socioeconomic conditions, occupations, housing, and other factors associated with populations at increased risk. Such analysis helps to identify where the health impacts of extreme heat may be greatest – including deprived urban areas affected by the urban heat island effect – and supports more targeted prevention and response measures (see also Core element 3 – Populations at increased risk; and Core element 6 – Reducing heat exposure).

## 7.3 Operational arrangements for integrated heat–health surveillance

Establishing an integrated heat–health surveillance system within an HHAP requires clear coordination mechanisms to support effective surveillance arrangements, including for sharing, analysis, reporting and use of data across sectors and levels of governance *(1,4,5,11)* (see also Core element 1 – Governance). National arrangements typically provide the overall framework, including indicator definitions, analytical approaches and coordination mechanisms. Regional and local actors contribute data, interpret findings in their specific contexts, and use surveillance outputs to guide preparedness, response and service delivery *(5–7,12)* (see also User action brief 1 – Health domain in Part 2).

The responsible public health authority, in collaboration with other relevant institutions, should determine the purpose and scope of heat–health surveillance, as well as indicators, data sources, reporting arrangements and decision pathways. Different institutions may generate and manage different data streams – for example, meteorological services provide heat exposure data (such as the number of alerts issued when certain thresholds are exceeded); civil registration and mortality systems provide mortality data; and hospitals, emergency departments, ambulance services, primary care providers and call systems may provide morbidity, syndromic and health service use data. Other complementary data streams – including behavioural data on how populations receive, understand and respond to heat warnings and protective advice – may also be used where available *(13)*. Such information may be collected through surveys, community-based reporting or user feedback mechanisms, and may require additional analytical capacity. The data are generally used as supplementary sources for situational awareness, communication planning or evaluation rather than as sole operational triggers.

Across all such streams, responsibilities for data generation, processing, interpretation, reporting and use should be defined clearly within the HHAP *(1,5–7,14,15)*. These data are compiled, analysed and interpreted by the institution or unit designated in the HHAP – usually under the coordination of the responsible public health authority. Surveillance outputs can then be reported through agreed channels to the actors responsible for warning, activation, communication and response. When surveillance findings indicate that health impacts are emerging or are greater than expected, the authorities identified in the HHAP can use this information to trigger, intensify, adapt or maintain response actions in line with predefined decision pathways and escalation arrangements.

Surveillance needs to be timely; it must bring together multiple data streams and translate them into actionable information for decision-makers before, during and after periods of extreme heat. The design and scope of an integrated surveillance system generally require *(5–7)*:

- identification of the main data sources for heat exposure and health outcomes, including mortality, morbidity and hospital data, meteorological data, and other relevant health or environmental information;
- definition of relevant and feasible indicators and reporting frequency to ensure timely detection of emerging heat-related health impacts and to support decision-making;

- agreement of institutional roles and responsibilities for data generation, collection, analysis, interpretation and use across institutions and governance levels;
- establishment of data-sharing and reporting arrangements that enable timely exchange of information, while ensuring data quality and consistency;
- linkage of surveillance outputs to inform warning thresholds, activation decisions and response measures set out in the HHAP; and
- integration of monitoring, evaluation and learning processes to allow surveillance data to be used not only for tracking heat-related health impacts but also to review performance, assess effectiveness of actions, and inform continuous improvement of the HHAP over time.

## 7.4 Roles and use of heat–health surveillance across levels of governance

Local and regional information contributes to national surveillance data, facilitating analysis and outputs that support coordinated action across all levels. Outputs – such as dashboards, bulletins, situation reports and alerts – are used to inform decision-making, including adjustment of response measures and, where relevant, escalation within the heat–health warning system (see also Core element 2 – Heat–health warning system).

Table 5 summarizes the operational arrangements for an example heat–health surveillance system operating at national, regional and local levels – including the roles of different actors, the main data sources used and how surveillance outputs are applied in practice. Together, these arrangements illustrate how data generated at different levels are combined and used to support coordinated action within the HHAP.

Across all levels of governance, heat–health surveillance involves multiple actors. At the national level, this typically includes ministries of health, public health institutes, national statistical offices and meteorological services. At the regional level, public health authorities and service coordinators play a key role in compiling and interpreting subnational data. At the local level, municipalities, health and social care providers, emergency services and community organizations contribute to data generation, interpretation and response.

Surveillance outputs should be linked to the prioritization criteria, predefined decision and escalation pathways within the HHAP. Where real-time or near-real-time surveillance indicates that health impacts are emerging or are greater than expected for the forecast heat conditions, the actors responsible for activation and response should use this information to decide whether actions need to be maintained, intensified or adapted. Depending on the context, this may include reinforcing public communication, expanding outreach to populations at increased risk, alerting health and social care services to rising demand, increasing access to cooling spaces, mobilizing additional staff or emergency support, or reviewing whether warning thresholds and activation levels remain appropriate. The extent to which this can be done in real time depends on the availability, timeliness and compatibility of both meteorological and health data. Linking surveillance outputs to agreed escalation pathways helps authorities ensure that surveillance supports timely action rather than reporting alone *(1,4,5)*.

## Table 5. Operational arrangements and use of heat–health surveillance across levels of governance

| Level | Role in the surveillance system | Data sources used for surveillance (examples) | How outputs are used |
|---|---|---|---|
| National | • Coordinating and overseeing the surveillance system<br>• Defining indicators and analytical methods<br>• Providing national analysis and guidance<br>• Ensuring integration of health, meteorological and relevant environmental data, including air pollution and other co-exposures relevant to heat–health risks | National sources and consolidated data flows, including:<br>• civil registration, vital statistics or national mortality surveillance systems for aggregated mortality data<br>• national routine health data system and sentinel reports for aggregated morbidity data<br>• syndromic surveillance systems for aggregated health service use data<br>• national meteorological services for meteorological data<br>• environmental monitoring systems for environmental data | • To assess overall heat–health impact<br>• To provide evidence to review and refine warning thresholds and alert levels (between seasons)<br>• To support national response coordination and adjustment of measures during events<br>• To identify inequities in heat-related health impacts<br>• To produce dashboards, bulletins and situation reports<br>• To guide communication and response strategies |
| Regional | • Compiling and interpreting subnational data<br>• Contextualizing national analysis<br>• Coordinating across health, emergency and social services<br>• Supporting regional implementation of HHAP actions | Regional extracts or summaries compiled from national and regional health data systems – including:<br>• mortality, morbidity, syndromic and health service use data<br>• regional sentinel reports<br>• regional meteorological and environmental data<br>• contextual data on population vulnerability, including equity-relevant data, service capacity and local conditions | • To support preparedness and coordination across regional services<br>• To identify areas and services under increased pressure, and target support<br>• To inform regional activation and adaptation of response measures<br>• To communicate with local and national actors |

**Table 5 contd**

| Level | Role in the surveillance system | Data sources used for surveillance (examples) | How outputs are used |
|---|---|---|---|
| Local | • Compiling and interpreting local data and early signals from health, social services and meteorological sources<br>• Responding to emerging health impacts<br>• Implementing HHAP actions<br>• Supporting outreach and health and social care delivery with particular attention to groups at increased risk of heat-related harm | Use of facility-, service- and community-level sources, including:<br>• local health and social care facility records and sentinel site reports<br>• triage, emergency department, ambulance service and call centre records<br>• reports of community health and social care workers, outreach teams and local volunteers<br>• data from municipal authorities and urban planning departments on urban heat areas, cooling spaces and housing conditions | • To identify local health pressures<br>• To adjust health and social service delivery based on predefined prioritization criteria<br>• To prioritize outreach and support for populations at increased risk<br>• To anticipate demand and mobilize services<br>• To inform local communication and outreach |

## 7.5 Surveillance of heat-related health outcomes

Heat–health surveillance monitors a range of health outcomes associated with extreme heat, including mortality, morbidity and syndromic data and other early signals of heat-related illness, as well as increased demand for health services. Surveillance systems differ in the combination of indicators they use, the timeliness and spatial resolution of the available data, and the purposes to which the information is applied *(5)*.

Surveillance of heat-related health outcomes relies on interpreting health data alongside information on heat exposure. Used together, these data help authorities assess whether impacts are emerging as expected, whether particular populations or places are being disproportionately affected, and whether response measures need to be maintained, intensified or adapted.

In practice, most systems combine more than one type of indicator to provide a fuller picture of the health impacts of extreme heat. Examples of how countries combine these surveillance data streams in practice within heat–health surveillance systems are provided in Box 17.

## Box 17. Combination of mortality, morbidity, syndromic and health service use data in practice

In England (United Kingdom), the UK Health Security Agency monitors heat-related impacts during periods of heat alert through real-time syndromic surveillance systems. These include data from NHS 111 calls (the national triage helpline service), GP consultations, ambulance dispatches and emergency department attendances. While the heat alert system is active, these surveillance streams are reviewed with mortality monitoring outputs to assess whether health impacts are increasing and whether additional public health action may be needed. This may include reinforcing risk communication, alerting health and care services to rising demand, and supporting interpretation of the severity and distribution of impacts during the event *(14)*.

In France, Santé publique France carries out heat-related health surveillance using meteorological information from Météo-France with health data from the Organization for Coordinated Emergency Surveillance network (the hospital emergency department network) and SOS Médecins (the emergency and on-call health-care network), and mortality data from the National Institute of Statistics and Economic Studies. During summer surveillance, these data are used to monitor two main types of health impact: morbidity (using a composite heat–health indicator including hyperthermia/heatstroke, dehydration and hyponatraemia, based on data from emergency departments and SOS Médecins activity) and mortality (based on excess mortality monitoring during heat episodes at the national and regional levels). During heat events, surveillance bulletins report morbidity data within 24 hours and mortality data within at least two weeks. After the summer season, national and regional models enable authorities to calculate the number of deaths attributable to heat during the whole summer and during periods of extreme heat *(16)*.

In Italy, the national heat–health system is coordinated by the Ministry of Health within the National Plan for Prevention of Heat Effects on Health, with operational support from the Department of Epidemiology of the Lazio Regional Health Service. Seasonal surveillance combines information from heat–health warning systems, the daily mortality surveillance system, and emergency department access surveillance. Ministry of Health publications report these surveillance outputs together during the summer season, and the system operates in a network of Italian cities to monitor daily heat risk, mortality and emergency department activity during extreme heat *(17,18)*.

In Québec (Canada), public health surveillance of extreme heat is supported through the Surveillance and Prevention of the Impacts of Extreme Meteorological Events on Public Health (SUPREME) system of the national health institution. The system transmits email warnings to health and social services networks and civil protection staff in real time when weather forecasts report a possible extreme heat event in the coming hours. The SUPREME portal facilitates surveillance and monitoring of extreme heat events and their impacts on health. The human health indicators disseminated in SUPREME include the number of deaths, hospitalizations, emergency department consultations and ambulance transport, and calls to Info-Santé, the health advice helpline. It is used to support rapid implementation of prevention and management measures during extreme heat. SUPREME also includes Géoportail, a mapping platform that presents spatial data on risks, vulnerable sectors and factors that can influence the impact of extreme heat on human health.

## Box 17 contd

Data useful for emergency planning – including the location of clinical services (such as hospitals and clinics, emergency rooms and drugstores) – are also provided *(19,20)*.

In the United States, the Centers for Disease Control and Prevention uses the Heat & Health Tracker, launched in 2021, to support heat–health surveillance and public health action during extreme heat events. The Tracker includes syndromic data from the National Syndromic Surveillance Program showing the rate of emergency department visits associated with heat-related illness per 100 000 emergency department visits, by U.S. Department of Health and Human Services region and by selected day or week. These near-real-time data, contributed by state and local health departments, are used to support situational awareness, public health messaging and local preparedness and response during periods of extreme heat *(15)*.

### 7.5.1 Surveillance of morbidity, syndromic activity and use of health services

Used together, morbidity, syndromic and health service use indicators can help to identify emerging health impacts, rising service demand and pressures on health systems while a heat event is ongoing. Commonly monitored morbidity, syndromic and health service use indicators include:

- emergency department visits, including visits for heat exhaustion, dehydration and heatstroke;
- hospital admissions for diagnosed or coded outcomes – particularly for cardiovascular and respiratory conditions, heatstroke or dehydration;
- ambulance dispatches and medical helpline calls, which may provide early signals of rising heat-related illness and service demand; and
- GP or primary care consultations for heat-related symptoms.

Morbidity indicators often provide earlier signals of heat-related health impacts than mortality indicators; they are therefore important for operational surveillance during heat events. They may include diagnosed or coded health outcomes that can be related heat, such as cardiovascular or respiratory conditions, heatstroke or dehydration.

Many surveillance systems use syndromic indicators (early clinical or pre-diagnostic information) and indicators of health service use, which can provide rapid signals before full diagnostic confirmation becomes available. Syndromic indicators capture early symptoms or complaints, while indicators of health service use reflect occupancy and use of health services during an extreme heat event.

Syndromic indicators may include symptoms or complaints presented at emergency department visits, triage notes, call centre records and, in some settings, provisional diagnoses or coded conditions recorded in routine health service data. Depending on the data source, they may also include conditions that are later confirmed through laboratory testing, such as electrolyte

disturbances identified in hospital records *(10,21)*. Types of syndromic surveillance indicators relevant to heat include:

- symptoms of heat exhaustion such as fatigue, dizziness and fainting
- dehydration and electrolyte imbalance
- respiratory distress
- cardiovascular complaints
- heatstroke symptoms such as confusion and loss of consciousness.

As syndromic surveillance can identify abnormal trends in real time, it is particularly useful during extreme heat events. It provides timely signals, allowing authorities to detect emerging health effects and support rapid public health action – such as reinforcing risk communication, expanding outreach to populations at increased risk of threats to health from extreme heat, and alerting health and social care services to rising demand.

Table 6 provides examples of health service data sources and diagnostic categories used to monitor or evaluate heat-related morbidity in the WHO European Region.

In addition to functioning as a dedicated component of HHAPs, heat–health surveillance should, where feasible, build on routine health information systems rather than operate in isolation. In practice, this means using existing health data infrastructures to identify relevant heat-related indicators, monitor trends in outcomes and service demand, and help identify population groups and areas with increased vulnerability. Population health management approaches may also make use of heat-related indicators and exposure information to support more targeted and proactive prevention and care. Integrating heat-related indicators into routine systems can strengthen continuity, reduce duplication and support more coordinated public health action before, during and after periods of extreme heat (28) (see also Core element 3 – Populations at increased risk; and Core element 5 – Health system resilience).

## Table 6. Health service data sources and diagnostic categories used to monitor and/or evaluate heat-related morbidity by countries in the WHO European Region

| Data source by health service | Diagnostic categories | References to national examples |
|---|---|---|
| Emergency room visits | • All causes<br>• Selected ICD-10 codes: heat-related conditions such as heatstroke and heat exhaustion (T67), dehydration (E86), and electrolyte imbalance including hyponatraemia (E87.1) as a primary or secondary cause of diagnosis | France: National Public Health Agency of France [Santé publique France] *(22)*; Pascal et al. *(10)*<br>Greece: European Climate and Health Observatory *(5)*<br>Italy: Ministry of Health [Ministero della Salute] *(23)*<br>North Macedonia: Institute for Public Health [Институт за јавно здравје] *(24)*<br>Portugal: Directorate-General of Health [Direção-Geral da Saúde] *(25)*<br>Spain: Ministry of Health [Ministerio de Sanidad] *(26)*<br>England, United Kingdom: UK Health Security Agency *(27)* |
| GP consultations | • All causes<br>• Selected ICD-10 codes: heat-related conditions such as cardiovascular diseases (I00–I99), heat stroke (T67), dehydration (E86) | Albania: European Climate and Health Observatory *(5)*<br>France: Pascal et al. *(10)*<br>Italy: Ministry of Health [Ministero della Salute] *(23)*<br>Portugal: Directorate-General of Health [Direção-Geral da Saúde] *(25)*<br>Spain: Ministry of Health [Ministerio de Sanidad] *(26)*<br>England, United Kingdom: UK Health Security Agency *(27)* |
| Ambulance calls | • All causes<br>• Selected ICD-10 codes: heat-related conditions such as cardiovascular diseases (I00–I99) | Albania, Greece, Hungary, Malta and Spain: European Climate and Health Observatory *(5)*<br>Portugal: Directorate-General of Health [Direção-Geral da Saúde] *(25)* |
| Medical helpline calls | • All causes | Italy: Ministry of Health [Ministero della Salute] *(23)*<br>Portugal: Directorate-General of Health [Direção-Geral da Saúde] *(25)*<br>England, United Kingdom: UK Health Security Agency *(27)* |
| Hospital admissions | • All causes | Greece, Malta and Spain: European Climate and Health Observatory *(5)*<br>Portugal: Directorate-General of Health [Direção-Geral da Saúde] *(25)* |

*Note:* different revisions of the ICD are used across the cited literature and source documents. ICD codes are reproduced here as reported in the original sources.

### 7.5.2 Surveillance of mortality

Mortality surveillance is a central component of many heat–health surveillance systems because it helps to quantify the overall health burden associated with extreme heat. Types of mortality surveillance include:

- all-cause mortality, which is often the most robust and widely available indicator for detecting excess deaths during heat events – a timely indicator that can support near-real-time surveillance in some settings;
- cause-specific mortality, focusing on cardiovascular, respiratory and renal diseases, which are known to be sensitive to heat; and
- age-specific mortality – with particular attention to older populations (aged 65 years and over) and infants, who are particularly at increased risk of heat-related harm during extreme heat.

In practice, most systems use all-cause mortality rather than only heat-specific causes of death. This is because heat-related deaths are often not recorded explicitly as caused by heat on death certificates. Instead, heat frequently contributes to or exacerbates other conditions – particularly cardiovascular, respiratory and renal diseases – leading to an increase in the total number of deaths during periods of extreme heat (see also Core element 3 – Populations at increased risk). For this reason, heat-related mortality is commonly assessed through excess mortality, defined as the difference between the observed number of deaths during an extreme heat event – or across the entire summer season – and the number expected for the same period based on modelled baseline mortality, accounting for seasonality, long-term trends and temporal variability *(1,5)*.

Mortality surveillance findings can be used to support several functions within HHAPs. During heat events, they may contribute to situational awareness where timely reporting is available. After the event, they are particularly important for evaluating the magnitude of impact, reviewing whether warning thresholds and response arrangements were appropriate, and refining future prevention and preparedness measures. Mortality data can also help identify longer-term trends in heat-related risk and vulnerability *(5)*.

Mortality surveillance is particularly valuable because it provides a robust measure of the overall health burden associated with extreme heat. Although mortality data are often less timely than syndromic or health service use indicators, they are essential for confirming the severity of impacts, identifying affected age groups or areas, and assessing whether a heat event resulted in excess deaths beyond expected seasonal patterns. In some settings, rapid mortality monitoring systems can also support near-real-time situational awareness during prolonged or severe heat events *(5,29)*. Several European countries participate in a shared platform for rapid mortality surveillance that monitors the health impacts of extreme heat events at a supranational level (Box 18).

### Box 18. The European mortality monitoring (EuroMOMO) network

The EuroMOMO network performs pooled real-time monitoring of all-cause mortality across 27 participating European countries and regions. During the summer period, the system is utilized as a core component of heat–health surveillance to detect excess deaths that may be attributed to high ambient temperatures. The methodology relies on a standardized mathematical model applied to weekly death counts provided by national statistical offices and departments of health. The primary output is the Z-score – a standardized measure of the deviation of observed mortality from the established baseline (expected deaths). This facilitates comparison of heat impacts across different geographical areas and age groups, specifically focusing on the populations aged 65 years and over and 85 years and over, who exhibit the highest vulnerability. The network provides weekly bulletins that integrate meteorological triggers with mortality peaks, enabling a rapid assessment of the public health burden of extreme heat at a supranational scale before official consolidated cause-of-death data become available *(30)*.

## 7.6 Complementary and contextual indicators for heat–health surveillance

In addition to core indicators such as mortality, morbidity, syndromic activity and health service use, heat–health surveillance may also draw on complementary and contextual indicators to strengthen situational awareness, interpretation of impacts and longer-term prevention planning. These indicators can enrich heat–health surveillance by helping authorities interpret observed impacts more completely and provide useful supplementary information on population responses, system pressures, behavioural adaptation and contextual drivers of risk. Their relevance and feasibility will vary by setting, data availability and surveillance purpose.

Large and rapidly generated digital and other data sources (Big Data) – such as social media activity, web search trends, mobile or platform-based data and wearable-device data – offer significant potential to complement traditional surveillance by providing rapid, real-time insights into population health behaviours and responses and system stressors during extreme heat events. For example, increases in online searches for heatstroke, dehydration or cooling advice, or spikes in social media posts about difficulty coping with heat, may provide additional insight into emerging stress in the population. Big Data may strengthen the situational awareness of public health systems during extreme heat events and support communication, preparedness and response, but they should be interpreted cautiously and used as a complement to, rather than a substitute for, established health surveillance systems *(31,32)*.

In settings where conventional health surveillance is delayed or under-resourced, or where there is no established syndromic surveillance system, selected digital data streams may provide a useful additional source of rapid information. When integrated with meteorological alerts, Big Data analytics can provide near-real-time situational awareness, supporting early warnings and targeted communication. However, issues related to data privacy, validation, representativeness and equitable access require careful consideration for responsible use in practice *(33)*.

Beyond health outcome indicators, other retrospective proxy indicators such as productivity loss, sickness leave data *(34)* or health insurance cost data *(35)* could also represent relevant sources for improving heat–health surveillance, even if data are only available retrospectively. While they are not suitable for real-time operational surveillance, they may help to quantify the broader burden of heat, support economic analysis, and strengthen the case for prevention and adaptation measures *(36)*.

Surveillance can also offer insights into how populations adapt to heat risks. Behavioural indicators could also provide useful information on how populations respond to heat risks. Depending on the context and available tools, this may include repeated surveys or other data collections on awareness of heat-related risks, access to cooling, and self-reported protective behaviours such as fluid intake, use of cooler spaces and avoidance of physical exertion during hot periods. These data are generally more suitable for evaluation, communication planning and targeted interventions than for real-time operational surveillance *(37,38)*. Such information can support longer-term preparedness and prevention planning for future extreme heat events.

Contextual vulnerability indicators may also strengthen heat–health surveillance and help to guide prevention. These may include indicators of energy poverty or energy insecurity, which can provide insight into whether people are able to keep indoor environments cool during periods of extreme heat. Information on occupational exposure and, where feasible, the likely setting of exposure – such as the home, workplace, outdoor recreational settings or care institutions – can also help authorities interpret surveillance findings and can inform more targeted interventions. Although these factors are not always captured in routine surveillance data, they are important for understanding patterns of risk and for designing effective prevention and response measures (see also Core element 6 – Reducing heat exposure).

## 7.7 Monitoring, evaluation and learning for improving heat–health surveillance

Monitoring, evaluation and learning help to ensure that heat–health surveillance remains functional, useful and responsive within the HHAP. Together, they show whether the surveillance system is operating as intended, supporting decision-making during heat events and improvements to the system over time. Review arrangements should be coordinated by the responsible public health or other authority managing the heat–health surveillance system, in collaboration with all relevant institutions – including regional and local actors involved in data collection, analysis and use (see also Core element 8 – Monitoring, evaluation and learning). Monitoring, evaluation and learning should be adapted to the design and purpose of the surveillance system in place, and aligned with existing HHAP and health information system review processes (see also Core element 5 – Health system resilience).

Monitoring focuses on the routine tracking of the functioning of the surveillance system, including data collection, reporting, integration and use. Key monitoring questions include:

- Are surveillance data being collected, analysed and reported on time?
- Are surveillance outputs (such as dashboards, situation reports and alerts) being produced and shared with the actors who need them?

- Are the main surveillance indicators available to support decision-making during heat events?

Monitoring indicators may include availability of the agreed core data streams; timeliness of data reporting; proportion of surveillance indicators reported according to agreed frequency; production of agreed outputs, such as bulletins, dashboards or situation reports; and existence of data-sharing agreements and interoperability mechanisms across sectors and levels.

Evaluation provides a structured assessment of how effectively the surveillance system supports heat–health action. It examines whether the system is fit for purpose, including its ability to detect health impacts, support decision-making and integrate multiple data sources. Key evaluation questions include:

- Does the surveillance system provide timely and accurate information to support decision-making and response during and after heat events?
- Do the selected indicators adequately capture observed health impacts and pressures on health services?
- Are surveillance findings used to adapt health and social care sector responses during heat events and to improve preparedness and response planning afterwards?

Evaluation indicators may include timeliness and completeness of the main indicators used in the system; number or proportion of decisions, actions or reports that explicitly reference surveillance findings; and number of system gaps identified and documented during evaluation (such as delays, missing data, limited coverage or integration issues).

Learning ensures that findings from surveillance monitoring and evaluation are turned into practical improvements before the next heat season. Key learning questions include:

- What worked well, and what did not, during the heat season or a major event?
- What changes and improvements are needed in data collection, integration, analysis or reporting?
- What improvements are feasible before the next heat season?

Learning indicators may include the number of agreed improvement actions arising from seasonal or post-event reviews for indicators, data sources or reporting processes for surveillance design; and the proportion of agreed changes implemented before the next heat season, along with updates to surveillance protocols, data-sharing arrangements and analytical methods.

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# Core element 8 – Monitoring, evaluation and learning

**The aim of this core element is to establish a process for review and improvement.**

## Key messages

- Monitoring, evaluation and learning form a cross-cutting function among core elements that supports review, accountability, continuous improvement and adaptive management of each core element, and assesses whether the HHAP works as an integrated system.
- Monitoring tracks whether planned HHAP measures are implemented and functioning as intended. Evaluation assesses effectiveness, equity, efficiency, gaps and unintended effects. Learning ensures that findings are used to improve the HHAP before the next heat season.
- A balanced set of structure, process and outcome indicators helps authorities assess capacities, implementation and results. Clear responsibilities, data flows and reporting arrangements across governance levels are essential for effective use of findings from the monitoring, evaluation and learning process.
- Regular simulation exercises, after-action reviews and feedback loops help to test whether HHAP arrangements work in practice, identify gaps and inform revisions to warning thresholds, response protocols, coordination mechanisms, communication approaches and resource allocation, before the next heat season.
- Monitoring, evaluation and learning should be proportionate to available capacity and feasible in both high- and low-resource settings, while still supporting equity, transparency and continuous improvement.

## Core element output

The core element output is a functional monitoring, evaluation and learning framework that supports systematic review, accountability and continuous improvement of the HHAP.

## Steps to implement the core element

The following steps collectively support the development of an operational monitoring, evaluation and learning framework within the HHAP. It is important to:

- define the purpose, scope and priority questions of the monitoring, evaluation and learning framework, which should be aligned with HHAP objectives and core elements;
- select a limited, balanced and feasible set of structure, process and outcome indicators, including indicators that can assess equity and reach populations at increased risk of threats to health from extreme heat;
- assign responsibilities for data collection, analysis, reporting, review and follow-up across national, regional and local levels;
- establish practical data flows, reporting timelines and review mechanisms across the HHAP cycle;
- integrate monitoring, evaluation and learning activities into pre-season planning, early-season checks, in-season monitoring, mid-season or post-event review, post-season evaluation and learning before the next HHAP cycle;
- organize simulation exercises, operational testing and after-action review to test coordination, decision-making, communication flows, response activation and operational readiness; and
- analyse monitoring and evaluation data, and produce regular reports to inform HHAP actors, supporting transparency and accountability.

## 8.1 Introduction

A framework for monitoring, evaluation and learning is an integral component of heat–health action planning. It supports HHAP design, implementation and review by providing a structured basis for tracking progress, assessing performance, informing revision and strengthening accountability.

> **Governance considerations**
>
> In addition to monitoring, evaluation and learning activities carried out within an HHAP at the national, regional or local level, national HHAPs may develop and recommend a common set of indicators to guide monitoring, evaluation and learning efforts across all levels.
>
> Coordinated reporting mechanisms between levels can support systematic collection and analysis of data, enabling a comprehensive assessment of effectiveness of heat–health action.

Within this guidance, monitoring, evaluation and learning are treated as a cross-cutting function of an HHAP. Therefore, each of the preceding core elements 1–7 includes a dedicated subsection that identifies element-specific key questions and indicators relevant to monitoring, evaluation and learning. This chapter brings together those core element-specific considerations, and explains how they can be organized into a coherent framework, reflecting its role in supporting continuous improvement of an HHAP. Monitoring, evaluation and learning help authorities ensure that actions remain responsive to extreme heat events, changing climate conditions, evolving patterns of vulnerability and institutional capacities. In this context, they refer to a continuous, evidence-based cycle that underpins adaptive management within HHAPs *(1,2,3)*.

This chapter explains the purpose of monitoring, evaluation and learning. It provides an overview of the main components of the framework within an HHAP and how these functions can be applied across national, subnational and local levels of governance *(1,2)*.

## 8.2 The purpose of monitoring, evaluation and learning within the HHAP

Monitoring, evaluation and learning remain underdeveloped in many HHAPs. A review of 65 extreme heat adaptation plans in the United States, for example, found that although more than half included evaluation components, fewer than 30% produced follow-up reports. The review also identified misalignment between stated objectives, indicators and reporting practices, highlighting the need for more robust and context-sensitive monitoring, evaluation and learning processes *(4)*.

These findings underline the importance of embedding monitoring, evaluation and learning into an HHAP from the outset, with clear responsibilities, reporting arrangements and feedback loops

that enable findings to be used in the next HHAP cycle. The aim is to assess how different core elements function together effectively as an integrated system.

Monitoring focuses on the routine tracking of HHAP implementation and the functioning of core elements as an integrated system throughout the heat season. It involves systematic collection of quantitative and qualitative data on key indicators to provide continuous information on whether planned measures are being implemented, and whether systems are functioning as intended. Monitoring addresses practical implementation questions such as:

- Were warnings issued on time?
- Were response measures activated in a timely manner?
- Were health and social care services ready to take action?
- Did outreach activities reach both the general public and populations at increased risk of threats to health from extreme heat?

Were data reported completely and on time?

Evaluation builds on this information to provide a structured assessment of the relevance, effectiveness, efficiency, equity dimensions and overall performance of the HHAP as an integrated system in terms of achieving the intended outcomes. Evaluation points to areas for improvement by asking broader performance questions, such as:

- Did the HHAP reduce heat-related morbidity and mortality?
- Were resources used efficiently?
- Were benefits distributed equitably or were there differences in outcomes across geographical areas or population groups?
- Were there any practical barriers, implementation gaps or coordination weaknesses?
- Did any unintended effects occur?

Learning is a reflective process that ensures that findings from monitoring and evaluation are used systematically to improve HHAP performance across core elements over time *(1–3,5–7)*. Learning promotes knowledge exchange both within and across governance levels, ensures that the HHAP evolves in response implementation experience, and informs practical improvements in coordination mechanisms and operational practice. This may, for example, trigger revisions to indicators, warning thresholds, communication approaches, coordination mechanisms, resource allocation before the next heat season or targeted actions for populations at increased risk of heat-related harm.

In the context of the HHAP, monitoring, evaluation and learning serve several complementary purposes. They help to *(1,3–5,8)*:

- strengthen accountability and transparency by defining clear indicators, responsibilities and reporting arrangements, allowing implementation and results to be tracked across HHAP actors and levels of governance;
- assess effectiveness by examining whether the HHAP as a whole – and key interventions such as warning dissemination, outreach to populations at increased risk, activation of

cooling spaces and health service preparedness – are reducing heat-related health risks and functioning as intended;

- ensure that HHAPs are equitable by appraising the ethics of measures introduced and their impact on increasing equity;
- identify gaps and unintended effects by detecting, for example, delivery bottlenecks, populations not reached, inequitable impacts, public mistrust or alert thresholds that are not well adapted to the local context;
- facilitate continuous learning by the institutions and people involved, and support adaptive management by using findings, for example, to revise alert thresholds, communication approaches, intervention packages, coordination mechanisms and resource allocation before the next heat season;
- inform resource allocation by showing where investment is most needed and, where feasible, using cost–benefit or cost–effectiveness analysis to compare the costs of HHAP actions with their health and economic benefits;
- build public trust through transparent reporting on HHAP performance and evidence-informed improvements; and
- support long-term sustainability by embedding monitoring, evaluation and learning responsibilities into institutional mandates, routine planning cycles and regular feedback loops.

HHAPs operate in dynamic contexts. Climate conditions, population vulnerabilities, institutional capacities and patterns of exposure evolve over time. A plan that is not regularly reviewed may become misaligned with emerging evidence, shifting local climate risks, operational realities or changing needs of populations at increased risk. Monitoring, evaluation and learning therefore support adaptive management by linking data collection, analysis, review and decision-making across governance levels *(1–3,6,8)*.

For monitoring, evaluation and learning to be meaningful and sustainable, from the start of HHAP development, responsibilities need to be defined, partnerships for data and knowledge exchange established, and period reviews undertaken to confirm whether responsibilities, data flows and reporting arrangements remain fit for purpose.

## 8.3 Indicator framework for monitoring, evaluation and learning

A monitoring, evaluation and learning framework should be built around a limited, balanced and context-relevant set of indicators. These should be linked to the objectives of the HHAP and its core elements, and it should be possible to collect and use them in the light of available data systems and institutional capacity *(1–3,7)*.

Indicators can be organized into three broad categories: structure, process and outcome indicators. This typology helps to ensure that the framework captures not only final health outcomes but also the institutional capacities and implementation steps required to achieve them *(2,7)*.

- Structure indicators assess whether the institutional, organizational and technical capacities needed to implement the HHAP are in place. These may include indicators relating to governance arrangements, data-sharing mechanisms, weather forecasting services, health service readiness, epidemiological surveillance, communication systems, financing mechanisms and relevant physical infrastructure.
- Process indicators assess implementation, including the timeliness of warnings, activation of response measures, training and preparedness activities, targeted actions for populations at increased risk of threats to health from extreme heat, outreach activities, public awareness campaigns and access to cooling spaces.
- Outcome indicators assess the effects of interventions, including changes in heat-related illness and deaths, health service use, public awareness, behavioural change and, where feasible, economic aspects.

The chosen set of indicators should be proportionate to the available capacity. In settings with limited capacity, a small number of priority indicators may suffice. At a minimum, arrangements should be in place to ensure that indicators are compiled regularly, clearly assigned to data owners and reviewed at least once at the end of the season. A mechanism should also be in place to feed lessons into the next HHAP cycle. These arrangements can be expanded and refined as data availability, institutional capacity and evidence evolve. More advanced systems may include real-time dashboards, disaggregated equity analysis, formal evaluation protocols and cost–effectiveness analysis *(3,7,8)*.

Monitoring, evaluation and learning processes have a synthesis function across the HHAP (Fig. 7). They bring together evidence from all core elements to assess whether the plan functions as an integrated system and to inform review and revision.

## Fig. 7. Monitoring, evaluation and learning as a synthesis function across HHAP core elements

## 8.4 Operationalizing monitoring, evaluation and learning within HHAPs

For monitoring, evaluation and learning to function effectively within HHAPs, clear institutional arrangements, defined responsibilities and feasible processes for data collection, analysis and use need to be in place. By embedding it into every core element and every stage of an HHAP – from seasonal planning and preparedness to post-event reviews – authorities can ensure that heat – health interventions remain evidence-based, context-sensitive, up to date and accountable to the communities they serve.

At the national level, the HHAP lead body will typically establish the overall monitoring, evaluation and learning framework. This includes defining a core set of indicators, setting reporting requirements, coordinating data collection and sharing across sectors and levels, consolidating incoming information, and convening or supporting cross-sector review to ensure that findings inform national policy, planning and resource allocation.

At the regional level, relevant authorities can adapt the framework to their context; consolidate, analyse and interpret data from regional and local actors; and support coordination between national and local levels. They can also identify regional differences in performance, capacity and vulnerability, and can facilitate targeted improvements.

At the local level, implementing actors – including public health authorities, health and social care services, municipalities and community partners – will typically monitor the delivery of HHAP measures in practice. This includes tracking warning dissemination, health and social service readiness and response, outreach to populations at increased risk of threats to health from extreme heat, and health impacts. In addition, implementing actors can gather feedback from implementation experience, including from front-line staff and communities, and engage with community forums to provide updates on local heat–health action

Table 7 provides an example of how monitoring, evaluation and learning activities can be organized across the HHAP cycle and distributed across national, regional and local levels of governance. The timing, responsibilities and reporting arrangements should be adapted to the country context, governance structure, available capacities and scale of heat-related risks.

In settings with limited resources, monitoring, evaluation and learning may rely on simplified methods, including using routine service data, rapid checklists, community feedback and post-season review meetings. The priority should be to ensure clear responsibilities, basic reporting arrangements and regular use of findings to support practical improvements before the next heat season *(3,7,8,9)*.

### Table 7. Examples of monitoring, evaluation and learning activities across the HHAP cycle

| Stage and timing | Key monitoring, evaluation and learning activities and outputs |
|---|---|
| Pre-season planning (before the heat season) | • Defining monitoring, evaluation and learning objectives and priority indicators aligned with HHAP goals<br>• Reviewing data availability and gaps, confirming data sources, and agreeing on data collection tasks and responsibilities<br>• Compiling baseline information from existing sources, such as off-season health and environmental indicators<br>• Establishing reporting timelines and coordination mechanisms<br>• Conducting simulation exercises, including after-action review (see section 8.5) |
| Early-season monitoring (at the start of the heat season) | • Undertaking community baseline surveys to improve understanding of public knowledge about the risks of extreme heat to health and protective behaviours – in particular among populations at increased risk of heat-related harm<br>• Verifying that reporting arrangements and data flows are functioning across governance levels<br>• Confirming channels for sharing monitoring information across actors |
| Heat season monitoring (during extreme heat events and throughout the heat season) | • Monitoring implementation of agreed HHAP measures and identifying issues requiring coordination or guidance<br>• Conducting operational testing (see section 8.5)<br>• Tracking health outcomes and health service use (see also Core element 7 – Heat–health surveillance)<br>• Tracking intervention process metrics such as recording times and reach of warnings sent, tallying cooling centre activations and occupancy, and home visits to people at increased risk<br>• Tracking timeliness and completeness of reporting<br>• Reviewing intervention coverage and reach<br>• Identifying emerging gaps or populations not being reached |
| Mid-season evaluation (mid-season or after a significant heat event) | • Conducting rapid reviews of implementation and coordination, supported by interviews with key actors<br>• Assessing early evidence on effectiveness and implementation bottlenecks, such as communication delays and logistical challenges<br>• Identifying operational challenges<br>• Agreeing and implementing immediate corrective actions where needed |

**Table 7 contd**

| Stage and timing | Key monitoring, evaluation and learning activities and outputs |
|---|---|
| Post-season evaluation (after the heat season) | • Quantifying adverse health outcomes of extreme heat, including excess deaths<br>• Comparing morbidity and mortality outcomes with historical baselines, where feasible<br>• Collecting qualitative feedback from communities and front-line actors<br>• Analysing data to assess the overall effectiveness and efficiency of the HHAP<br>• Assessing equity patterns by disaggregating outcomes by socioeconomic status, age and geography to detect disparities and assess whether populations at increased risk have been reached<br>• Undertaking cost–benefit or cost–effectiveness analyses of interventions<br>• Identifying strengths, gaps and unintended effects<br>• Holding stakeholder review meetings to validate findings |
| Learning and adaptation (before the next HHAP cycle) | • Producing a consolidated monitoring, evaluation and learning report, highlighting lessons learned and recommended adjustments<br>• Translating recommendations into HHAP updates such as thresholds, strategies, coordination mechanisms and resource allocation<br>• Sharing findings with stakeholders and communities |

## 8.5 Simulation exercises, operational testing and after-action review

Simulation exercises, operational testing and after-action reviews complement routine monitoring and formal evaluation and are important mechanisms for testing whether planned arrangements work in practice under realistic conditions.

Simulation exercises can be used before the heat season, or at regular intervals, to test and assess key components of the HHAP. These may include activation of heat–health warning systems, communication flows, decision-making processes, and coordination across sectors and levels of governance. They may also include implementation of response measures such as outreach to populations at increased risk of threats to health from extreme heat, and activation of cooling spaces and health system surge capacity. Exercises can take different forms, including tabletop simulations, scenario-based discussions and full-scale operational drills, depending on the available resources and context *(3,5,10)*.

Operational testing during the heat season complements simulation exercises by assessing how systems perform in real conditions. Warning dissemination channels, reporting arrangements, cooling space activation procedures, helplines, outreach systems and health service escalation protocols can all be tested. Real-time or near-real-time monitoring can support timely adjustments to ongoing response measures *(3,10)*.

After-action reviews should be conducted following simulation exercises and significant heat events. These reviews bring together relevant actors and stakeholders to reflect on what worked well, what challenges were encountered, and what improvements are needed. They should consider coordination across agencies, clarity of roles and responsibilities, communication effectiveness, data availability and use, and the equity and reach of interventions *(3,5,10)*.

Findings from simulation exercises, operational testing and after-action reviews should be systematically documented and fed into the monitoring, evaluation and learning cycle. Where appropriate, lessons learned should be shared across governance levels and with relevant stakeholders to support continuous improvement of HHAPs.

Box 19 illustrates how simulation exercises and scenario-based evaluations can be used within monitoring, evaluation and learning to test whether HHAP arrangements are sufficient for more extreme future heat events, identify coordination gaps before a crisis occurs, and translate lessons into preparedness and planning improvements.

## Box 19. Scenario analysis for extreme heat preparedness in the Netherlands (Kingdom of the)

In the Netherlands (Kingdom of the), in the context of the 2024–2025 evaluation of the Dutch National Heatwave Plan, the National Institute for Public Health and the Environment developed a "code red" extreme heat scenario to test national preparedness for a realistic but severe heat event. The scenario combined elements of the extremely dry summer of 2018 and the record-breaking heat of 2019, when temperatures in the country exceeded 40 °C for the first time. It assumed activation of the National Heatwave Plan and described a prolonged heat episode with simultaneous cascading impacts, including high indoor temperatures, pressure on health services, heat-related illness in care settings and recreational areas, water-system stress, vegetation fire risk, transport pressures and reduced emergency service capacity. The scenario was discussed in a workshop with experts and stakeholders from the national, regional and local levels. Participants examined whether the country would be ready for such a code red heat situation, what objectives should guide action during extreme heat, how roles and responsibilities should be divided, and whether national and regional HHAPs should complement each other in preparing for more severe events.

The exercise identified several preparedness gaps. These included the absence of clear criteria for issuing a code red for heat; a lack of agreement on national objectives for extreme heat preparedness; uncertainty over the division of roles between municipalities, safety regions (administrative regions responsible for coordinating emergency response across municipalities), public health services and ministries; and concern that standard crisis-response measures might not be suitable for heat.

The scenario analysis generated practical recommendations, including developing measurable guidelines for code red heat warnings, agreeing common objectives across governance levels, incorporating heat into national and regional crisis plans, clarifying when regional issues require national support, preparing targeted communication for different groups, considering escalation of communication from local to regional and national levels, and improving buildings and public spaces to reduce heat impacts (9,10).

# References[11]


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[11] All references were accessed 30 April 2026.

# Part 2.

## User action briefs

# Introduction

The user action briefs support implementation of the eight HHAP core elements. They offer practical, implementation-oriented action guidance for diverse audiences – including authorities, practitioners, managers, front-line workers and community leaders – on protecting people from the health impacts of extreme heat, including through their engagement in HHAP development and implementation. The briefs are informed by evidence and real-world implementation practice, offering structured support for planning and response.

The user action briefs span five key spheres:

- health domain (User action brief 1)
- occupational domain (User action brief 2)
- urban and built environment domain (User action brief 3)
- social care domain (User action brief 4)
- education and childcare domain (User action brief 5).

Each user action brief is designed to be read on its own; its format means that users can consult it to identify relevant actions before the summer or hot season, during an extreme heat event and when launching a new heat–health initiative. Users are encouraged to read the briefs together with the corresponding core elements in Part 1, which provide the conceptual foundation, evidence base and more detailed guidance that inform the actions proposed in the user action briefs. To avoid duplication, the references underpinning the actions are provided in Part 1 but not repeated here; however, selected key resources are listed at the beginning of each user action brief.

# Guiding principles

- The user action briefs are comprehensive yet flexible, presenting a wide range of possible actions. Each proposed action is not meant to be prescriptive but requires contextual adaptation. Users are encouraged to adjust actions based on the specific local context, priorities and needs – such as local climate, governance structures, available resources and institutional capacities, infrastructure, and population vulnerabilities. This includes specific consideration of seasonal versus all-year-round extreme heat exposure, and of integrating equity and inclusion throughout.
- Actions are audience-specific and are aligned with the four stages of heat–health action: planning and preparedness; monitoring and early action; emergency response; and evaluation and improvement. They are grouped by user type and by the timing of interventions to support both proactive planning and response.
- Some actions may represent aspirational goals and long-term vision, especially in resource-constrained settings. These are included to inspire long-term planning and investment, and to serve as benchmarks for future development and collaboration. However, it is important to get started. Stakeholders are therefore encouraged to prioritize the actions that will have the greatest impact and are most feasible as a starting-point: in resource-constrained settings, stakeholders are encouraged to prioritize a small set of no-regret low-cost actions.

## Structure of the briefs

Each user action brief follows the same structure, containing:

- a short contextual paragraph;
- a section on who should read this brief, identifying target audiences;
- an outline of what is presented in the brief, explaining the overall layout and the key cross-references to core elements in Part 1; and
- a list of key resources.

These sections are followed by a series of action boxes, organized by each audience and by the four stages of heat–health action:

- planning and preparedness (ongoing and before the summer or hot season), focusing on long- and medium-term activities that build capacity and readiness;
- monitoring and early action (during the summer or hot season), focusing on surveillance and activation of routine preventive measures;
- emergency response (during extreme heat events), focusing on intensified actions triggered by heat–health alerts; and
- evaluation and improvement (after extreme heat events and at the end of the season), focusing on review of the response, lessons learned and adjustments for future cycles.

# User action brief 1 – Health domain

## Context

Extreme heat is placing increasing pressure on health services, and is worsening health outcomes for people with chronic conditions, older adults, children, pregnant people, outdoor and indoor workers, and other groups at increased risk of threats to health from extreme heat. Heat directly causes heat exhaustion, heatstroke, dehydration and acute kidney injury. It also exacerbates cardiovascular, respiratory, renal and mental health conditions, with excess emergency department visits, hospital admissions and mortality occurring on the same day and in the days that follow extreme heat exposure. Heat can also disrupt the delivery of care itself – through power outages, equipment failures, compromised medication storage and reduced workforce capacity – making the protection of patients, staff and continuity of services a central concern. The health sector plays a central role in HHAPs, both as a leader of governance and surveillance and as a provider of preventive, curative and emergency services during the summer or hot season. This user action brief sets out practical actions that health sector actors can take to protect communities, patients and the workforce from extreme heat. Measures related to occupational heat exposure of the health workforce are addressed in User action brief 2 – Occupational domain; these can be adapted to health sector settings.

## Who should read this

This user action brief is intended for actors within the health domain – those whose primary role is to protect and improve health by delivering, supporting or governing health services across the public, private and informal sectors.

- It supports health authorities at the national, regional and local levels when they need to set priorities, allocate resources, coordinate across departments and sectors, and translate national or regional guidelines into operational action.
- It informs public health practitioners about tracking heat-related outcomes, assessing community vulnerabilities, designing communication plans, training partners and supporting local prevention efforts.
- It assists health facility managers in ensuring operational implementation of measures within their facilities – making sure that primary health facilities, hospitals and clinics are ready, managing supplies, safeguarding patients and staff, checking infrastructure, running drills, and training teams.
- It helps front-line health workers (including GPs, nurses, paramedics, community health workers and pharmacists) provide direct care, identify heat-related risks, educate patients, follow clinical protocols and report cases.

## What is presented in this brief

This user action brief presents suggested actions for each audience group, organized according to the four key stages of heat–health action: planning and preparedness (ongoing and before the summer or hot season); monitoring and early action (during the summer or hot season); emergency response (during extreme heat events); and evaluation and improvement (after extreme heat events and at the end of the season).

The action boxes in this user action brief are organized according to the various actors within the health domain. Boxes UAB1.1–UAB1.4 present suggested actions for health authorities; boxes UAB1.5–UAB1.8 present suggested actions for public health practitioners; boxes UAB1.9–UAB1.12 present suggested actions for health facility managers; and boxes UAB1.13–UAB1.16 present suggested actions for front-line health workers, including physicians, nurses, midwives, care assistants, informal carers, physiotherapists and social workers.

This brief can be read on its own, but readers are encouraged to consult it alongside the core elements in Part 1 of this guidance, in particular Core element 1 – Governance, Core element 3 – Populations at increased risk, Core element 4 – Communication, Core element 5 – Health system resilience and Core element 7 – Heat–health surveillance. The public health message bank in Part 3 supports communication efforts by actors in the health domain. For more details on actions to manage combined exposure to extreme heat and vegetation fires, see Annex 1.

## Key resources[12]


Bundesempfehlung: Musterhitzeschutzplan für Krankenhäuser [Model heat protection plan for hospitals]. Bonn: Bundesministerium für Gesundheit; 2024 (https://www.bundesgesundheitsministerium.de/presse/pressemitteilungen/lauterbach-legt-hitzeschutzplaene-vor-pm-24-05-24.html) (in German).

Checklists to assess vulnerabilities in health care facilities in the context of climate change. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/340656). Licence: CC BY-NC-SA 3.0 IGO.

Climate change and health: vulnerability and adaptation assessment. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/345968). Licence: CC BY-NC-SA 3.0 IGO.

Heat stroke in adults [website]. BMJ Publishing; 2025 (https://bestpractice.bmj.com/topics/en-gb/849).

Musterhitzeschutzplan für den Rettungsdienst [Model heat protection plan for the emergency services] Berlin: KLUG – Deutsche Allianz Klimawandel und Gesundheit; 2025 (https://www.klimawandel-gesundheit.de/neuer-musterhitzeschutzplan-fuer-den-rettungsdienst-schutz-fuer-einsatzkraefte-und-patientinnen-angesichts-zunehmender-hitzewellen/) (in German).

The synergies of heat stress and air pollution and its health impacts: technical brief. Geneva: World Health Organization; 2025 (https://doi.org/10.2471/B09369). Licence: CC BY-NC-SA 3.0 IGO.


[12] All references were accessed 1–4 May 2026.

## Actions for health authorities

PREPARING FOR THE NEXT SUMMER | HEALTH AUTHORITIES

**Box UAB1.1. Actions for health authorities in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Strategic planning | • At the national level, lead or contribute to development and funding of a baseline HHAP integrating the eight core elements defined in Part 1 of this guidance.<br>• At the local level, adapt that baseline HHAP, secure dedicated budgets and staff, and assign clear roles and responsibilities. |
| Guidance, tools and data systems | • At the national level, publish adaptable toolkits (such as vulnerability mapping protocols, cooling centre checklists and indicators) and establish and/or maintain a centralized heat–health surveillance system.<br>• At the local level, use these resources to map risks, monitor trends daily/weekly in season, and report quarterly or annually. |
| Cooling infrastructure | • Mandate the establishment of, and set minimum standards for, safe cooling centres (avoiding fire-hazard zones), and ensure fair access in communities at increased risk of threats to health from extreme heat.<br>• Define eligibility, accessibility, equity criteria, opening hours, and operation and maintenance requirements for cooling centre networks, with reporting requirements for local managers.<br>• Allocate dedicated funding lines for cooling infrastructure (such as cooling centres, shading and insulation upgrades), prioritizing high-risk and historically underserved communities. |
| Emergency preparedness | • Mandate and fund periodic joint simulation exercises – covering hospitals, utility providers, social services and groups with special needs (see also Core element 3 – Populations at increased risk) – for extreme heat events. These exercises can be local and/or national, as appropriate. |
| Capacity-building | • Fund and require training programmes for managers of health facilities, front-line workers and public health teams on recognizing and treating heat-related illness (see also Annex 3 on signs and symptoms of heat-related illness); on advising the public – and specifically populations at increased risk of heat-related harm such as older adults, chronically ill people, outdoor workers and pregnant women; on supporting populations at increased risk; and on HHAP roles and data systems. |
| Risk communication and community outreach | • Set communication standards and resources for audience-tailored messaging to ensure consistent and multilingual messages across stakeholders.<br>• Prepare messaging and coordinate multichannel, multilingual campaigns that promote preventive behaviours, direct people to cooling resources, and engage civil society partners (see also public health message bank in Part 3).<br>• Coordinate with the labour sector and local employers – guided by the local risk map – to extend protective messaging and access to cooling resources for outdoor and other workers at increased risk (see User action brief 2 – Occupational domain). |
| Multisectoral cooperation | • Establish and resource a formal coordination mechanism or platform bringing together key sectors such as the health, meteorological services, civil protection, social services, housing, urban planning, labour, water and energy sectors.<br>• Define clear roles, communication pathways and decision-making processes for heat risk management across sectors and levels of governance.<br>• Collaborate across sectors to tackle root vulnerabilities – improving homes, reducing isolation and lowering urban heat island effects. |

PREPARING FOR THE NEXT SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Accountability and equity monitoring | • Mandate regular monitoring, evaluation and learning reporting from subnational units, and synthesize national summaries to track progress.<br>• Develop and maintain registers of populations at increased risk based on age, pre-existing conditions, medication use and social isolation (see also Core element 3 – Populations at increased risk).<br>• Use equity metrics to detect unintended gaps (such as energy poverty) and reallocate resources to ensure that all populations benefit.<br>• Advocate, with finance and planning ministries, sustained investment in long-term climate and heat adaptation infrastructure (such as greening, passive cooling, energy-efficient retrofits and surveillance systems). |

DURING SUMMER

HEALTH AUTHORITIES

**Box UAB1.2. Actions for health authorities in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Staying alert and mobilizing | • Monitor official meteorological forecasts and warnings, lead the activation of the HHAP, and share alerts rapidly with all stakeholders. |
| Cross-sector coordination | • Activate coordination mechanisms across health, social services, civil protection, water and electricity providers and other non-health partners to safeguard continuity of essential services such as drinking-water and electricity. |
| Real-time health surveillance | • Oversee real-time or near-real-time surveillance of heat-related morbidity, mortality and health service use, and adjust interventions (for example, implementing targeted preventive interventions, home visits, hydration outreach, cooling centre transport and medication reviews); if necessary, redeploy first aid or clinical staff to hotspots (while ensuring their own safety).<br>• Use validated indicators on heat-related cases (such as emergency department visits, ambulance dispatches and all-cause excess mortality), combined with syndromic data and short-range forecasts to anticipate surges (see also Core element 7 – Heat–health surveillance).<br>• Review and adjust the HHAP based on surveillance data to identify emerging risks and guide response decisions.<br>• Provide stakeholder feedback, communicating any changes to local managers and practitioners.<br>• Convene intersectoral coordination meetings at agreed intervals to share early-warning intelligence and align response actions across sectors.<br>• Refresh and communicate official heat–health alert thresholds and trigger criteria to all stakeholders at the start of and during the season. |
| Cooling centre network | • Ensure that local managers keep cooling centres open, well equipped and staffed around the clock, and ensure funding continuity for cooling centre operations.<br>• Coordinate basic resources, such as seating, hydration stations, basic medical care and transport options for those without vehicles.<br>• Monitor coverage, accessibility, capacity and utilization, with particular attention to populations at increased risk of heat-related harm and underserved areas. |

DURING SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Continuous public messaging | • Coordinate and disseminate consistent, evidence-based public communication (see also Core element 4 – Communication).<br>• Roll out multichannel, multilingual campaigns via radio, social media and community bulletins on hydration, cooling centre locations and emergency hotlines, adapting the tone and format to the local culture and language. These actions are predominantly local; national/federal authorities should provide enabling resources, funding and standards, but rely on local execution (see also public health message bank in Part 3).<br>• Deliver messages in high-traffic public transport infrastructure – screens in buses and trams, digital noticeboards at stops, and displays in train and bus stations. |
| Preparedness for mass gatherings | • For any large summer events (such as sporting events, festivals and religious gatherings), coordinate heat–health risk plans with organizers to protect participants and staff (for more details, see also Annex 2 on mass gatherings during periods of extreme heat). |

DURING EXTREME HEAT EVENTS

**Box UAB1.3. Actions for health authorities in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Activating emergency protocols | • Trigger emergency protocols set out in the HHAP, and participate in coordination meetings at the level appropriate to the jurisdiction (local, regional and/or national) – escalating requests for support as needed. |
| Aligning with warning systems | • Ensure that local actions mirror national/regional heat–health alerts, and that consistent, clear messages reach hospitals, clinics, utility providers and community leaders. |
| Monitoring health in real time | • Work with public health teams, facility managers and front-line workers to track heat-related illnesses and deaths as they occur, directing resources to emerging hotspots.<br>• Use this information to guide rapid decision-making and resource deployment. |
| Supporting populations at increased risk | • Activate protocols rapidly for outreach to populations at increased risk of heat-related harm – such as older adults, chronically ill and socially isolated people, and those with disabilities – by issuing real-time guidance, and using data tools to track home visits and check-ins.<br>• Authorize and oversee the deployment of GPs, home visiting physicians, community nurses and social care workers for home visits or phone check-ins; coordinate logistics; and feed outcome data into the national system.<br>• Mandate the reinforcement of actions to protect workers from extreme heat (see User action brief 2 – Occupational domain). |

DURING EXTREME HEAT EVENTS CONTINUED

| Action area | Actions |
|---|---|
| Refreshing public safety messages | • Continuously update and broadcast heat–health advisories on cooling strategies, hydration and avoiding hazards like drowning – in multiple formats (audio, visual and accessible for those with impairments) – and tailor advice to populations at increased risk (see also Core element 4 – Communication; public health message bank in Part 3).<br>• Authorize emergency funding and surge resources to protect health system capacity (staff, beds, supplies and transport) for the duration of the extreme heat event.<br>• Coordinate at the executive level with civil protection, fire service, energy and water stakeholders to safeguard continuity of essential services for populations at increased risk during the event.<br>• Issue emergency public health orders where warranted (for example, temporary work-hour modifications, restrictions on mass gatherings and suspension of non-essential outdoor activities), in coordination with relevant authorities. |

AFTER EXTREME HEAT EVENTS

HEALTH AUTHORITIES

**Box UAB1.4. Actions for health authorities in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Assessing and documenting outcomes | • Compile data on impacts of extreme heat (such as morbidity, hospital admissions, mortality and community feedback) and emergency response activities to pinpoint gaps and guide improvements. |
| Debriefing and refining coordination | • Establish clear indicators and timelines for monitoring and evaluation of data, sharing findings with all stakeholders, and formally incorporating lessons learned into updated HHAPs (see also Core element 7 – Heat–health surveillance; Core element 8 – Monitoring, evaluation and learning).<br>• Assess the effectiveness of preparedness, response and coordination mechanisms. Identify strengths, gaps and priority improvements.<br>• Conduct sectoral stakeholder debriefings, bringing together local government, health-care providers, emergency services and community representatives to streamline roles and strengthen collaboration for the next event. |
| Updating risk communication | • Analyse which outreach channels and messages resonated best, then revise the public information strategy, adjusting formats, languages and delivery timing to boost reach and effectiveness next time (see also Core element 4 – Communication).<br>• Streamline the HHAP with adjacent programmes addressing social isolation, healthy ageing and community connectedness, which are equally important determinants of vulnerability.<br>• Use post-event evidence to advocate, with finance and planning ministries, sustained multiyear investment in long-term heat adaptation (for example, greening, passive cooling, energy-efficient retrofits and surveillance systems).<br>• Publish a post-event report and engage with civil society and community organizations to discuss the findings, lessons learned and planned adjustments to the HHAP.<br>• Audit excess mortality and morbidity attributable to extreme heat events during the summer or hot season, disaggregating by age, sex and other relevant groups.<br>• Commission an independent after-action review of the heat–health response, with mandated participation of health, civil protection, social care and community stakeholders. |

## Actions for public health practitioners

PREPARING FOR THE NEXT SUMMER | PUBLIC HEALTH PRACTITIONERS

**Box UAB1.5. Actions for public health practitioners in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Co-designing local plans and systems | • Work with local and regional authorities to develop, update or operationalize a local HHAP aligned with national or federal guidance where available, ensuring that roles, referral pathways, alert triggers and implementation responsibilities are clearly defined.<br>• Set up or strengthen early-warning communication links with meteorological services, emergency services and health authorities so that alerts are received, interpreted and shared rapidly with relevant local partners (see also Core element 2 – Heat–health warning system).<br>• Map out population groups and neighbourhoods at increased risk of threats to health from extreme heat, including consideration of those with chronic illness or other pre-existing conditions, and groups experiencing social inequalities such as inadequate housing, energy poverty and social isolation (see also Core element 3 – Populations at increased risk). |
| Surveillance and training | • Establish surveillance for heat-related illnesses in the community and in health facilities.<br>• Train health-care staff, volunteers and community workers on prevention and early detection, and on the provisions of the local HHAP.<br>• Support the development or maintenance of registers of populations at increased risk of heat-related harm based on age, pre-existing conditions, disability, pregnancy, medication use and social isolation – distinguishing where appropriate between outpatient and inpatient groups for tailored outreach.<br>• Organize/participate in simulation exercises (jointly with hospitals, social services and civil protection stakeholders). |
| Cooling resources | • Help to ensure that public cooling spaces (such as public buildings, shade sites and hydration stations) are identified and resourced. |
| Tailoring communications | • Develop culturally appropriate outreach strategies and participatory workshops to evaluate public messages. |

DURING SUMMER | PUBLIC HEALTH PRACTITIONERS

**Box UAB1.6. Actions for public health practitioners in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Sharing and acting on real-time data | • Maintain continuous, two-way data flow between higher-level health authorities and front-line health facilities – practitioners should both transmit local case data upward and disseminate updated guidance rapidly downward. |
| Focused health education | • Roll out risk-based campaigns via text alerts, social media and community bulletins, emphasizing hydration, cooling options and emergency contacts, with special outreach to groups at increased risk of heat-related harm.<br>• Include parents and informal carers as priority recipients of hydration messaging; remind them that sweet drinks and alcohol do not provide adequate rehydration, and that the recommended fluid is water. |

DURING EXTREME HEAT EVENTS

PUBLIC HEALTH PRACTITIONERS

**Box UAB1.7. Actions for public health practitioners in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Rapid-response outreach | • Deploy, coordinate or advise on mobile health and outreach teams to screen and treat populations at increased risk of heat-related harm on site, and verify that drinking-water stations and cooling centres are operational and stocked. |
| Monitoring and communicating evolving risks | • Track heat-related illness data in real time, alert stakeholders to hotspots and coordinate clear public advisories – through local media and trusted channels – on signs of heat exhaustion and where to get help.<br>• Track the effects on staff conducting field surveillance, outreach and outdoor communication activities. Verify whether they are equipped with sun protection, hydration supplies and scheduled rest opportunities in cooler areas, and apply a buddy system to spot heat illness early in colleagues (see User action brief 2 – Occupational domain; Annex 3 on signs and symptoms of heat-related illness). |

AFTER EXTREME HEAT EVENTS

PUBLIC HEALTH PRACTITIONERS

**Box UAB1.8. Actions for public health practitioners in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Reviewing outcomes and refining plans | • Analyse surveillance and hospital data with authorities and epidemiologists to assess health impacts, response effectiveness and implementation gaps; debrief with partners; and update local/regional HHAPs. |
| Updating messaging and long-term strategies | • Identify which communication channels and messages had the greatest reach, adjust for next time, and advocate lasting solutions.<br>• Use the findings to improve future communication and advocate longer-term risk reduction measures such as urban greening, passive cooling and improved access to safe indoor environments (see also Core element 6 – Reducing heat exposure). |

## Actions for health facility managers

PREPARING FOR THE NEXT SUMMER | HEALTH FACILITY MANAGERS

**Box UAB1.9. Actions for health facility managers in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Planning, equipping and training | • Conduct a facility-level heat risk assessment – covering thermal envelope; heating, ventilation and AC redundancy; ward-specific microclimates; and backup power – to identify infrastructure gaps and inform retrofit priorities.<br>• Develop, update and test regularly (through simulation exercises) heat-contingency plans for the facility – defining triggers, roles, escalation and communication chains – to maintain operational continuity during extreme heat events.<br>• Stock up and rotate essentials (intravenous fluids, oral rehydration salts and cooling packs), inspect and upgrade cooling/ventilation systems and backup power, and install thermometers in critical areas.<br>• Where feasible, create cool outdoor recreation areas (such as shaded courtyards, trellises and misting features) for patients, visitors and staff.<br>• Inspect, repair and upgrade indoor and outdoor shading (such as mobile awnings, external blinds and insulated curtains, especially on south- and west-facing windows), including outdoor shading for waiting and recreation areas.<br>• Identify, confirm and prepare clean-air and cool rooms/areas that can be activated during heat events, with accessible routes, seating, hydration points and clear criteria for prioritizing patients at increased risk of threats to health from extreme heat. |
| Staff readiness and triage | • Schedule work/rest rotations.<br>• Procure lightweight personal protective equipment (PPE) (such as breathable cotton scrubs, cooling vests/neck packs and light moisture-wicking long-sleeved garments for sun protection of outreach staff).<br>• Train all staff on heat illness protocols and equipment use. Distribute clinical flowcharts and triage checklists to front-line workers for rapid assessment and treatment of heat-related conditions.<br>• Set up a rapid triage system for heat-related cases. |

DURING SUMMER | HEALTH FACILITY MANAGERS

**Box UAB1.10. Actions for health facility managers in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Staying aligned and informed | • Monitor national/local heat alerts, and make sure that such alerts are sent proactively to facilities so that they receive them automatically through agreed channels.<br>• Partner with public health teams to receive updated surveillance information. |

DURING SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Environment and patient care | • Deploy portable cooling equipment where fixed cooling systems are unavailable, undersized or have failed, prioritizing wards housing patients at increased risk of heat-related harm – including older patients, infants, pregnant patients, people with chronic conditions and long-stay patients.<br>• Monitor supply levels in real time of intravenous fluids, oral rehydration salts and cooling packs, and coordinate with logistics for rapid replenishment if demand surges.<br>• Track indoor temperatures, indoor air quality where relevant, and symptoms in patients and staff; adjust schedules or procedures as needed; and ensure that designated clean-air and cooling areas are clearly signposted and accessible.<br>• Verify that medicines, vaccines, laboratory materials, food and other temperature-sensitive items are stored within required temperature ranges, and confirm that temperature monitoring, documentation and escalation protocols are functioning.<br>• Reduce indoor temperatures through external shading, night-time ventilation when outdoor air quality permits (see also Annex 1 for more details on actions to manage combined exposure to extreme heat and vegetation fires) and switching off unnecessary lights and equipment.<br>• Display clear information on heat-related symptoms, prevention and when to seek help in common areas, waiting rooms and wards (see also Annex 3 on signs and symptoms of heat-related illness). Provide patient and family information materials during visits so that patients, relatives and carers understand basic protective actions before an extreme heat event occurs.<br>• Reconsider room occupancy and reallocate ward use strategically according to indoor temperature monitoring (for example, moving patients at increased risk to the coolest wards).<br>• Promote hydration and, where applicable, log fluid intake in line with hydration-logging protocols (especially in long-term care wards). |

DURING EXTREME HEAT EVENTS

HEALTH FACILITY MANAGERS

**Box UAB1.11. Actions for health facility managers in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Activating emergency protocols | • Trigger the local HHAP and the facility's own contingency plan. Communicate activation clearly to clinical, non-clinical, facilities management, logistics and communications teams. |
| Heat response team | • Convene a daily (or more frequent) heat response team during the alert – including the facility director, facility manager, communications focal point, clinical leads, occupational health and infection prevention staff – to act on emerging risks.<br>• Use the team to review risks, service pressures, indoor temperatures, supply levels, staffing constraints and required corrective actions. |

DURING EXTREME HEAT EVENTS CONTINUED

| Action area | Actions |
|---|---|
| Protecting staff and patients | • Release prepositioned supplies to emergency departments and outreach teams both outdoors and in mobile services.<br>• Enforce regular hydration and rest breaks.<br>• Deploy dedicated observers for individuals at increased risk of heat-related harm.<br>• Provide extra cooling measures.<br>• Activate surge plans to manage increased patient loads.<br>• Increase or release emergency department and intensive care unit surge capacity (such as elective procedure deferrals, surge beds and additional triage) to handle heat- and smoke-related admissions (see also Annex 1 for more details on actions to manage combined exposure to extreme heat and vegetation fires). |

AFTER EXTREME HEAT EVENTS

HEALTH FACILITY MANAGERS

**Box UAB1.12. Actions for health facility managers in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Debriefing and diagnosing | • Conduct a structured post-event debrief with clinical, non-clinical and support teams on what worked, what did not and what should be improved.<br>• Inspect cooling, ventilation, shading, refrigeration and backup power systems to identify failures or weaknesses during peak demand.<br>• Gather feedback from residents and long-stay patients to capture the experience of those most exposed to indoor heat throughout the event. |
| Updating for next season | • Incorporate lessons learned into facility's contingency plans, protocols and training materials to strengthen the facility's resilience before the next heat event. |

## Actions for front-line health workers

PREPARING FOR THE NEXT SUMMER | FRONT-LINE HEALTH WORKERS

**Box UAB1.13. Actions for front-line health workers in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Training and familiarity | • Complete up-to-date training on diagnosing and treating heat-related illnesses (see also Annex 3 on signs and symptoms of heat-related illness).<br>• Check the facility's heat–health protocols and local vulnerability maps before the summer or hot season. |
| Stocking and simulating | • Help to ensure that cooling aids (fans, cold packs and rehydration solutions) and emergency supplies are ready for use.<br>• Participate in extreme heat drills or briefings to confirm the roles of triage, patient education, reporting and escalation. |
| Patient education preparation | • Adapt and deliver previously prepared education materials (for example, on how to stay cool, warning signs and safe medication storage) in routine consultations.<br>• Run pre-season medication reviews for and with patients on medications that affect thermoregulation or fluid balance (such as diuretics, antihypertensives, anticholinergics, antipsychotics, antidepressants and lithium), and document adjustments and counselling. |

DURING SUMMER | FRONT-LINE HEALTH WORKERS

**Box UAB1.14. Actions for front-line health workers in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Embedding heat checks | • Add heat risk screening to routine visits, especially for patients at increased risk of threats to health from extreme heat, and arrange follow-ups by phone or home visit when needed.<br>• Contact informal carers (such as family members, neighbours and community-based volunteers) of patients at increased risk during follow-ups, since they are central to day-to-day monitoring and support during heat events. |
| Teaching self-care | • Advise patients and carers how to monitor hydration, temperature and warning signs (see also Annex 3 on signs and symptoms of heat-related illness), and share locations of cooling centres and hotlines. Include how to protect medications from high temperatures and potential signs and symptoms that might reflect interactions with heat or side-effects. |
| Sharing alerts and data | • Maintain regular communication with facility managers and public health teams to report unusual symptom spikes and support targeted community outreach. |

DURING EXTREME HEAT EVENTS | FRONT-LINE HEALTH WORKERS

**Box UAB1.15. Actions for front-line health workers in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Following emergency protocols | • Follow emergency protocols and implement the recommended actions for clinical practice, including adjusting patient triage, intensifying follow-up of patients at of heat-related harm, and avoiding elective procedures during peak heat periods if they can be postponed. |
| Protecting staff and patients | • Follow regular hydration and rest break schemes if appropriate, deploy dedicated observers for individuals at increased risk of heat-related harm, provide extra cooling measures, and follow surge plans to manage increased patient loads.<br>• Escalate concerns promptly to supervisors or clinical leads when patients deteriorate, staffing becomes unsafe or cooling measures are insufficient. |

AFTER EXTREME HEAT EVENTS | FRONT-LINE HEALTH WORKERS

**Box UAB1.16. Actions for front-line health workers in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Reviewing and sharing | • Participate in clinical debriefings on heat illness cases and operational challenges to establish lessons learned and improve future practice.<br>• Help to gather feedback from residents and long-stay patients to capture the experience of those most exposed to indoor heat – including comfort, hydration, sleep, access to cool areas, communication, symptoms and perceived safety throughout the event. Pay particular attention to people who may have difficulty communicating discomfort or accessing cooling independently. |
| Updating practices | • Stay updated with revised or new heat–health protocols, clinical guidance and signs and symptoms of heat-related illness, with refresher modules every season (see also Annex 3 on signs and symptoms of heat-related illness).<br>• Contribute practical feedback to support facility managers when revising triage protocols, staff guides and equipment checklists for next season. |

# User action brief 2 – Occupational domain

## Context

Extreme heat poses significant risks in occupational settings, including both outdoor and indoor workplaces. The combination of environmental heat (high air temperature, humidity, radiant heat and low wind) and the metabolic heat generated by physical work can exceed the body's capacity to dissipate heat. This increases the likelihood of heat cramps, heat exhaustion and heatstroke, dehydration and acute kidney injury, and – in some occupations with repeated and prolonged exposure – contributes to chronic kidney disease of non-traditional origin, cardiovascular events, and adverse reproductive outcomes. Heat also impairs cognitive and physical performance, and increases the incidence of workplace accidents and injuries, with measurable losses in productivity and working hours at the population level. Outdoor workers, workers performing physically demanding tasks, workers in hot indoor environments, workers using PPE that limits heat dissipation, workers with pre-existing chronic conditions (such as cardiovascular and kidney diseases), pregnant workers and older workers are at increased risk of threats to health from extreme heat. Protecting workers therefore requires tailored measures that reflect occupational risks, work conditions and legal obligations, guided by occupational heat–health policies and workplace heat prevention frameworks – including risk assessment, adaptation of work practices, worker training and emergency response arrangements. Specific attention and measures may be needed to reach workers in the informal sector and/or unregistered enterprises, such as engagement with community organizations, trade unions and local health services.

## Who should read this

This brief is intended for the following actors within the occupational domain.

- It supports occupational health and safety authorities at the national, regional and local levels, who establish regulatory frameworks and standards, provide guidance and resources, and ensure compliance across different actors to prevent occupational heat-related illnesses.
- It informs occupational health and safety inspectors, who participate in training, develop inspection plans, conduct inspections, investigate incidents, respond to complaints, ensure compliance and share findings.
- It assists employers, who are responsible for conducting risk assessments; developing and implementing heat stress management plans; providing rest, shade and hydration; implementing acclimatization programmes; training employees; and using engineering and administrative controls.

## What is presented in this brief

This user action brief contains a structured set of proposed actions to handle extreme heat in diverse workplaces, particularly in formal settings. Because workplaces worldwide vary widely in size, sector and conditions, users should tailor the suggested actions to local settings. In resource-constrained settings, users are encouraged to prioritize the most impactful and feasible actions as a starting-point.

Actions are presented for each audience group, organized around the four key stages of heat–health action: planning and preparedness (ongoing and before the summer or hot season); monitoring and early action (during the summer or hot season); emergency response (during extreme heat events); and evaluation and improvement (after extreme heat events and at the end of the season).

The action boxes in this user action brief are organized according to the various actors within the occupational domain. Boxes UAB2.1–UAB2.4 present suggested actions for occupational health and safety authorities; boxes UAB2.5–UAB2.8 present suggested actions for occupational health and safety inspectors; and boxes UAB2.9–UAB2.12 present suggested actions for employers, organized according to the four key stages of heat–health action.

This brief complements existing guidance from international organizations, such as the European Agency for Safety and Health at Work, International Labour Organization, WHO and WMO. It can be read on its own, but readers are encouraged to consult it alongside the core elements in Part 1 of this guidance, in particular Core element 1 – Governance, Core element 3 – Populations at increased risk and Core element 6 – Reducing heat exposure. The "At work" section of the public health message bank in Part 3 supports communication efforts by actors in the occupational domain. For more details on actions to manage combined exposure to extreme heat and vegetation fires, see Annex 1.

## Key resources[13]


Advisory Committee on Safety and Health at Work. Opinion: climate change – extreme weather conditions. Brussels: European Commission; 2024 (Doc. 016-24; https://circabc.europa.eu/ui/group/cb9293be-4563-4f19-89cf-4c4588bd6541/library/f1cb742e-1c05-482c-be79-f2065cd3c054/details).

Advisory Committee on Safety and Health at Work. Opinion: climate change – heat at work. Brussels: European Commission; 2025 (Doc. 015-25; https://circabc.europa.eu/ui/group/cb9293be-4563-4f19-89cf-4c4588bd6541/library/61e58999-6cfa-402d-9d98-38fac4b2b001/details).

Beat the heat [website]. WHO Regional Office for South-East Asia; 2025 (https://www.who.int/india/beat-the-heat).

Heat at work – guidance for workplaces. Bilbao: European Agency for Safety and Health at Work; 2023 (https://osha.europa.eu/en/publications/heat-work-guidance-workplaces).

Heat at work: implications for safety and health: a global review of the science, policy and practice. Geneva: International Labour Organization; 2024 (https://www.ilo.org/publications/heat-work-implications-safety-and-health).

Occupational health [website]. World Health Organization; 2025 (https://www.who.int/health-topics/occupational-health).

SunSmart Global UV App [website]. World Health Organization;2025 (https://www.who.int/teams/environment-climate-change-and-health/radiation-and-health/non-ionizing/optical-radiation).

Temperature in the workplace: heat stress [website]. Health and Safety Executive; 2025 (https://www.hse.gov.uk/temperature/employer/heat-stress.htm).

The content of a Directive on the prevention of occupational heat risks [website]. European Trade Union Confederation; 2025 (https://www.etuc.org/en/document/content-directive-prevention-occupational-heat-risks).

World Health Organization, World Meteorological Organization. Climate change and workplace heat stress: technical report and guidance. Geneva: World Health Organization; 2025 (https://iris.who.int/handle/10665/382351). Licence: CC BY-NC-SA 3.0 IGO.


[13] All references were accessed 1–4 May 2026.

# Actions for occupational health and safety authorities



**Box UAB2.1. Actions for occupational health and safety authorities in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Occupational heat stress regulations and guidelines | • Set minimum criteria for workplace heat stress regulations and guidelines, drawing on international, national and regional standards, including guidelines and recommendations from organizations such as the International Labour Organization, WHO, WMO and relevant regional bodies (such as the European Agency for Safety and Health at Work and National Institute for Occupational Safety and Health in the United States).<br>• Ensure that regulations and guidance address sectors at increased risk of threats to health from extreme heat, such as agriculture, construction and mining, fishing, transport, logistics, manufacturing, waste management, emergency services, and indoor workplaces with heat-generating processes and where workers often face high levels of extreme heat exposure and physical exertion.<br>• Ensure that guidelines address workers who may be at increased risk of heat-related harm, including those less acclimatized (see also Core element 3 – Populations at increased risk). |
| Risk assessment | • Mandate or commission risk assessments at both national and local levels to identify sectors, occupations and geographical areas with high extreme heat exposure and health risks.<br>• Commission mapping of regional variations in heat exposure and workers at risk, taking into account local climate data and the concentration of specific industries.<br>• Require employers to conduct workplace-level heat stress risk assessments before the summer or hot season. Whenever work conditions, tasks, staffing or heat warning levels change, mandate submission of summary findings to the inspectorate at agreed intervals.<br>• Promote the use of occupational heat stress indicators (such as wet-bulb globe temperature – a widely recognized index for evaluating environmental heat stress in direct sunlight) to assess the level of hazard exposure, with thresholds adapted to work intensity, clothing/PPE, acclimatization status, humidity, radiant heat and local climate. |
| Regulations on breaks, flexible shifts and PPE at workplaces | • Introduce or adjust regulations and minimum requirements on breaks, flexible shifts and PPE for different workplaces.<br>• Mandate the planning of breaks for resting and hydrating in shaded areas as part of working hours during the summer and extreme heat events. Also mandate that adequate sanitation facilities are available at workplaces, especially for female workers.<br>• Mandate the planning and provision of acclimatization periods for new or returning workers, particularly at the beginning of the summer or hot season. Consider mandating the reduction or postponement of strenuous activities during the summer or hot season and during extreme heat events – particularly those performed outdoors or in unventilated indoor environments.<br>• Mandate regulations regarding PPE and clothing that maintain occupational safety while reducing heat strain. |
| Heat–health warning systems tailored for occupational settings | • Collaborate and coordinate with health and meteorological authorities to establish heat–health warning systems tailored for occupational settings to provide timely alerts.<br>• Integrate occupational heat alerts into planning and implementation of temporary or mobile worksites, large-scale public events and mass gatherings (see also Core element 3 – Populations at increased risk; Core element 6 – Reducing heat exposure; Annex 3 on signs and symptoms of heat-related illness). |

| Action area | Actions |
|---|---|
| Coordination with health and emergency services | • Establish collaborative and coordination mechanisms with health and emergency services to ensure a rapid response in critical and high-risk areas and during critical periods.<br>• Define referral pathways for occupational heat-related illness, including first aid, emergency transport, reporting and investigation of severe cases. |
| Clear reporting mechanisms for heat-related illnesses | • Establish and promote standardized reporting mechanisms for heat-related illnesses and incidents in the workplace for effective monitoring and response.<br>• Align occupational reporting with the heat–health surveillance system where possible, while respecting data protection and confidentiality requirements. |
| Training programmes on heat stress management | • Develop standardized training curricula for employers, workers, supervisors, and occupational health and safety professionals and inspectors. Training may cover heat risk recognition, prevention measures, acclimatization, hydration, work/rest schedules, symptoms of heat illness, first aid, emergency escalation, reporting and worker rights.<br>• Ensure that training materials are accessible, practical and available in multiple languages to reach diverse workforces. |
| Promoting stakeholder engagement | • Promote stakeholder engagement and participation by, for example, organizing forums with employers, unions and inspectors to align national with local regulations on heat stress prevention – including outreach to representatives of informal workers and unregistered enterprises. Where inspection capacity is limited, work through trade unions, worker associations and community organizations to promote compliance and awareness.<br>• Extend regulatory protection to workers in the informal economy and platform/gig economy, in coordination with social protection bodies and worker representatives. |
| Funding and resources availability | • Establish funding, incentives or technical support schemes to support companies and employers – especially small and resource-constrained enterprises – with implementing heat prevention measures.<br>• Support investment in shade, ventilation, cooling, drinking-water access, monitoring equipment, worker training and safer work organization.<br>• Support research on the effectiveness of different intervention strategies to identify best practices and inform future regulatory updates.<br>• Resource the inspectorate (staff, equipment and training) to enable enforcement of heat stress regulations during the summer or hot season and during extreme heat events – including outreach to informal and small enterprises. |
| Awareness campaigns | • Mandate the development and dissemination of awareness campaigns that provide clear information on the causes and symptoms of heat-related illnesses (see also Annex 3 on signs and symptoms of heat-related illness), and on effective prevention strategies in the workplace, including staying hydrated, taking regular rest breaks in shaded areas and wearing appropriate clothing.<br>• Use a variety of communication channels, such as radio, television, online platforms, print media and workshops.<br>• Mandate the translation of materials into multiple languages to communicate effectively with all workers (see also Core element 4 – Communication; public health message bank in Part 3). |

DURING SUMMER

OCCUPATIONAL HEALTH AND SAFETY AUTHORITIES

**Box UAB2.2. Actions for occupational health and safety authorities in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Monitoring heat–health warnings and heat-related illness | • Track heat–health warnings throughout the summer or hot season in coordination with meteorological and health authorities.<br>• In coordination with health authorities, monitor and track reported occupational incidents, complaints, hospitalizations and fatalities from heat-related illness in the workplace.<br>• Issue timely alerts and advisories to employers, inspectors, unions and workers, providing information on the expected heat levels and recommending appropriate preventive measures.<br>• Convene regular coordination meetings with employers, unions, inspectors, workers and relevant public authorities during the summer or hot season to align response actions and address emerging concerns.<br>• Activate sector-specific heat stress thresholds, and notify employers and inspectors of any in-season adjustments to thresholds, work-hour limits and rest requirements. |
| Enforcing regulations and guidelines | • Prioritize inspections in high-risk sectors, high-exposure regions and workplaces with previous complaints, incidents or non-compliance.<br>• Work with occupational health and safety inspectors to ensure that employers are implementing the required preventive measures, providing advice. Where necessary, issue penalties for any violations to ensure accountability and deter future non-compliance. |
| Accessible information and resources | • Provide accessible information and resources for workers and employers on current heat risks, symptoms of heat illness (see also Annex 3 on signs and symptoms of heat-related illness), how to prevent heat-related illnesses during extreme heat, worker rights and emergency contacts.<br>• Maintain online portals and multilingual helplines that offer up-to-date guidance on heat safety, ensuring that employers, inspectors and workers have access to the information they need.<br>• Disseminate practical guidance through employer organizations, trade unions, worker associations, community organizations and platforms used by undocumented or mobile workers. |

DURING EXTREME HEAT EVENTS

OCCUPATIONAL HEALTH AND SAFETY AUTHORITIES

**Box UAB2.3. Actions for occupational health and safety authorities in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Activating the emergency phase of heat–health warning systems | • Activate the occupational emergency phase when occupational heat thresholds or official extreme heat alerts are reached or forecast.<br>• Immediately disseminate specific and targeted guidance for employers, workers, inspectors, unions and relevant authorities.<br>• Ensure that guidance specifies required actions, including work/rest cycles, hydration, shade, shift modification, postponement of high-risk tasks and emergency escalation.<br>• Coordinate with event organizers to ensure compliance with emergency heat–health protocols during mass gatherings (see also Annex 2 on mass gatherings during periods of extreme heat). |

DURING EXTREME HEAT EVENTS CONTINUED

| Action area | Actions |
|---|---|
| Supervision of sectors at increased risk | • Direct intensified supervision efforts – particularly in sectors known for high heat exposure, such as outdoor work sites and industries with indoor heat sources. The focus of this supervision should be on ensuring adherence with heat stress prevention measures. |
| Temporary emergency regulations | • Where legally authorized, issue temporary emergency regulations, orders or guidelines to provide additional protection for workers during extreme heat. Measures may include mandatory rest schedules, modification of working hours, suspension of high-risk activities during the hottest hours, limits on heavy exertion or temporary stop-work requirements.<br>• Ensure that emergency measures clarify employer obligations, worker rights and enforcement consequences. |
| Access to cooling centres and information on staying safe during extreme heat | • Ensure that employers and workers receive information about cooling centres, shaded rest areas, drinking-water points, emergency health services and practical heat safety advice on how to stay safe during extreme heat.<br>• Work with municipalities, health authorities, unions and community organizations to reach workers outside standard formal employment settings, and ensure that information is accessible to them. |
| Communicating with employers and workers | • Communicate actively with employers and workers about extreme heat risks, protective measures, worker rights and emergency procedures.<br>• Reinforce key messages about the importance of hydration, staying cool, recognizing the symptoms of heat illness (see also Annex 3 on signs and symptoms of heat-related illness), first aid and when to stop work or seek urgent medical care.<br>• Coordinate at the executive level with civil protection providers, health authorities and meteorological services to align messaging and emergency response across sectors. |

AFTER EXTREME HEAT EVENTS

OCCUPATIONAL HEALTH AND SAFETY AUTHORITIES

**Box UAB2.4. Actions for occupational health and safety authorities in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Reviewing preparedness and response measures | • Conduct a structured review of occupational preparedness, prevention, enforcement and response measures that were put in place and implemented during the extreme heat event.<br>• Assess the impact of extreme heat on workers' health and safety, including illness, injuries, fatalities, complaints and service disruption.<br>• Involve employers, unions and other relevant actors to gather feedback on what worked well and what challenges were encountered, and to identify any best practices that emerged during the period of extreme heat. |
| Data analysis | • Analyse data on all reported cases of heat-related illnesses that occurred during the extreme heat event.<br>• Identify trends by sectors, patterns and any specific occupations that were disproportionately affected. |
| Updating regulations and guidelines | • Use the post-event findings to revise occupational heat stress regulations, guidelines, exposure thresholds, inspection protocols, training materials and reporting requirements.<br>• Incorporate effective practices that emerged during the event, and address any gaps in existing regulations to ensure better compliance in the future. |

AFTER EXTREME HEAT EVENTS CONTINUED

| Action area | Actions |
| --- | --- |
| Reporting on findings | • Publish a post-event report summarizing occupational impacts, enforcement findings, compliance gaps, lessons learned and planned improvements.<br>• Sanction documented non-compliance where appropriate, and publish enforcement outcomes to deter future breaches and strengthen accountability.<br>• Investigate any heat-related occupational fatalities or serious injuries with mandatory follow-up actions, and feed findings into the regulatory review.<br>• Use the findings to advocate investment in inspectorate capacity, workplace adaptation, worker training and occupational heat risk prevention. |

## Actions for occupational health and safety inspectors

PREPARING FOR THE NEXT SUMMER | OCCUPATIONAL HEALTH AND SAFETY INSPECTORS

**Box UAB2.5. Actions for occupational health and safety inspectors in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Inspection protocols and checklists | • Evaluate, update and prepare inspection protocols or checklists focusing on heat stress prevention measures in workplaces (such as providing adequate training for workers, ensuring availability and accessibility of drinking-water and shaded rest areas, and implementing appropriate work/rest schedules), considering international, national and regional standards.<br>• Include specific criteria for sectors at increased risk of threats to health from extreme heat, outdoor worksites, indoor heat-generating workplaces, mobile worksites and temporary worksites. |
| Extreme heat response plans | • Advise relevant health authorities and employers on developing and implementing effective extreme heat response plans that are consistent with legal requirements and national guidance.<br>• Provide technical guidance on appropriate controls, best practices and specific measures tailored to the workplace, and ensure that employers understand their responsibilities in protecting workers during extreme heat. |
| Proactive inspections | • Plan inspections in high-risk sectors before the summer or hot season, including construction, agriculture, manufacturing, mining, transport, logistics, waste management and other exposed sectors.<br>• Use pre-season inspections to identify gaps early, and require corrective action before extreme heat occurs to ensure that employers and workers have taken the necessary steps to prepare for extreme heat.<br>• Map organizations in the informal economy and small/unregistered enterprises in the inspectorate's area of responsibility, and plan complementary outreach and awareness approaches where formal inspection routes are limited. |
| Training | • Participate in training programmes on occupational heat stress, relevant regulations, wet-bulb globe temperature or equivalent indicators, workplace controls, first aid and emergency response.<br>• Stay updated on regulatory changes and best practices in occupational heat stress management.<br>• Ensure that all field inspectors are prepared to identify early signs of heat stress (see also Annex 3 on signs and symptoms of heat-related illness), evaluate mitigation measures and protect their own health during inspections. |

DURING SUMMER | OCCUPATIONAL HEALTH AND SAFETY INSPECTORS

**Box UAB2.6. Actions for occupational health and safety inspectors in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Checks in workplaces | • Conduct checks in workplaces during the summer or hot season, prioritizing places with outdoor work activities, heavy physical labour and indoor heat-generating processes.<br>• Verify that employers are implementing the required preventive measures – such as providing drinking-water, rest breaks and shade – and that workers are aware of and following safe work practices. |

DURING SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Focusing inspections on workers at increased risk | • Focus inspections on workplaces with workers at increased risk of heat-related harm, including older, pregnant and medically vulnerable workers with chronic conditions and migrants, to ensure that adequate protections are in place (see also Core element 3 – Populations at increased risk).<br>• Check that workers at increased risk have access to drinking-water, rest, shade, training, reporting channels and emergency support.<br>• Ensure that employers have implemented specific measures to address the unique needs and challenges of workers at increased risk, including providing information in appropriate languages and ensuring access to necessary resources and support. |
| On-the-spot guidance and recommendations | • During inspections, provide on-the-spot guidance and practical recommendations to employers on specific control measures, including shading, ventilation and hydration stations. |
| Responding promptly to complaints and reports of unsafe working conditions | • Prioritize and respond promptly to any complaints or reports regarding unsafe working conditions related to heat stress.<br>• Maintain a reporting channel during the summer or hot season, and triage incoming concerns for prioritized follow-up. |
| Issuing warnings and penalties | • Issue notices when employers are found to be in violation of heat stress regulations and are failing to protect workers adequately from extreme heat. |
| Documenting and reporting findings | • Document findings from all inspections related to heat stress to contribute to ongoing efforts to improve heat stress prevention.<br>• Retain inspection data for future analysis to identify trends, inform future regulatory updates, and guide development of more targeted inspection strategies. |

DURING EXTREME HEAT EVENTS | OCCUPATIONAL HEALTH AND SAFETY INSPECTORS

**Box UAB2.7. Actions for occupational health and safety inspectors in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Prioritizing inspections | • During extreme heat, prioritize inspection efforts on workplaces that have been identified as at high risk for heat stress in risk assessments conducted by occupational safety and health authorities (see also Box UAB2.1).<br>• Focus on outdoor worksites, places with heavy physical labour and indoor heat-generating processes, temporary worksites and sectors employing workers at increased risk of heat-related harm. |
| Implementing emergency measures | • Ensure that employers are implementing the necessary emergency measures to protect workers – including checking for availability of cooling or shaded areas, implementation of frequent breaks, reduction of workloads, and provision of adequate hydration. |
| Stop-work orders | • Where conditions are imminently dangerous due to extreme heat, issue immediate stop-work orders for high-risk tasks or worksites.<br>• Document the basis for stop-work action and the conditions required before work can safely resume. |

DURING EXTREME HEAT EVENTS CONTINUED

| Action area | Actions |
|---|---|
| Increasing visibility and presence | • Increase visibility and presence of inspectors in areas at increased risk to deter unsafe practices and provide reassurance to workers. |
| Keeping authorities updated | • Report urgent issues to the relevant occupational health and safety authorities, facilitating swift action when necessary. |
| Raising awareness | • Reinforce awareness of extreme heat risks in workplaces and employer responsibilities.<br>• Contribute to public information campaigns, media briefings or public service announcements when requested by the competent authority.<br>• Document worker complaints and observed conditions during the event in a standardized format, and triage onsite visits accordingly to focus inspection capacity on the highest-risk workplaces. |

AFTER EXTREME HEAT EVENTS

OCCUPATIONAL HEALTH AND SAFETY INSPECTORS

**Box UAB2.8. Actions for occupational health and safety inspectors in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Post-event evaluations | • Participate in post-event evaluations with authorities, employers and other actors to provide insights from inspection findings.<br>• Provide inspection-based evidence on compliance, employer practices, worker concerns, enforcement challenges and recurring gaps. |
| Compiling an account of the event | • Compile a detailed account of compliance levels and outcomes during the event.<br>• Identify patterns by sector, workplace type, geography, employment arrangement and worker group. |
| Follow-up inspections | • Conduct follow-up inspections to verify that employers have corrected deficiencies identified before or during the extreme heat event.<br>• Prioritize workplaces where serious risks, worker complaints or heat-related illness were documented. |
| Reviewing and updating inspection protocols | • Contribute to the review and update of heat stress inspection protocols to ensure that future inspections are more effective in identifying and addressing the specific challenges posed by extreme heat events. |
| Sharing lessons learned | • Share lessons learned and best practices with other inspectors and actors to enhance the overall effectiveness of heat stress prevention efforts.<br>• Investigate any heat-related occupational fatalities or serious injuries that occurred during the summer or hot season, and share documented findings with the relevant authorities for regulatory review.<br>• Review inspectorate capacity, equipment, training and safety needs for the next hot season. |

## Actions for employers

PREPARING FOR THE NEXT SUMMER | EMPLOYERS

**Box UAB2.9. Actions for employers in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Risk assessment | • Conduct a comprehensive heat–health risk assessment of the workplace before the summer or hot season.<br>• Identify all potential sources of heat exposure, including ambient air temperature, radiant heat from machinery or processes, direct sunlight, indoor heat sources and poor ventilation.<br>• Assess work intensity, duration and length; availability and access to PPE, clothing, drinking-water, shade or cooled spaces; and opportunities for rest.<br>• Identify workers who may be at increased risk of threats to health from extreme heat (see also Core element 3 – Populations at increased risk).<br>• Where available, involve occupational health professionals, company doctors and medical officers in risk assessments, health monitoring, liaison with authorities and inspectors, and provision of emergency medical services. |
| Preparedness and response plans | • Based on the findings of the risk assessment, develop and implement a preparedness and response plan.<br>• Include procedures and control measures to mitigate extreme heat exposure, including for adequate hydration, work/rest schedules, rest breaks in cool or shaded areas, ventilation and cooling systems, appropriate PPE (such as cooling vests and breathable clothing), and responding to heat-related emergencies in the workplace.<br>• Assign clear responsibilities of designated personnel for implementing and monitoring the plan. |
| Investing in infrastructure | • Invest in infrastructure improvements to monitor and reduce extreme heat exposure.<br>• Install room thermometers or other heat-monitoring devices in relevant work areas; use wet-bulb globe temperature or equivalent indicators where feasible.<br>• Improve ventilation and air circulation in indoor work environments and, where feasible, install or provide access to air-conditioned or cooled spaces.<br>• Provide effective shade for outdoor work areas, through either natural shade or installation of temporary or permanent shade structures.<br>• Procure and stock appropriate heat-protective PPE (such as cooling vests and breathable clothing) ahead of the summer or hot season. |
| Reviewing and updating work schedules and workloads | • Review work schedules before the summer or hot season to identify opportunities to minimize strenuous physical activities during the hottest periods of the day.<br>• Use flexible work hours or early/late start times, job rotation, additional staffing and postponement of non-essential heavy work where feasible.<br>• Adjust workloads based on the prevailing temperature and humidity level, radiant heat, work intensity, worker acclimatization and PPE requirements. Also consider potential co-exposure with vegetation fires and derived smoke (see also Annex 1 for more details on actions to manage combined exposure to extreme heat and vegetation fires).<br>• Break heavy tasks into shorter periods with adequate rest and recovery time. |

PREPARING FOR THE NEXT SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Adequate drinking-water | • Ensure access to sufficient drinking-water in all work areas, including outdoor, mobile, remote and temporary worksites.<br>• Locate drinking-water points conveniently near work areas to encourage frequent hydration, make them easy to access during tasks and rest breaks, and ensure that they are regularly replenished and maintained.<br>• Actively encourage workers to drink water regularly throughout the day, even if they do not feel thirsty, and consider scheduling regular hydration breaks – particularly during periods of extreme heat or strenuous work. For workers engaged in heavy physical activity, provide electrolyte-containing beverages to replenish salt lost through sweat. |
| Training | • Provide training to all occupational health and safety professionals, relevant managers, supervisors and workers. Training should be tailored to the specific risks of the job and work environment, and should cover aspects such as regulations, the risks of heat-related illnesses, their symptoms, prevention strategies, and emergency and first aid procedures (see also Annex 3 on signs and symptoms of heat-related illness). Regular refresher training should be provided, especially before the start of the summer or hot season. |
| Establishing clear communication channels | • Establish clear channels through which workers can easily and confidentially report any heat-related concerns, discomfort or symptoms (see also Annex 3 on signs and symptoms of heat-related illness) without fear of reprisal or negative consequences.<br>• Designate a workplace heat stress focal point with clear authority to escalate concerns and coordinate among managers, supervisors, occupational health professionals and worker representatives.<br>• Ensure that workers know how to report symptoms, request support, stop unsafe work and seek medical help. |
| Mass gatherings | • For employers participating in or supporting mass gatherings (such as concerts, religious events, festivals and sporting events), coordinate with event organizers to align heat–health protocols and event safety plans (see also Annex 2 on mass gatherings during periods of extreme heat).<br>• Conduct pre-event heat–health risk assessments tailored to temporary and mobile work settings, including the need for onsite health-care personnel.<br>• Ensure that health and medical services are available on site, appropriately staffed and equipped to manage heat-related emergencies.<br>• Ensure access to drinking-water, shade, rest areas, emergency transport and communication systems for workers.<br>• Communicate clear, practical health advice to employers on how to prevent and reduce heat-related risks.<br>• Monitor overall requests from attendees related to their health and/or adverse health events to inform further activities and planning. |

DURING SUMMER

EMPLOYERS

**Box UAB2.10. Actions for employers in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Monitoring workplace temperatures | • Monitor workplace temperatures regularly and adjust work activities accordingly to minimize extreme heat exposure.<br>• Record heat conditions, controls implemented and any worker symptoms or incidents. |

DURING SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Improving ventilation and cooling | • Inspect and maintain ventilation, fans, cooling systems, shaded areas and cooled rest spaces to ensure that they remain functional.<br>• Improve airflow and reduce heat retention in indoor workplaces wherever feasible.<br>• Repair or adapt cooling and ventilation systems promptly when they fail or become insufficient. |
| Flexible work schedules or modification of tasks | • Schedule more physically demanding tasks for cooler times of the day, such as early morning or late afternoon.<br>• Rotate workers between more and less strenuous jobs to reduce prolonged exposure to extreme heat and heavy exertion.<br>• Increase staffing, postpone non-essential heavy work or modify tasks when heat risk increases. |
| Frequent rest breaks | • Ensure that workers take frequent rest breaks in cool or shaded areas.<br>• Increase the frequency and duration of breaks according to heat risk, work intensity, PPE use and acclimatization status.<br>• Provide access to clean-air and cool rooms (such as air-conditioned rooms or designated cool-down areas) so that workers can rest and cool down. |
| Encouraging and facilitating hydration | • Ensure that drinking-water is readily available at all times and located close to work areas.<br>• Encourage workers to drink water frequently throughout the day.<br>• Consider providing water bottles or other means for workers to access and carry water easily. Reminders to hydrate can be incorporated into work routines. |
| Appropriate PPE that minimizes heat stress | • Provide PPE that is designed to minimize heat retention, such as lightweight and breathable clothing, while maintaining safety where feasible.<br>• Review whether required PPE increases heat strain, and provide cooling aids, additional breaks or safer alternatives when needed.<br>• Consider whether cooling vests or other types of personal cooling gear might be appropriate to help workers stay cooler without compromising their safety. |
| Buddy system | • Establish a buddy system where workers look out for each other and report any concerns they may have about a colleague's well-being.<br>• Instruct workers to report concerns about a colleague's condition immediately and to seek help when symptoms appear (see also Annex 3 on signs and symptoms of heat-related illness). |
| Regular safety briefings | • Provide regular safety briefings during the summer or hot season, especially when heat alerts are issued.<br>• Brief supervisors and workers on current heat risk, monitoring duties, work/rest schedules, hydration provision and escalation pathways for symptomatic workers. |

**Box UAB2.11. Actions for employers in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Measures to reduce extreme heat exposure | • Activate the workplace heat stress response plan and notify all workers, supervisors and onsite contractors of the elevated risk level and applicable controls.<br>• Ensure that supervisors understand which controls are mandatory at the current alert level.<br>• Reschedule outdoor work and other strenuous activities, if necessary, to cooler parts of the day, such as early morning or late evening, or postpone any non-essential tasks that can be delayed safely until the extreme heat event subsides.<br>• Monitor adherence with the heat stress prevention programme.<br>• Ensure that workers have readily available access to designated cooling areas where they can take their breaks and recover from the heat. For indoor workplaces without AC, maximizing ventilation is essential (see also Annex 1 for more details on actions to manage combined exposure to extreme heat and vegetation fires). |
| Rest breaks | • Ensure that shaded, ventilated or cooled recovery areas are available and accessible to all workers.<br>• Implement emergency work/rest schedules by increasing the frequency and duration of (paid) rest breaks, which should be taken in cool environments, such as air-conditioned rooms or well-ventilated, shaded areas, to allow the body to lower its core temperature effectively.<br>• Increase supervisor checks to confirm that breaks are taken and hydration is maintained. |
| Reducing physical demands | • Promote a reduction of physical demands and workloads for workers during the hottest parts of the extreme heat event.<br>• Assign lighter tasks, reducing the pace of work and/or length of work shifts, providing mechanical aids to reduce manual labour.<br>• Increase the number of workers assigned to a task to lessen the burden on individuals, where possible. |
| Promoting hydration | • Ensure continuous access to sufficient drinking-water throughout the extreme heat event, including at outdoor, mobile, remote and temporary worksites.<br>• Actively remind workers to drink regularly, before they feel thirsty, and provide practical means to carry water where work is mobile or dispersed – such as refillable bottles, insulated containers or mobile water stations.<br>• Schedule reminders for frequent fluid intake. Provide additional hydration support water, such as electrolyte-containing beverages to replenish salt lost through sweat offering. |
| Monitoring workers for heat stress | • Actively monitor workers for signs or symptoms of heat stress throughout the work shift, using supervisor observation and buddy systems (see also Annex 3 on signs and symptoms of heat-related illness), and ensure prompt medical attention if needed.<br>• Ensure that supervisors conduct regular checks during peak heat periods and that workers are encouraged to report symptoms early.<br>• Immediately remove any worker showing signs of heat stress from exposure, and provide appropriate support. |
| Suspending activity | • Suspend work activities if conditions become too dangerous due to extreme heat, when required by law, official guidance, workplace thresholds or when conditions pose a serious and immediate risk to worker health<br>• Ensure that no worker is required or pressured to continue work under unsafe heat conditions. |

DURING EXTREME HEAT EVENTS CONTINUED

| Action area | Actions |
|---|---|
| Providing immediate cooling measures if needed | • Provide immediate onsite cooling measures for workers showing signs of heat stress, including moving them to a shaded or cooled area, removing excess clothing or PPE where safe, and initiating active cooling using cool water or wet cloths. If symptoms do not improve, contact emergency services.<br>• Ensure that all staff know how to apply emergency cooling measures and where equipment is located. |

AFTER EXTREME HEAT EVENTS

EMPLOYERS

**Box UAB2.12. Actions for employers in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Reviewing and evaluating the response plan | • Conduct a structured debrief after extreme heat events with managers, supervisors, workers, occupational health staff, safety representatives and unions where present.<br>• Review and evaluate the effectiveness of the response plan.<br>• Consider how well the plan was implemented and whether it achieved its intended objectives in protecting workers; identify any challenges or areas where the plan could be improved for future events. |
| Feedback | • Gather feedback from workers, supervisors and occupational health and safety inspectors on their experiences during the event, highlighting what worked well from their perspectives, what challenges they faced, and what suggestions they have for improving the response in the future.<br>• Pay particular attention to feedback from workers at increased risk of heat-related harm. |
| Evaluating the performance of cooling infrastructure | • Evaluate the performance of cooling infrastructure, procedures and other measures, identifying failures, limitations or areas where improvements or upgrades are needed.<br>• Ensure the reliability and effectiveness of these controls during future extreme heat events. |
| Analysing incidents of heat-related illness | • Review all heat-related symptoms, first aid cases, medical complaints, work stoppages, productivity disruptions and safety incidents.<br>• Analyse the contributing factors to each incident and identify any possible issues or failures in prevention measures that may have played a role.<br>• Document corrective actions and assign responsibility for completing them before the next hot season. |
| Developing and implementing improvements | • Develop and implement the necessary improvements to plans, protocols and infrastructure to ensure better protection for workers during future events. |
| Replenishing supplies | • Restock and test cooling equipment, heat-protective PPE, first aid kits, electrolyte solutions and any other heat management resources. |
| Communicating lessons learned | • Communicate lessons learned and updated procedures to all workers, ensuring that everyone is aware of what worked well and what needs to be done differently, and reinforces the employer's commitment to worker safety and well-being. |

# User action brief 3 – Urban and built environment domain

## Context

The built environment plays a critical role in either exacerbating or mitigating exposure to extreme heat. Dense urban morphology, low vegetation cover, heat-absorbing surfaces and poorly ventilated buildings amplify exposure through the urban heat island effect, with cities typically several degrees warmer than surrounding rural areas – especially at night, when sustained high indoor temperatures impair physiological recovery and sleep. A substantial share of heat-related morbidity and mortality occurs indoors and at home, so the thermal performance of building stock – including roof and wall insulation, glazing, shading, natural and mechanical ventilation, and access to cooling – is a major determinant of population health risk during the summer or hot season. Health-focused spatial planning and management can substantially reduce exposure to extreme heat through interventions such as green and blue infrastructure, heat-resilient buildings, shaded public spaces, accessible cooling and clean-air facilities, and improved ventilation. This user action brief proposes long- and short-term actions for the actors who shape and manage public urban spaces and the local built environment so that they can reduce heat-related health risks in a changing climate. Creating heat-resilient built environments requires sustained collaboration and coherence across the national, regional and local levels of governance – and coordination across the health, urban planning, housing, transport, environment, energy and civil protection sectors.

## Who should read this

This brief is intended for the following actors within the urban and built environment domain.

- It supports local authorities who act as policy-makers by establishing policies and regulations that shape the living environment – guiding land use, building standards and infrastructure – and by ensuring compliance with safety, health and sustainability regulations.
- It informs city, municipal and local managers who serve as implementers by overseeing the daily operations and administration of municipal and local services, and by ensuring that policies are implemented effectively before, during and after the summer or hot season and extreme heat events.

## What is presented in this brief

This user action brief proposes actions for managing the health impacts of heat in public urban spaces and the local built environment. Actions are presented for each audience group, organized around the four key stages of heat–health action: planning and preparedness (ongoing and before the summer or hot season); monitoring and early action (during the summer or hot season); emergency response (during extreme heat events); and evaluation and improvement (after extreme heat events and at the end of the season). While many actions follow this four-stage framing, others in this domain are for the long term and not seasonally bound; these are best embedded in routine planning and infrastructure cycles. The brief focuses on structured planning and interventions within formal governance systems, although the actions are also adaptable to informal and periurban settings.

The action boxes in this user action brief are organized according to the various actors within the urban and built environment domain. Boxes UAB3.1–UAB3.4 present suggested actions for local authorities who act as policy-makers; boxes UAB3.5–UAB3.8 present suggested actions for city, municipal and local managers who are responsible for operational delivery – including those running cooling centres, public water access, parks, public transport and municipal buildings.

This brief can be read on its own, but readers are encouraged to consult it alongside the core elements in Part 1 of this guidance, in particular Core element 1 – Governance, Core element 3 – Populations at increased risk and Core element 6 – Reducing heat exposure. For more details on actions to manage combined exposure to extreme heat and vegetation fires, see also Annex 1.

## Key resources[14]


Cities and Climate Change Initiative [website]. UN-HABITAT; 2026 (https://unhabitat.org/initiative/cities-and-climate-change-initiative).

Climate adaptation in built environment [website]. Netherlands Enterprise Agency; 2024 (https://english.rvo.nl/topics/climate-adaptation-built-environment).

Cool Cities Network [website]. C40 Cities; 2026 (https://www.c40.org/networks/cool-cities-network/).

Heatwave guide for cities. Geneva: International Federation of Red Cross and Red Crescent Societies; 2019 (https://www.ifrc.org/document/heat-wave-guide-cities).

Manage and adapt to heat in the city [website]. Global Heat Health Information Network; 2025 (https://heathealth.info/in-the-city/).

Urban adaptation in Europe. Copenhagen: European Environment Agency; 2020 (EEA Report 12/2020; https://www.eea.europa.eu/en/analysis/publications/urban-adaptation-in-europe)

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WHO housing and health guidelines. Geneva: World Health Organization; 2018 (https://iris.who.int/handle/10665/276001). Licence: CC BY-NC-SA 3.0 IGO.

World Bank Handbook on Urban Heat Management in the Global South. Washington, DC: World Bank; 2025 (https://openknowledge.worldbank.org/entities/publication/92e9d108-0c0a-4369-b22a-fba4ba850d1c).


[14] All references were accessed 1–4 May 2026.

## Actions for local authorities (policy-makers)

PREPARING FOR THE NEXT SUMMER | LOCAL AUTHORITIES (POLICY-MAKERS)

**Box UAB3.1. Actions for local authorities in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Integrated heat risk assessments | • Commission integrated heat risk and vulnerability assessments at the neighbourhood scale, including mapping of urban heat islands, building stock, exposure of populations at increased risk of threats to health from extreme heat, and access to green and blue infrastructure.<br>• Ensure that green and blue infrastructure is planned and managed to avoid creating habitats for vector-borne disease or increasing the risk of vegetation fires.<br>• Involve planning, health, housing, employment, social service, labour, transport, energy, environment and emergency management departments to ensure a cross-sectoral assessment and coordinated implementation. |
| Integrating heat resilience into planning and policy | • Adapt local HHAPs to include short-, medium- and long-term actions for the built environment.<br>• Integrate heat reduction actions into existing municipal planning processes, including spatial and development plans, infrastructure investment plans, climate adaptation plans, and mobility, housing and energy strategies rather than treating heat as a standalone HHAP add-on.<br>• Gradually integrate heat adaptation requirements into statutory spatial plans, zoning regulations, development control policies and permitting processes, including provisions for shade, ventilation corridors, reflective or cool materials, green and blue infrastructure and safe indoor temperatures.<br>• Set local policy objectives and standards for cooling infrastructure such as green corridors, water elements and public shade.<br>• Establish a policy framework for designated public buildings – such as libraries, public pools, community centres, malls and places of worship – as cooling refuges. Agree opening hours and capacity in advance; signpost them to the public.<br>• Ensure that cooling spaces are safe, well maintained, accessible and welcoming to all community members including populations at increased risk of heat-related harm.<br>• Track progress against long-term heat resilience objectives, such as green-space expansion, tree canopy coverage, building standard uptake and public realm cooling every two to three years.<br>• Report annually on shorter-cycle preparedness actions, including cooling space readiness, public water access, communication and maintenance. |
| Promoting and protecting green and blue infrastructure | • Adopt and implement regulations and incentives to protect existing green and blue spaces, and more broadly natural spaces. Expand tree canopy/vegetation cover using climate-appropriate, low-allergen species.<br>• Codify protection of cold-air outflows in urban planning regulation so that topography and wind-driven natural cooling is preserved.<br>• Prioritize neighbourhoods with high heat exposure and limited access to cooling.<br>• Require long-term maintenance plans for green and blue infrastructure. Promote smaller-scale greening (such as street trees, pocket parks and de-paving) alongside larger projects.<br>• Engage populations, including those at increased risk, in the co-design of green and blue spaces – addressing usability (lighting, toilet facilities, accessibility, park wardens, distance, transport and opening hours) and ensuring that the spaces serve as both restorative public spaces and cooling resources. |

| Action area | Actions |
|---|---|
| Improving building standards over time | • Advocate, adopt or strengthen standards that support passive cooling (such as insulation, ventilation strategies, shading and cool roofs), energy efficiency, and safe indoor temperatures for new buildings, major renovations and all buildings owned by local authorities.<br>• Offer financial or regulatory incentives where building codes lag behind best practice. |
| Fostering partnerships and innovation | • Apply a health-in-all-policies approach by integrating heat protection objectives into urban projects related to transport, housing, social services, energy, environment and public space.<br>• Establish formal collaboration mechanisms, including memoranda of understanding, with private sector partners, civil society organizations, community groups and representatives of populations at increased risk and those who work with them, to monitor heat impacts, test innovative cooling solutions and share data.<br>• Establish ongoing mechanisms such as citizen panels, community workshops and participatory mapping to incorporate insights from local populations into planning decisions. |
| Encouraging private sector action | • Provide incentives, such as grants and tax relief, for businesses and homeowners to invest in heat resilience measures, including greening, cool roofs, shading, building envelope insulation and energy-efficient cooling systems. |
| Coordinating public awareness campaigns | • Where applicable, support and contribute to public information campaigns led by health authorities or civil society partners about heat risks, available cooling options and how to stay safe (see also public health message bank in Part 3).<br>• Issue protocols for official municipal heat risk communication, and approve official heat risk messaging issued by municipal departments and partner agencies, ensuring consistency with national, regional and local guidance and accessibility for diverse audiences. |
| Training | • Mandate tailored training on heat protection for staff in administration, kindergartens, senior centres, social institutions and public-facing services, focusing on recognizing heat–health risk, guiding the public, supporting populations at increased risk and activating local protocols.<br>• Fund and promote competency-based training programmes for urban planners, municipal engineers and built environment officers on heat-resilient design, materials and standards. |
| Public access to water and shading | • Secure sustainable funding mechanisms for installation, operation and routine maintenance of public drinking-water outlets.<br>• Mandate installation and maintenance of public drinking-water fountains and shading at key points in public space, public transport hubs and markets, and along high-traffic pedestrian routes.<br>• Develop local policies that promote or require free water bottle refills in shops, public buildings and offices. |
| Equity and populations at increased risk | • Prioritize heat resilience investments for neighbourhoods with the highest combined heat exposure and social vulnerability indices, with annual reporting on distributional outcomes. |
| Long-term financing and budget integration | • Embed dedicated heat adaptation budget lines in the multiyear capital budget, and require alignment of major infrastructure projects with current heat risk assessments. |

DURING SUMMER

LOCAL AUTHORITIES (POLICY-MAKERS)

**Box UAB3.2. Actions for local authorities in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Promoting the use of public cooling space | • Support policies or initiatives that extend access hours to parks or shaded public areas during cooler morning and evening periods, with attention to lighting and safety, while addressing accessibility, maintenance and transport considerations.<br>• Where legally and operationally feasible, issue temporary policy directives to extend opening hours and waive entry fees for public cooling spaces during heat-alert periods. |
| Communication | • Communicate the location and functionality of public drinking-water outlets and cooling spaces to the public – through municipal websites, mobile apps (for example, integrated with city or transport apps), printed maps in transport hubs, local media and social media – and update these regularly.<br>• Coordinate joint messaging with health authorities, transport operators and public utility providers on heat advisories, service modifications and emergency contacts. |
| Oversight of operational readiness | • Receive readiness reports from municipal managers on cooling centre status, drinking-water access points and outreach to populations at increased risk of heat-related harm.<br>• Act on identified gaps by reallocating resources, issuing instructions or escalating unresolved issues. |

DURING EXTREME HEAT EVENTS

LOCAL AUTHORITIES (POLICY-MAKERS)

**Box UAB3.3. Actions for local authorities in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Facilitating coordination with utility providers | • Activate the pre-agreed contingency plan with public utility providers, track outages, and request priority restoration for facilities serving populations at increased risk of heat-related harm – including hospitals, care homes, cooling centres and other essential public facilities. |
| Expanding access to cooling spaces | • Authorize the extension of operating hours in green parks and cooling centres – if possible, keep cooling spaces open for longer hours or overnight, if needed.<br>• Support policies and partnerships that allow extended or 24/7 operation of cooling centres ensuring that safety, staffing, accessibility, transport and communication arrangements are in place.<br>• Direct municipal services to improve accessibility, including transport options for populations at increased risk. |
| Strategic public communication | • Oversee coordination among departments to provide timely and clear information about possible and concrete extreme heat impacts on services (such as transport, waste collection and energy supply) and public safety, using inclusive and accessible communication channels. |
| Equity-focused emergency outreach | • Authorize and fund emergency outreach to high-risk neighbourhoods, including transport assistance to cooling spaces, welfare checks for socially isolated residents, and targeted support for people experiencing homelessness, disability, energy poverty or limited mobility. |

AFTER EXTREME HEAT EVENTS

LOCAL AUTHORITIES (POLICY-MAKERS)

**Box UAB3.4. Actions for local authorities in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Evaluation of heat response measures | • Support regular assessments of the performance and usage of cooling centres, temporary measures, building regulations and public communication strategies. Use the findings to improve local heat strategies, investment priorities and operational guidance. |
| Infrastructure impact reviews | • Establish or strengthen reporting mechanisms to identify heat-induced damage to public infrastructure (such as roads, energy, transport and utilities).<br>• Use reports to plan necessary repairs, maintenance or resilience upgrades. |
| Stakeholder debriefs | • Facilitate or participate in structured post-event reviews with municipal managers, planners, developers, health agencies and community groups to share lessons learned and refine cross-sectoral strategies. |
| Long-term investment commitments | • Commit multiyear investment to heat adaptation infrastructure based on documented gaps, prioritizing the most underserved areas and communities with the highest combined heat exposure and social vulnerability. |

## Actions for city, municipal and local managers (implementers)

PREPARING FOR THE NEXT SUMMER | CITY, MUNICIPAL AND LOCAL MANAGERS (IMPLEMENTERS)

**Box UAB3.5. Actions for city/municipal/local managers in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Urban heat risk assessments | • Conduct local urban heat risk assessments with relevant municipal and planning authorities, mapping urban heat islands and identifying populations at increased risk of threats to health from extreme heat.<br>• Translate heat risk assessment findings into prioritized site-level interventions with assigned responsible departments, timelines and budgets.<br>• Use assessment findings to adapt the local HHAP with clear roles and timelines across departments (health, social services, education, housing, planning and emergency management).<br>• Apply the sponge-city principle (permeable surfaces, sustainable drainage and water retention features) to support urban cooling and resilience to combined heat and heavy-rainfall events. |
| Heat-resilient zoning and land use | • Support heat-resilient zoning and land use measures that prioritize green areas, blue infrastructure and permeable surfaces – especially in dense, high-risk zones. |
| Integrating green and blue infrastructure into master plans | • Ensure that major redevelopments include parks, tree-lined streets and/or water features.<br>• Involve communities at increased risk of heat-related harm (see also Core element 3 – Populations at increased risk) in planning to ensure access to the green and blue areas during extreme heat events.<br>• For green spaces, use fast-growing, drought-tolerant, large-canopy, low-allergen and native tree species, where feasible. |
| Urban cooling corridors | • Develop urban cooling corridors by creating or expanding tree-lined walkways, green belts, water features and connected public spaces that improve airflow and reduce local heat exposure.<br>• Maintain and keep clear existing cooling corridors so that topography and wind-driven natural cooling is preserved. |
| Upgrading municipal buildings | • Gradually upgrade municipal buildings with insulation, external shading, reflective and/or green roofs, and efficient cooling – prioritizing buildings hosting populations at increased risk such as schools, kindergartens, care homes, health facilities, libraries and community centres. |
| Housing upgrades | • Plan targeted heat resilience-related housing upgrades for vulnerable housing stock – especially in public and social housing – prioritizing insulation, shading, ventilation, cool roofs and safe indoor temperatures.<br>• Develop financing strategies and partnerships to seek funding for retrofitting vulnerable public and social housing stock. |
| Heat adaptation funding streams | • Establish dedicated heat adaptation funding streams for large-scale tree planting, public space cooling, climate-proof materials and green corridor initiatives. |
| Upgrading key public facilities | • Upgrade key public facilities – such as community centres and libraries – with cooling systems, drinking-water stations and shaded areas. |
| Ensuring access to cooling and hydration | • Ensure access to cooling and hydration by preparing a network of cooling centres and drinking-water stations, especially for populations at increased risk. |

PREPARING FOR THE NEXT SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Cross-sectoral coordination | • Designate a cross-sectoral heat response coordinator within the municipality or local jurisdiction, with clear authority to convene departments, call together partners and escalate unresolved issues during the season.<br>• Coordinate with local departments and service providers to support readiness in schools, childcare settings, care homes, health facilities and other facilities serving populations at increased risk.<br>• Coordinate with energy providers to anticipate peak-demand grid loads during the upcoming summer or hot season; agree on procedures to maintain critical supply during outages; and plan medium-term grid upgrades to reduce the risk of failure during extreme heat events, if needed.<br>• Establish emergency protocols with utility providers (such as drinking-water and energy supply), including escalation triggers, contact points, priority customers, outage reporting and restoration procedures for critical facilities.<br>• Collaborate with local businesses, universities, schools and civil society to innovate cooling solutions (such as pilot projects for new shade materials or low-energy cooling approaches). |
| Public information | • Support public access to heat–health information through hotlines, websites and emergency contact visibility that can guide the public before, during and after extreme heat events (see also Core element 4 – Communication; public health message bank in Part 3).<br>• Although green and shaded outdoor spaces remain valuable year-round, during the most intense phase of an extreme heat event, public messaging should redirect groups at increased risk to indoor cooled spaces wherever available. |
| Access to cool spaces | • Expand access to cool spaces by partnering with community, faith-based and private organizations to open buildings during extreme heat events. Consider the needs of different populations at increased risk. |
| Prepare public bathing facilities | • Monitor bathing-water quality, safety signage and access arrangements before and during the summer or hot season. Install cooling features such as water curtains or mist showers for use during extreme heat. Ensure equitable access for women, older people, children and people with disabilities. |
| Maintaining green and blue spaces | • Maintain green and blue spaces with regular upkeep. Where possible, extend opening hours and add benches or shaded seating to make them more accessible. |
| Small-scale upgrades | • Implement rapid, small-scale improvements in high-risk areas, such as temporary shade, drinking-water stations or cool benches in busy areas. |
| Public water access | • Verify locations, functionality, accessibility and water quality of public drinking-water outlets, and install new outlets where needed.<br>• Repair non-functioning outlets, install temporary or permanent drinking-water points where gaps exist, and monitor drinking-water. |

DURING SUMMER

CITY, MUNICIPAL AND LOCAL MANAGERS (IMPLEMENTERS)

**Box UAB3.6. Actions for city/municipal/local managers in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Monitoring weather alerts and heat–health warnings | • Monitor weather forecast and heat–health warnings, and verify that designated public spaces are ready for use, including adequate shade, ventilation, seating, accessibility and drinking-water access. |

DURING SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Cooling centres and installations | • Activate and oversee the operation of public cooling centres and temporary cooling installations. Promote their locations, opening hours and services through local media, social media and community channels.<br>• Conduct daily readiness checks of cooling centres (including drinking-water availability, signage, accessibility, staffing, seating, safety, toilets and basic supplies) and report status to local authorities.<br>• Mobilize volunteers (such as community heat-watch programmes, civil protection volunteers and NGOs) for transport, cooling centre operations, hydration outreach and check-ins on populations at increased risk of heat-related harm. |
| Public infrastructure | • Regularly inspect public infrastructure such as bus stops, pavements, playgrounds, outdoor seating, waiting areas and pedestrian routes and outdoor seating for excess heat retention.<br>• Add temporary or permanent shade if needed and where feasible. |
| Flexible working hours | • In coordination with occupational authorities, assess and apply flexible working hours for municipal/local staff, including shifting roadworks, waste collection and park maintenance to cooler hours in the early morning or late afternoon (see User action brief 2 – Occupational domain). |
| Supporting groups at increased risk | • Activate registration of residents at increased risk where available and compliant with data protection requirements.<br>• Coordinate health and social services to support populations at increased risk. For days of expected extreme heat, deploy social workers or volunteers and schedule home visits, calls and welfare checks, prioritizing socially isolated people, older people, people with disabilities, people experiencing homelessness and those living in substandard or overheated housing. |
| Daily heat advisories | • Work with health authorities to issue daily heat advisories, covering hydration, sun protection, cooling options, safer outdoor activity times and when to seek help.<br>• Prepare operational versions for first responders and partner agencies, and public-facing versions that use clear thresholds, colour codes or wording changes when escalation occurs to avoid warning fatigue and maintain public attention (see also Core element 4 – Communication). |

DURING EXTREME HEAT EVENTS

CITY, MUNICIPAL AND LOCAL MANAGERS (IMPLEMENTERS)

**Box UAB3.7. Actions for city/municipal/local managers in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Cross-sectoral emergency protocols | • Activate emergency protocols and convene a cross-sector task force involving health, education, civil protection, transport and social service departments, as well as utility providers and community partners, to coordinate real-time measures. Assign contact points to support rapid coordination, problem solving and escalation.<br>• Stand up a 24/7 incident command structure for the duration of the event, with defined roles, shift patterns, hand-over procedures, escalation triggers and decision-making authority.<br>• Mobilize trained volunteers (such as community heat-watch programmes, civil protection volunteers and NGOs) for transport, cooling centre operations, hydration outreach and check-ins on populations at increased risk of heat-related harm. |

DURING EXTREME HEAT EVENTS CONTINUED

| Action area | Actions |
|---|---|
| Extending operating hours | • Extend operating hours of public buildings, public toilets and drinking-water access points in parks and cooling centres. Where feasible, keep cooling spaces open for longer hours or overnight. Ensure that seating, charging stations, accessibility, basic safety arrangements and drinking-water are available. |
| Supporting transport access | • Where feasible, provide free or discounted public transport during peak heat periods to help people reach cooling spaces and avoid walking in extreme heat conditions. |
| Mobile support | • Deploy mobile support teams to areas at increased risk, prioritizing people with limited mobility, and those experiencing social isolation, homelessness and inadequate or overheated housing conditions. If needed, send teams with drinking-water, fans and basic cooling supplies. Check indoor temperatures when needed (see also Core element 3 – Populations at increased risk).<br>• Track mobile support deployment in real time, and reallocate teams to neighbourhoods with rising case reports or service requests. |
| Ensuring access to hydration stations | • Activate public drinking-water points and ensure that fixed water fountains are functional, signposted, accessible and safe to use.<br>• Activate prearranged agreements with businesses and community partners (such as extended retail/café cooling spaces and water bottle refills), and ensure clear public signage and inclusion of participating venues in public information materials. |
| Monitoring critical infrastructure | • Coordinate with operators of public infrastructure – such as energy, drinking-water, wastewater and public transport – to inspect critical assets regularly to detect any heat-related damage early, and to maintain continuity of essential services. |
| Adjusting outdoor work | • In coordination with occupational safety and labour authorities, pause, reschedule or modify physically demanding municipal work during peak heat hours – especially outdoor work, waste collection, road maintenance, parks maintenance and other heat-exposed tasks (see User action brief 2 – Occupational domain). |
| Updating public messaging | • Work with health authorities to disseminate clear, consistent messages on preventing heat-related illnesses and available resources (such as cooling centres, water stations and emergency call numbers) (see also Core element 4 – Communication; public health message bank in Part 3). |

AFTER EXTREME HEAT EVENTS

CITY, MUNICIPAL AND LOCAL MANAGERS (IMPLEMENTERS)

**Box UAB3.8. Actions for city/municipal/local managers in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Reviewing health and service data | • Work with health authorities to collect and review reports from hospitals, emergency services, community centres and outreach teams on heat-related incidents. Identify which neighbourhoods or populations at increased risk of heat-related harm required the most support.<br>• Map heat-related incidents, service requests, cooling centre use and outreach activity by neighbourhood, and overlay with indices of populations at increased risk to identify gaps in response coverage. |

AFTER EXTREME HEAT EVENTS CONTINUED

| Action area | Actions |
|---|---|
| Inspecting municipal infrastructure | • Inspect heat-related damage to public spaces, buildings and systems. Schedule repairs or upgrades as needed. Share findings with planning, infrastructure, utility and other relevant authorities.<br>• Inspect cooling-system performance in public and municipal buildings (natural and mechanical heating, ventilation and AC, and shading); document failures during peak demand and prioritize repairs. |
| Evaluating cooling measures | • Assess usage and feedback on cooling centres (such as capacity limits and comfort levels).<br>• Involve residents, businesses, volunteers, community organizations and staff in structured debriefings. |
| Updating local HHAPs | • Integrate lessons learned into local HHAPs, including revised roles, triggers, communication routes, resource needs and coordination arrangements to improve future response.<br>• Update operating procedures for cooling centre operations, mobile support and interdepartmental coordination based on documented lessons. |
| Planning future investments | • Adjust local budgets to support resilient infrastructure, like drought-tolerant trees, drinking-water outlets, shaded bus stops or passive cooling upgrades.<br>• Prepare and submit prioritized investment proposals to local authorities, with cost estimates, expected benefits, maintenance needs and equity considerations, to inform multiyear capital planning and heat adaptation budgets. |

# User action brief 4 – Social care domain

## Context

Care homes and other social care settings can experience dangerously high indoor temperatures during extreme heat events, amplifying health risks for residents – particularly older adults and people with underlying health conditions, cognitive impairment, limited mobility or reduced ability to regulate body temperature. Older adults are at higher risk because of age-related decline in thermoregulation and thirst perception, frequent comorbidities (cardiovascular, respiratory, renal, neurological and metabolic conditions), and use of medications that interfere with heat dissipation or fluid balance – such as diuretics, antihypertensives, anticholinergics, antipsychotics and some antidepressants. Many social care facilities also have building and operational characteristics that compound exposure: limited active cooling, poor thermal insulation, restricted natural ventilation in shared rooms and constrained workforce capacity to monitor every resident continuously during heat episodes. People who receive care at home, and the social care workers who support them, can also be affected. Because social care settings host populations with elevated baseline risk during heat, they are a priority environment for heat–health risk prevention, monitoring and response. Measures related to occupational heat exposure of the social care workforce itself are addressed in User action brief 2 – Occupational domain, and can be adapted to specific sector settings.

## Who should read this

This brief is intended for the following actors involved in delivery of social care.

- It supports social care authorities at national, regional and local levels who set policies and standards, commission services, allocate resources, provide guidance, and coordinate with health and emergency services in relation to care homes and other social care services within their jurisdiction.
- It informs social care managers, who hold operational responsibility for managing facilities and services, and for ensuring continuity and quality of care during extreme heat.
- It assists the social care workforce, including front-line care workers, support workers, home-care workers and other staff providing direct care and support to residents and service users in a range of settings.

## What is presented in this brief

This user action brief contains a structured set of proposed actions to manage extreme heat in social care settings. Actions are presented for each audience group, organized around the four key stages of heat–health action: planning and preparedness (ongoing and before the summer or hot season); monitoring and early action (during the summer or hot season); emergency response (during extreme heat events); and evaluation and improvement (after extreme heat events and at the end of the season).

The action boxes in this user action brief are organized according to the various actors within the social care domain. Boxes UAB4.1–UAB4.4 present suggested actions for social care authorities; boxes UAB4.5–UAB4.8 present suggested actions for social care managers; and boxes UAB4.9–UAB4.12 present suggested actions for the social care workforce.

This brief is designed to be read on its own, but readers are encouraged to consult it alongside the core elements of Part 1, in particular Core element 1 – Governance, Core element 3 – Populations at increased risk, Core element 5 – Health system resilience and Core element 6 – Reducing heat exposure, which provide the broader framework for protecting people in care settings. The public health message bank in Part 3 supports communication efforts by actors in the health domain. For more details on actions to manage combined exposure to extreme heat and vegetation fires, see Annex 1.

## Key resources[15]


Community care during extreme heat: heat illness: prevention and preliminary care. Ottawa: Health Canada; 2024 (https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/climate-change-health/community-care-extreme-heat-heat-illness-prevention-preliminary-care-health-canada-2011.html).

Heat-Health Alert action card for health and social care providers. London: UK Health Security Agency; 2025 (https://www.gov.uk/guidance/heat-health-alert-action-card-for-health-and-social-care-providers).

Interventions to mitigate heat-related harms among vulnerable populations. Toronto: Public Health Ontario; 2023 (https://www.publichealthontario.ca/-/media/Documents/H/2023/heat-related-harms-vulnerable-populations.pdf?rev=7393a35b55cd45f784b8600faac6a8a9&sc_lang=en&hash=F077D550424F305BC6560A11CB06E962).

Supporting vulnerable people before and during hot weather: social care managers. London: UK Health Security Agency; 2024 (https://www.gov.uk/guidance/supporting-vulnerable-people-before-and-during-hot-weather-social-care-managers).


[15] All references were accessed 1–4 May 2026.

## Actions for social care authorities

PREPARING FOR THE NEXT SUMMER | SOCIAL CARE AUTHORITIES

**Box UAB4.1. Actions for social care authorities in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Developing and mandating local guidance | • Ensure that clear local heat–health guidance is available specifically for social care services, institutions and facilities, aligned with the locally applicable HHAP and consistent with national or regional heat–health plans.<br>• Set minimum standards for facility-level heat preparedness plans and protocols, covering risk assessment, staff training, building checks, cooling strategies, hydration protocols, communication procedures and emergency escalation.<br>• Require all licensed social care providers within the jurisdiction to adopt and implement the local heat–health guidance, with documented compliance reporting. |
| Funding | • Allocate specific funding to invest in cooling equipment in social care facilities – including external shading solutions such as awnings, pergolas and shade sails, geothermal heat pumps, fans and high-efficiency AC for common areas and rooms of residents at increased risk of threats to health from extreme heat – and staff training on heat safety.<br>• Prioritize funding for social care institutions and facilities in the most vulnerable areas or serving disadvantaged communities.<br>• Direct heat resilience-related investments preferentially to social care settings located in the most vulnerable areas or serving disadvantaged communities.<br>• Establish dedicated funding lines for facility-level cooling retrofits in older or thermally vulnerable social care buildings, prioritized by exposure and resident heat risk profile. |
| Communication | • Establish a clear and quick communication system for social care services, institutions and facilities to receive timely alerts and warnings from meteorological services and public health authorities (see also Core element 2 – Heat–health warning system; Core element 4 – Communication).<br>• Coordinate joint communication protocols with health authorities, emergency services and social care providers to ensure consistent alert and escalation pathways and response instructions during heat events. |
| Guidelines on minimum staffing levels | • Establish guidelines on minimum staffing levels required to promote service continuity during periods of extreme heat to ensure adequate monitoring and care. |
| Annual heat risk assessments | • Mandate annual heat risk assessments for all social care services, institution and facilities, reviewing and, where necessary, updating care plans to address heat-related risks. Identify individual vulnerabilities and specific needs during extreme heat.<br>• Require submission of facility-level heat risk assessments to the social care regulator at agreed intervals, and act on identified risks. |
| Public awareness campaigns | • Support public awareness campaigns targeting social care services, institutions and facilities for social care providers, staff, residents, families and carers. Provide resources and information on heat-related risks and preventive measures for populations at increased risk of heat-related harm (see also Core element 3 – Populations at increased risk; public health message bank in Part 3). |

PREPARING FOR THE NEXT SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Training | • Mandate and regulate staff training sessions for all social care services, institutions and facilities, providing education for managers and staff on heat-related illnesses in populations at increased risk, hydration and cooling techniques, prevention strategies, recognizing symptoms (see also Annex 3 on signs and symptoms of heat-related illness) and emergency response procedures.<br>• Set minimum competency standards for social care managers and staff related to heat-related harm, including heat illness recognition, cooling techniques, hydration protocols, resident monitoring, communication with families and emergency response. Require periodic refresher training. |
| Coordination with health and emergency services | • Establish formal coordination mechanisms between local health authorities, emergency services and social care providers, covering data sharing, mutual support and shared protocols for residents at increased risk during heat events. |
| Workforce well-being and protection | • Require worker protection measures for the social care workforce during extreme heat events – in alignment with occupational heat stress regulations – covering aspects including hydration, rest breaks, shift adjustments, PPE considerations and procedures for reporting heat strain (see User action brief 2 – Occupational domain). |

DURING SUMMER

SOCIAL CARE AUTHORITIES

**Box UAB4.2. Actions for social care authorities in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Issuing timely alerts and guidance | • Regularly disseminate heat safety advice and reminders to social care services, institutions and facilities through officially agreed channels, reinforcing key preventive measures for residents, staff, families and carers. If needed, communicate any heat–health alerts to all care facilities within the jurisdiction promptly, including the expected risk level, required actions, reporting expectations and escalation contacts. |
| Resource sharing and support | • Make provisions to facilitate access to additional resources and support for social care services, institutions and facilities that may be experiencing challenges in managing the heat, including access to cooling equipment, hydration supplies, temporary staffing support, technical advice and emergency maintenance.<br>• Activate prearranged mutual aid agreements among providers for staff redeployment, equipment sharing, transport assistance and emergency cooling support. |
| Compliance monitoring during the season | • Conduct targeted compliance checks on facility-level heat preparedness plans and protocols before peak heat periods, focusing on resident risk assessment, cooling capacity, hydration arrangements, staffing, communication and emergency escalation. Follow up on identified gaps. |
| Coordination with health services during the season | • Request regular updates from social care providers and health services on heat-related cases, hospitalizations and resource needs, and act on emerging risks. |

DURING EXTREME HEAT EVENTS

SOCIAL CARE AUTHORITIES

**Box UAB4.3. Actions for social care authorities in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Enhanced monitoring and support systems | • Activate enhanced monitoring and support systems by implementing heightened oversight of social care services, institutions and facilities. Ensure that they are following their heat response plans and providing necessary support.<br>• Activate emergency reporting requirements for social care providers – such as heat-related incidents, hospitalizations, deaths, staffing shortages, cooling failures and capacity strain – at agreed intervals during the event. |
| Liaison with health services | • Maintain close communication with health services to support coordinated clinical advice and response, referrals, escalation, resident transfers, and continuity of care during extreme heat.<br>• Coordinate at the executive level with local health authorities and emergency services on resident transfers, ambulance demand, bed availability and surge capacity for residents at increased risk of heat-related harm. |
| Emergency authorizations and resources | • Authorize emergency funding, equipment redistribution and temporary staffing arrangements among providers as needed to maintain safe care during the event. |
| Public communication on social care continuity | • Communicate clearly with caring families, civil society organizations and the public on continuity of social care services, protective actions being taken and how to escalate concerns about residents during the event. |

AFTER EXTREME HEAT EVENTS

SOCIAL CARE AUTHORITIES

**Box UAB4.4. Actions for social care authorities in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Reviewing and updating policies and providing feedback | • Review and adjust social care heat policies, guidelines and standards, based on post-event or season review findings. Provide feedback to social care services, institutions and facilities on their performance, identified gaps and areas for enhancement.<br>• Conduct post-event or season debriefing sessions with social care managers, staff, workers' representatives and relevant partners. Hold meetings to discuss their experiences during the extreme heat event, gather feedback on the effectiveness of the response, and identify any difficulties encountered.<br>• Evaluate how effectively social care providers implemented the local HHAP, facility-level heat protocols and emergency procedures. Identify any gaps or areas that need to be strengthened for future heat events.<br>• Document key lessons learned and effective strategies used during the extreme heat event to inform future training, response plan updates and inspection priorities.<br>• Audit heat-related morbidity and mortality among social care residents during the event, with disaggregation by setting type, age, underlying vulnerability and location, where possible. |
| Public reporting and accountability | • Publish a post-event report covering social care performance, outcomes and planned changes. Engage civil society, resident advocacy groups, families and service provider representatives in reviewing findings. |

## Actions for social care managers

PREPARING FOR THE NEXT SUMMER | SOCIAL CARE MANAGERS

**Box UAB4.5. Actions for social care managers in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Establishing a facility protocol | • Prepare a facility-specific heat–health plan or protocol aligned with the applicable national, regional or local HHAP. It should include facility risk assessments, alert triggers for action, staff responsibilities, resident risk stratification, communication arrangements and links with health and emergency services.<br>• Test the facility's heat–health plan or protocol annually through a tabletop exercise and an onsite simulation. Document findings, assign corrective actions and update the plan or protocol before the next hot season. |
| Allocating resources and ensuring equipment functionality | • Ensure that essential heat response resources are available, functional and checked regularly, including AC units, fans, thermometers (in common areas and residents' rooms), hydration supplies, shades and curtains, and appropriate PPE for staff.<br>• Identify and designate a clean-air and cool room or cooling spaces for use during extreme heat or compound heat–smoke events, with clear access routes, signage, seating and hydration supplies.<br>• Schedule and document pre-season maintenance of AC, fans, ventilation equipment and backup power, with documented inspection records. Ensure that faults are repaired before the summer or hot season begins. |
| Identifying residents at increased risk | • In collaboration with health-care professionals, identify and maintain a clear and accessible list of residents at increased risk of threats to health from extreme heat due to age, medical conditions, medications and mobility issues, as well as those who may not be able to communicate their needs effectively.<br>• Consult medical staff about whether individual residents require specific hydration plans, fluid restrictions, electrolyte solutions or other clinically appropriate hydration support, according to their physiological needs.<br>• Update individual care plans for residents at increased risk of heat-related harm to include heat-specific triggers, monitoring frequency, hydration needs, cooling measures, medication considerations and escalation pathways. |
| Planning adjustments to daily routines | • Plan adjustments in daily routines for residents and staff during the summer or hot season and extreme heat events to avoid strenuous activities during peak heat hours. Schedule activities, outdoor time and ventilation practices during cooler parts of the day, where safe and appropriate. |
| Plan for increased hydration and nutritional needs | • Evaluate and adapt a specific meal and hydration plan during extreme heat periods, according to residents' physiological and nutritional needs.<br>• In collaboration with health-care professionals, catering services and staff, make provisions for adequate hydration supplies and lighter, more hydrating meal options during extreme heat, including the amount and frequency of offering fruit, salads, soups and other suitable items. |
| Pre-summer staff training | • Ensure that all relevant staff – including care assistants, nurses, administrative staff, catering staff, cleaning staff, maintenance staff and managers – receive training on heat-related illness, prevention, symptom recognition, hydration, cooling techniques and emergency response, including first aid for heatstroke and heat exhaustion (see also Annex 3 on signs and symptoms of heat-related illness).<br>• Designate a facility heat response coordinator with clear authority during alerts, and brief all staff on the chain of command, decision-making roles and escalation contacts. |

PREPARING FOR THE NEXT SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Information sessions | • Organize in-person information sessions for residents and their families or informal carers on the health risks of extreme heat, signs and symptoms (see also Annex 3 on signs and symptoms of heat-related illness), preventive actions, hydration, cooling measures and how the facility will respond during alerts. |
| Internal communication systems | • Establish clear and efficient communication channels for staff to report concerns about residents' well-being during extreme heat, and for managers to disseminate important updates and guidance. |
| Insulation of buildings | • In the long term, ensure that facility buildings are well insulated to reduce indoor heat gain while maintaining safe ventilation, recognizing that insulation should support comfort and safety in both summer and winter.<br>• Identify and apply for relevant government, municipal or donor resources available to care homes and social services for cooling equipment, building upgrades, staff training, emergency planning and heat risk reduction. |
| Extractor fans | • In rooms where heat accumulates – such as kitchens, laundry areas and bathrooms – consider installing extractor fans to remove warm air (and humidity) and improve overall air circulation. |

DURING SUMMER

SOCIAL CARE MANAGERS

**Box UAB4.6. Actions for social care managers in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Announcements about heat-related decisions | • Monitor announcements from social care authorities regarding heat-related decisions and activities during the summer or hot season, including heat alerts, guidance updates, reporting requirements and service continuity instructions.<br>• Establish a daily morning briefing routine during the summer or hot season to review forecasts, current alert levels, resident risks, staffing, room temperatures, essential supplies and any adjustments needed to care routines. |
| Monitoring indoor temperatures | • Implement regular temperature checks in residents' rooms and common areas, taking action if temperatures exceed recommended levels.<br>• Maintain a temperature log for each resident's room and common area, with documented action thresholds, responsible staff and corrective actions taken. |
| Reinforcing hydration and sun protection | • Remind staff about encouraging and assisting residents with fluid intake, appropriate clothing and applying sunscreen when outdoors. |
| Ensuring adequate staffing and breaks | • Maintain staffing levels that facilitate frequent checks on residents, hydration support and safe care. Ensure that staff take necessary breaks and stay hydrated.<br>• Prearrange contingency staffing arrangements, such as agency cover and mutual aid with neighbouring facilities for periods of extreme heat. |
| Regular safety reminders | • Send regular reminders to staff about the importance of hydration for residents and themselves, monitoring early signs of heat-related illness, and implementing preventive measures (see User action brief 2 – Occupational domain; Annex 3 on signs and symptoms of heat-related illness). |

**Box UAB4.7. Actions for social care managers in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Monitoring indoor temperatures frequently | • Increase the frequency of temperature monitoring in all resident areas, including rooms, common areas and heat-prone spaces. Take immediate action if temperatures increase – such as relocating residents to cooler areas where appropriate.<br>• Where indoor temperatures exceed safe thresholds for residents at increased risk of heat-related harm, escalate by activating cool rooms, redistributing residents and notifying relevant authorities or support services as required. |
| Increasing the frequency of checks on residents | • Implement a system for more frequent monitoring of all residents – particularly those at increased risk (see also Core element 3 – Populations at increased risk), including regular checks during the night.<br>• Document resident checks in care records – including temperature exposure where relevant, vital signs, hydration, behaviour changes, symptoms, and actions taken and any escalation. |
| Keeping indoor spaces cool and cooling equipment functioning | • Once outdoor temperatures are higher than indoor temperatures in the facility, close windows and doors and keep them closed during the hottest part of the day. If safe and possible, open windows early in the morning or late in the evening to help ventilate the indoor environment, when outdoor air quality permits (see also Annex 1 for more details on actions to manage combined exposure to extreme heat and vegetation fires).<br>• Verify that AC is functioning in designated areas, and that fans are readily available for residents who need them. Use fans when clinically and environmentally safe and only if the ambient temperature is below 35 °C (see section 6.3 for further considerations on fan use). |
| Avoiding appliances that generate heat | • Ensure that the heating system is turned off during extreme heat. As far as possible, avoid turning on appliances and electronics that might be a source of heat inside the facility – including lights, ovens, stoves or heat radiators. Reschedule activities that require use of these appliances and electronics. |
| Additional hydration and cooling measures | • Ensure that staff offer fluids more frequently than usual in line with individual care plans and clinical restrictions.<br>• Use cooling methods such as cool cloths, misting sprays, cool showers or baths, cooling packs and relocation to cooler areas where appropriate. |
| Communication with families | • Keep families, close relatives and informal carers informed about the situation and the measures taken to protect residents, and about any changes to visiting arrangements or care routines. Encourage visits by relatives to support hydration and comfort of residents.<br>• Provide a single point of contact for families and carers during the event to reduce the burden on care staff, and ensure consistent messaging. |
| Workforce safety and surge management | • Activate workforce safety measures for staff, such as additional rest, hydration breaks and alternative duties. Manage shift handovers and call in surge staff as needed in line with occupational heat protection guidance (see User action brief 2 – Occupational domain). |

**Box UAB4.8. Actions for social care managers in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Post-extreme event debriefing sessions | • Hold debriefing meetings with all relevant staff to discuss their experiences during the event, gather feedback on the effectiveness of the facility's heat–health plan or protocol and associated practices, and identify any difficulties encountered. Use the findings to update and improve the plan or protocol for future events.<br>• Include residents, families and carers in the debrief through structured feedback to capture their experience of the event. |
| Documenting lessons learned and best practices | • Compile a written record of key lessons learned and effective strategies used during the event. Use it to inform future training, planning and resource allocation.<br>• Update the facility heat–health plan or protocol, training materials, equipment, register and resource lists based on documented findings. |
| Equipment and infrastructure inspection | • Inspect cooling equipment, ventilation, shading, drinking-water supply and backup power for performance under peak demand. Document repairs, replacements or upgrades needed before the next hot season. |
| Resident outcome review | • Review heat-related health outcomes among residents, such as dehydration, heat-related illnesses, hospital admissions, deterioration of chronic conditions and deaths, and share relevant findings with health services and authorities. |
| Staff well-being follow-up | • Conduct staff well-being check-ins after the event. Document any heat-related occupational illnesses and arrange recovery support where needed. |

## Actions for the social care workforce

The following actions apply to all social care workers, including those in residential settings and those providing community-based and home visiting services. Workers delivering care in people's homes or community settings should adapt these actions to their specific context.

PREPARING FOR THE NEXT SUMMER | SOCIAL CARE WORKFORCE

**Box UAB4.9. Actions for the social care workforce in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Training and awareness | • Participate in training sessions focused on heat safety, prevention, recognizing symptoms of heat illness in older adults and other residents at increased risk of threats to health from extreme heat, first aid and emergency response (see also Annex 3 on signs and symptoms of heat-related illness).<br>• Review individual care plans for residents; note specific heat-related needs for each one, such as medications, hydration, nutrition, mobility, communication and cooling.<br>• Ensure familiarity with the facility's heat–health plan or protocol, the location of cool rooms and equipment, and specific roles and responsibilities during a heat event. |
| Personal heat safety preparation | • Plan personal heat safety measures, such as appropriate clothing, sufficient hydration and breaks; review all applicable occupational heat safety guidance (see User action brief 2 – Occupational domain). |

DURING SUMMER | SOCIAL CARE WORKFORCE

**Box UAB4.10. Actions for the social care workforce in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Announcements about heat-related decisions | • Stay informed about social care authority announcements regarding heat-related decisions and activities during the summer or hot season, including heat alerts, facility instructions and changes to care routines. |
| Safe outdoor activity | • Support residents to spend time outdoors only when conditions are safe; prioritize shaded locations and cooler parts of the day; limit exposure to direct sun, particularly during peak heat hours.<br>• Schedule walks, group activities and outdoor visits for cooler times of the day like early morning or late afternoon to maintain well-being while minimizing heat risks. Consider air quality and possible co-exposure with vegetation fires when planning outdoor activities (see also Annex 1 for more details on actions to manage combined exposure to extreme heat and vegetation fires). |
| Maintaining comfortable indoor environments | • Ensure that windows are opened for ventilation during cooler parts of the day when safe and outdoor air quality allows (see also Annex 1 for more details on actions to manage combined exposure to extreme heat and vegetation fires) and that blinds or curtains are used to block direct sunlight. Use fans in accordance with facility policy and safety guidelines, but only if the ambient temperature is below 35 °C (see section 6.3 for further considerations on fan use). |
| Encouraging appropriate clothing | • Assist residents in wearing light-coloured and loose-fitting clothing during hot weather, taking account of comfort, dignity, skin protection and individual preferences. |

DURING SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Offering fluids | • Offer drinking-water and other hydrating fluids regularly to residents throughout the day – especially during and after activities – while following each resident's care plan and any clinical restrictions on fluid intake. |
| Active monitoring | • Monitor residents for signs of dehydration and heat-related illness, and act accordingly. Observe residents closely for symptoms such as increased confusion, weakness, dizziness, headache, decreased urine output and changes in skin condition (see also Annex 3 on signs and symptoms of heat-related illness). |
| Reporting concerns | • Report any concerns about a resident's well-being or signs of heat-related illness to the nursing staff or manager, according to the facility's heat–health plan or protocol. |
| Self-care and awareness | • Prioritize hydration and take regular breaks in cool areas, following staff heat protection arrangements. Report any personal symptoms of heat illness to the facility manager immediately (see User action brief 2 – Occupational domain). |

DURING EXTREME HEAT EVENTS

SOCIAL CARE WORKFORCE

**Box UAB4.11. Actions for the social care workforce in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Following specific response plans | • Adhere to all procedures outlined in the facility's heat–health plan or protocol. |
| Conducting hourly checks | • Implement a system of hourly checks on residents at increased risk of heat-related harm, monitoring for any signs of heat-related illnesses, dehydration, discomfort, confusion or deterioration (see also Annex 3 on signs and symptoms of heat-related illness). |
| Advice on staying cool | • Encourage and support residents to avoid direct sun exposure during peak heat hours. Promote staying in cool, ventilated and shaded environments. |
| Moving residents to cooler areas | • If a resident's room becomes too hot, assist them with moving to a designated cool room or the coolest available area. If possible, use fans to increase air circulation and create a cooling effect. Be aware that fans may provide relief when the ambient temperature is below 35 °C (see section 6.3 for further considerations on fan use). |
| Limiting physical activities | • Reschedule outdoor work and/or physical activities to cooler times of the day, such as early morning or late evening. If residents work outside, make sure they do light activities, take breaks, drink plenty of water throughout the day, and avoid physical exhaustion. Consider air quality and vegetation fire co-exposure before any outdoor activity (see also Annex 1 for more details on actions to manage combined exposure to extreme heat and vegetation fires). |
| Offering hydration support | • Remind residents to drink water regularly, even if they do not feel thirsty. Offer plenty of drinking-water during meals and at regular intervals throughout the day, taking account of each resident's needs, preferences and any medical fluid restrictions.<br>• Assist residents who need support in staying hydrated; encourage small sips if residents have difficulty drinking. |

DURING EXTREME HEAT EVENTS CONTINUED

| Action area | Actions |
|---|---|
| Assisting with personal cooling | • Help residents to use safe cooling measures, such as cool cloths to their neck, face and wrists, and assist with showering or bathing if needed and safe.<br>• Where safe and appropriate, support residents to cool hands or feet in cool water for short periods while managing risks such as slips, falls, skin fragility or discomfort. |
| Recognizing and responding to heatstroke | • Recognize the signs of heatstroke (such as confusion, hot and dry skin, rapid pulse and loss of consciousness) and call for immediate medical assistance while initiating cooling measures (see also Annex 3 on signs and symptoms of heat-related illness). |
| Documenting all monitoring and interventions | • Maintain accurate resident care records including temperature checks, fluid intake and any signs or symptoms of heat-related illness observed (see also Annex 3 on signs and symptoms of heat-related illness), along with any action taken. |
| Self-care and awareness | • Maintain hydration and take regular breaks in cool areas. Report any personal symptoms of heat illness to the facility manager immediately (see User action brief 2 – Occupational domain). |

AFTER EXTREME HEAT EVENTS

SOCIAL CARE WORKFORCE

**Box UAB4.12. Actions for the social care workforce in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Maintaining monitoring | • Continue to monitor residents closely for the days immediately following an extreme heat event, even after temperatures have fallen. Be alert for any lingering effects or delayed onset of symptoms like confusion, unusual fatigue or dehydration, falls or worsening chronic illness (see also Annex 3 on signs and symptoms of heat-related illness). |
| Reinforcing preventive measures with residents | • Continue to emphasize the importance of hydration and other preventive measures with residents throughout the summer or hot season, as temperatures may rise again, and residents may remain at increased risk of heat-related harm after an event. |
| Providing feedback on experiences and challenges | • Share observations, challenges, successful practices and suggestions for improvement during post-event debriefing sessions with managers and colleagues. |
| Reviewing and updating protocols | • Contribute front-line experiences to the process of reviewing and updating the preparedness and response heat–health plan or protocol, including resident monitoring, hydration support, cooling measures, communication and escalation procedures. |

# User action brief 5 – Education and childcare domain

## Context

Extreme heat poses increasingly recognized health risks for infants, children and adolescents. Children are at higher risk of heat-related illness than adults because of a higher ratio of surface area to body mass, lower sweat output and less efficient evaporative cooling. Infants and young children also depend on caregivers to regulate their thermal environment, and may not recognize or communicate early symptoms. Pre-existing conditions and strenuous outdoor activity further increase risk. Beyond acute heat-related illness, exposure to high temperatures has been associated with disrupted sleep, impaired attention and reduced learning outcomes. Because children and adolescents spend a substantial part of their day in schools and childcare settings, education and childcare environments are critical points of intervention. Measures related to occupational heat exposure of the education and childcare workforce are addressed in User action brief 2 – Occupational domain, and can be adapted to specific sector settings.

## Who should read this

This brief is intended for the following actors involved in delivery of childcare and education.

- It supports education authorities at national, regional and local levels, who set policies, provide resources and guidance related to HHAPs, and coordinate the actors needed to deliver short- and long-term solutions to reduce the risk of heat-related illness among school and childcare facility staff, students and children.
- It informs school and childcare facility heads, managers and administrators, who are responsible for implementing site-specific heat-protective plans and protocols, managing infrastructure and communicating with education authorities and school communities, including families, staff and students.
- It assists teachers, school nurses, school-based health workers and childcare staff, who work in direct contact with children and students, playing a key role in preventing heat-related illnesses, recognizing early signs and symptoms of heat-related illnesses, and acting promptly.

## What is presented in this brief

This user action brief presents suggested actions for managing extreme heat in schools, preschools, kindergartens, nurseries, playgroups and similar settings for each audience group, organized around the four key stages of heat–health action: planning and preparedness (ongoing and before the summer or hot season); monitoring and early action (during the summer or hot season); emergency response (during extreme heat events); and evaluation and improvement (after extreme heat events and at the end of the season).

The action boxes in this user action brief are organized according to the various actors within the education and childcare domain. Boxes UAB5.1–UAB5.4 present suggested actions for education authorities; boxes UAB5.5–UAB5.8 present suggested actions for school and childcare facility heads, managers and administrators; and boxes UAB5.9–UAB5.12 present suggested actions for teachers, school nurses, school-based health workers and childcare staff.

This brief is designed to be read on its own, but readers are encouraged to consult it alongside the core elements of Part 1, in particular Core element 1 – Governance, Core element 3 – Populations at increased risk, Core element 4 – Communication and Core element 6 – Reducing heat exposure. The "At school and in childcare settings" section of the public health message bank in Part 3 supports communication efforts by actors in the education and childcare domain. For more details on actions to manage combined exposure to extreme heat and vegetation fires, see Annex 1.

## Key resources[16]


A threat to progress: confronting the effects of climate change on child health and well-being. New York: United Nations Children's Fund; 2024 (https://www.unicef.org/reports/threat-to-progress).

Building climate smart education systems [website]. Global Partnership for Education; 2025 (https://www.globalpartnership.org/what-we-do/building-climate-smart-education-systems).

CDPH health guidance for schools on sports and strenuous activities during extreme heat [website]. California Department of Public Health; 2024 (https://www.cdph.ca.gov/Programs/EPO/Pages/Extreme%20Heat%20Pages/extreme-heat-guidance-for-schools.aspx).

Hot weather and heatwaves: guidance for schools and other education settings [blog]. In: The Education Hub Blog; 16 June 2025 (https://educationhub.blog.gov.uk/2025/06/hot-weather-and-heatwaves-guidance-for-schools-and-other-education-settings/).

Protecting children from heat stress: a technical note. New York: United Nations Children's Fund; 2023 (https://www.unicef.org/documents/protecting-children-heat-stress-technical-note%C2%A0).


[16] All references were accessed 1–4 May 2026.

## Actions for education authorities

PREPARING FOR THE NEXT SUMMER | EDUCATION AUTHORITIES

**Box UAB5.1. Actions for education authorities in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Integrating education into HHAPs | • Ensure that local HHAPs address schools and childcare settings and provide standard frameworks to develop site-specific heat–health plans and protocols.<br>• Set minimum standards for heat preparedness and response in schools and childcare settings, including triggers for action, staff responsibilities, and communication procedures aligned with the relevant national, regional and/or local HHAP. |
| Alert protocols | • Establish systems to ensure that all schools and childcare settings receive and act on heat–health alerts from meteorological and health authorities in a timely manner.<br>• Require each school and childcare setting to develop a specific heat–health plan or protocol to protect children and students, including triggers for action, staff responsibilities and communication procedures. |
| Awareness and training | • In coordination with health authorities, fund and require training of school and childcare facility staff on heat-related illness prevention and recognition, first aid measures, hydration support, modification of calendars to ensure the safety of activities during extreme heat, and introduction of age-appropriate heat safety education for children and students.<br>• Mandate and fund training for school nurses and school-based health workers on heat-related illness recognition, first aid measures, referral pathways and support for children or students at increased risk of threats to health from extreme heat.<br>• With health authorities, set heat–health risk-related minimum competency standards for school and childcare facility staff, and require periodic refresher training. |
| Communication materials | • Develop and distribute posters, leaflets and digital content on heat safety for children, families and staff, in collaboration with health authorities.<br>• Work with health authorities to run campaigns tailored to the needs of children and students. Use age-appropriate, culturally relevant messaging to help children, students and families recognize heat risks and stay safe (see also the “At school and in childcare settings” section of the public health message bank on heat and health in Part 3; Core element 4 – Communication). |
| School and childcare facility policies and operations | • Develop guidelines for adjusting school and childcare facility calendars, daily schedules and dress codes for outdoor activities, physical education, excursions and examinations during extreme heat.<br>• Define consistent decision criteria (including indoor temperature thresholds and alert levels) for schedule modifications, exam rescheduling and temporary closures, with consistent application across the jurisdiction.<br>• Require school and childcare facility policies to allow children to drink water and access sanitation facilities during lessons and activities, not only during breaks.<br>• Require accessible drinking-water points to be located outside toilet and washroom areas so that children and students are encouraged to hydrate. Establish criteria and frequency for checking maintenance of drinking-water facilities – including functionality, cleanliness, accessibility and water quality and safety. |

PREPARING FOR THE NEXT SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Allocating targeted resources | • Provide resources for increasing heat resilience in schools and childcare settings, such as ventilation, accessible drinking-water points, oral rehydration solution stocks where appropriate, first aid and staff training.<br>• Direct heat resilience-related funding to schools and childcare settings serving disadvantaged communities, children at increased risk of heat-related harm and those with the most thermally vulnerable infrastructure. |
| Infrastructure improvements | • Mandate and fund investment in external blinds, shutters, window shading or other shading solutions for classrooms and childcare rooms – particular for those with high solar gain.<br>• Encourage gradual upgrades, including identification of cooling spaces, adequate and well-maintained water and sanitation facilities, and accessible drinking-water points to support hydration in schools and childcare settings, and enable refilling of water bottles.<br>• Embed heat-resilient design standards (such as thermal envelope, ventilation, shading and water systems) into construction, renovation and procurement guidelines for schools and childcare settings (see also Core element 6 – Reducing heat exposure). |
| Coordination with health and social care authorities | • Establish formal coordination mechanisms with health and social care authorities for shared protocols on heat-related illness in children and students, support for children and students at increased risk, emergency referrals, and family communication. |
| Workforce well-being | • Require workforce protection measures, including hydration, rest breaks, alternative duties, schedule adjustments, and safe working conditions for school and childcare facility staff during extreme heat events, in alignment with occupational heat stress regulations (see User action brief 2 – Occupational domain). |

DURING SUMMER

EDUCATION AUTHORITIES

**Box UAB5.2. Actions for education authorities in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Supporting preparedness in schools | • Remind school and childcare facility managers to activate heat-related measures in line with their site-specific heat–health plans and protocols. Reinforce key messages on hydration, light clothing, sufficient ventilation and limiting physical activity during peak heat hours.<br>• Issue a season-opening bulletin to all schools and childcare settings confirming heat-alert thresholds, decision criteria, reporting expectations and key contacts for the summer or hot season. |
| Monitoring forecasts and sharing guidance | • Monitor official weather forecasts and share clear actionable guidance regularly with managers of schools and childcare facilities on heat–health protection measures. |
| Resource availability | • Confirm that schools and childcare settings have essential supplies, such as portable fans, air coolers, shading devices, accessible drinking-water supplies, oral rehydration solutions (where clinically appropriate) and first aid supplies. Redistribute resources to under-resourced and high-risk facilities, as needed.<br>• Activate emergency procurement pathways for cooling supplies, shading devices, first aid supplies and backup drinking-water in schools facing shortages. |

DURING SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Schedule adjustments | • Advise schools and childcare settings to adapt schedules where necessary, including rescheduling exams, delaying term starts, or modifying daily routines, physical activity or excursions according to heat risk and local decision criteria.<br>• Recommend that schools and childcare settings adopt policies that enable increased hydration, including longer and more frequent breaks and unrestricted access to drinking-water and sanitation facilities throughout the day, including during lessons and activities. |
| Raising awareness among children and families | • Work with health authorities to run campaigns tailored to children's needs. Use age-appropriate, culturally relevant messaging to help children, students and families recognize heat risks and stay safe (see also the "At school and in childcare settings" section of the public health message bank on heat and health in Part 3; Core element 4 – Communication). |
| Local support information | • Provide schools and childcare settings with up-to-date details on nearby cooling centres, health services, emergency contacts and other community resources available during the summer or hot season and extreme heat events. |
| Supervising implementation and providing support | • Monitor how schools and childcare settings are applying heat-related measures, and offer practical support where needed. Provide ongoing support and resources to settings facing challenges in implementing their site-specific heat–health plans and protocols. |
| Tracking health impacts | • Coordinate with schools, childcare settings and health authorities to monitor heat-related health issues among children, students and staff, and escalate unusual patterns or serious concerns.<br>• Maintain a sector-wide reporting channel to receive information on heat-related incidents, service disruptions and resource needs in schools and childcare settings, and share aggregated findings with health authorities. |
| Coordination with families and communities | • Coordinate joint communication with parent associations, school councils and local civil society on heat advisories and school-level adjustments and available support throughout the summer or hot season. |

DURING EXTREME HEAT EVENTS

EDUCATION AUTHORITIES

**Box UAB5.3. Actions for education authorities in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Staying informed | • Monitor official weather forecasts and heat–health alerts from national and local meteorological services and health authorities continuously during extreme heat events. |
| Activating heat–health plans and protocols and issuing alerts | • Immediately notify school and childcare settings of any heat alerts, expected conditions and required actions. Where needed, release contingency resources (such as drinking-water, fans, first aid supplies and temporary shading) to support urgent needs.<br>• Authorize emergency funding and resource redistribution to schools and childcare settings facing acute shortages of drinking-water, cooling equipment or first aid supplies. |
| Authorizing adjusted schedules | • Recommend or approve earlier start times, shortened school days, remote learning or temporary closures if alert levels or local risk assessments indicate that continued operation may be unsafe. |

DURING EXTREME HEAT EVENTS CONTINUED

| Action area | Actions |
|---|---|
| Guidance and support | • Support schools and childcare settings to apply consistent criteria for adjustments on schedules, activities, sports or even temporary closures in extreme heat conditions. |
| Coordinating safe transport | • Work with local transport authorities and operators to reduce heat exposure during travel, minimizing waiting times, adjusting transport schedules, providing shade at pick-up points, and prioritizing safe transport for children and students at increased risk of heat-related harm. |
| Implementation of heat–health plans and protocols | • Verify that schools and childcare settings are applying site-specific heat–health plans and protocols effectively, and identify any that need additional guidance, resources or operational support. |
| Monitoring health outcomes | • Request regular updates from managers, school nurses and local health centres on heat-related incidents affecting staff, children and students, in coordination with health authorities.<br>• Coordinate at the executive level with health authorities and emergency services on transfers and surge capacity for children and students with heat-related illness. |
| Communicating with the public | • In collaboration with health authorities, provide timely updates to families and communities on heat risks, school or childcare adjustments, protective measures, available support and when to seek medical help. |

AFTER EXTREME HEAT EVENTS

EDUCATION AUTHORITIES

**Box UAB5.4. Actions for education authorities in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Post-event debriefs | • With health authorities and school or childcare facility managers, organize post-event debriefs with staff to reflect on what worked, what did not and what should be improved. Focus on actionable lessons for further events. |
| Updating policies and protocols | • Use the findings from debriefs, incident reports and stakeholder feedback to revise school policies and heat–health plans and protocols. Integrate improvements into both short- and long-term strategies, such as adjusting school calendars, enhancing ventilation, amending activity rules and adopting heat-resilient building practices.<br>• Suggest improvements to local HHAP implementation, where relevant. |
| Replenishing supplies and repairing equipment | • Support schools and childcare settings to restock essential supplies, check functionality and adequacy of water and sanitation services, and repair or replace any damaged cooling equipment. Ensure that drinking vessels (such as cups and glasses) are available in sufficient numbers, especially in preschools and schools where meals are offered. |
| Reinforcing training and awareness | • Use the post-event period to refresh staff training and re-engage children, students and families with key heat safety messages, including hydration, sun protection, warning signs and safe routines during future heat events. |
| Public reporting and accountability | • Publish a post-event report covering school and childcare facility performance, outcomes, heat-related incidents, school or childcare adjustments, resource gaps, equity issues and planned improvements. Engage families, staff and student bodies in reviewing findings. |

# Actions for school and childcare facility heads, managers and administrators

PREPARING FOR THE NEXT SUMMER

SCHOOL AND CHILDCARE FACILITY HEADS, MANAGERS AND ADMINISTRATORS

**Box UAB5.5.** **Actions for school and childcare facility heads, managers and administrators in the planning and preparedness stage: ongoing and the before summer or hot season**

| Action area | Actions |
|---|---|
| Updating heat–health plans and protocols | • Review and update heat–health plans and protocols in line with education authority guidance. Ensure that staff understand key actions, including those related to hydration breaks, class relocation to cooler areas and early dismissal.<br>• Test the school or childcare facility heat–health plan or protocol annually through a tabletop exercise involving teachers, childcare staff, school nurses, school-based health workers, and maintenance and administrative staff. Document findings and update the plan or protocol.<br>• If a pool is present, include preventive actions for supervision, safe use during heat, emergency response and drowning prevention in heat–health plans and protocols. |
| Adjusting school policies | • Adapt dress codes to allow lighter clothing and hats. Reschedule, modify or cancel sporting and outdoor activities during extreme heat.<br>• Coordinate with parent associations on dress code modifications, schoolbag contents (including water bottle, hat and sunscreen) and school-day adjustments during the summer or hot season.<br>• Where facilities provide meals, liaise with catering services to offer lighter, hydrating meal options during extreme heat (such as salads, fruit and soups) that align with nutritional needs and safety requirements.<br>• Ensure that school and childcare facility policies allow children to drink water and access sanitation facilities during lessons and activities, not only during breaks. |
| Checking indoor temperatures | • Equip rooms with thermometers and maintain a temperature monitoring log with defined thresholds and actions. |
| Preparing buildings and grounds | • With the support of a maintenance team, ensure that ventilation works, shaded areas exist, drinking-water fountains function, and water and sanitation facilities are well maintained. Designate functional cool rooms for use during extreme heat events.<br>• Ensure continuous availability and accessibility of safe drinking-water, including backup supply where relevant and needed. |
| Cooling options for indoor spaces | • If indoor temperatures increase to an uncomfortable threshold, ensure that portable fans or AC units are available if other cooling options are insufficient. Check all equipment in advance. |
| Cooling kits | • Prepare basic cooling supplies for children at increased risk of threats to health from extreme heat or those showing early signs of heat stress – such as damp cloths, backup drinking-water and rehydration packets (see also Annex 3 on signs and symptoms of heat-related illness).<br>• Maintain a minimum stock of refillable water bottles and hats to provide to children and students – particularly those who may not have access to these.<br>• Ensure availability of first aid materials, including cooling packs, damp cloths, hydration supplies, first aid guidance charts and emergency contact information. |
| Shaded outdoor areas | • Ensure that adequate shaded outdoor areas are available, using trees, pergolas, shade sails or open structures that remain ventilated to reduce heat exposure. |

PREPARING FOR THE NEXT SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Promoting hydration | • Ensure that drinking-water is easily accessible by providing clean, comfortable and conveniently located facilities outside toilet areas. Promote the use of taps, fountains or dispensers, and keep a minimum stock of refillable bottles. Maintain clean and functional toilets so that children do not avoid drinking water during the day. |
| Raising awareness among staff and students | • Ensure that all school and childcare facility staff know how to recognize signs of heat exhaustion and know the immediate actions to take (see also Annex 3 on signs and symptoms of heat-related illness).<br>• Provide regular, age-appropriate education to students on heat safety. Encourage them to report symptoms. Display posters around the school or childcare facility.<br>• Ensure that school nurses, school-based health workers and childcare facility staff are trained and equipped for heat–health-related illness.<br>• Designate a heat response coordinator within the school or childcare facility with clear authority to escalate concerns and brief staff during alerts. |
| Communicating with families | • Organize a pre-season meeting (or written communication) for families covering heat risks, the school or childcare facility heat–health plan or protocol, protective measures taken, expectations on attendance/early dismissal and how families can support children during hot weather (for example, by dressing children appropriately and sending them in with drinking-water bottles).<br>• Establish clear channels for notifying families of schedule changes due to heat-related adjustments. |

DURING SUMMER

SCHOOL AND CHILDCARE FACILITY HEADS, MANAGERS AND ADMINISTRATORS

**Box UAB5.6. Actions for school and childcare facility heads, managers and administrators in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Official guidance | • Monitor announcements from education and health authorities, and inform staff promptly of any changes to routines, activities, schedules and safety procedures.<br>• Hold brief meetings with key staff during the summer or hot season to ensure alignment on alert levels, classroom and childcare room temperature checks, hydration arrangements, activity modifications and any children or students requiring additional support. |
| Reducing heat exposure | • Mandate staff to keep blinds closed in direct sun. Use fans safely where appropriate to improve air movement, and prioritize shaded outdoor areas or cooler indoor spaces for activities. |
| Cool indoor environments | • Use thermometers to monitor room temperatures, and open windows only when outdoor air is cooler and the risk of exposure to air pollution is low (see also Annex 1 for more details on actions to manage combined exposure to extreme heat and vegetation fires). Use fans only in accordance with safety guidance, ensuring safe placement and supervision (see also section 6.3 for further considerations on fan use).<br>• Coordinate minimum use of heat-generating equipment and lighting. Ensure that heating systems are switched off for the season. |
| Adjusting activity schedules | • Reschedule physical education, sports and active play to cooler morning hours. Offer calm indoor alternatives during peak heat hours. |
| Promoting hydration | • Ensure that drinking-water stations are working and accessible. Remind children and students to drink regularly and carry water bottles. |

DURING SUMMER CONTINUED

| Action area | Actions |
|---|---|
| Supervising activities in outdoor spaces | • Limit outdoor playing time during peak heat hours. Provide shaded or indoor areas for breaks. |
| Monitoring children's and students' health and well-being | • Ensure that staff actively observe children and students for signs of heat-related illness, including dizziness, headache, unusual tiredness, nausea, confusion, cramps or changes in behaviour (see also Annex 3 on signs and symptoms of heat-related illness). Pay particular attention to children and students with known medical conditions or disabilities, or who are at increased risk of heat-related harm.<br>• Keep records of heat-related concerns, symptoms, first aid actions and any adjustments made. Encourage children and students to speak up if they feel unwell.<br>• Where present, ensure that school nurses and school-based health workers support monitoring of children and students at increased risk for signs of heat-related illness, advise staff on symptoms and escalation, and coordinate first aid or referral when needed. |
| Engaging maintenance staff | • Increase routine checks of the functionality of cooling and ventilation systems, as well as drinking-water points and sanitation facilities. If issues arise, ensure a quick response. |
| Supporting staff well-being | • Ensure that staff have access to drinking-water, rest breaks and cooler areas, and adjust duties where needed to reduce heat strain (see User action brief 2 – Occupational domain). |
| Coordination with families | • Inform families of any modifications to routines (such as physical activity, excursions, snacks/meals, clothes and hydration) and remind them of practical home-based heat safety. Provide contacts for queries during alerts. |

DURING EXTREME HEAT EVENTS

SCHOOL AND CHILDCARE FACILITY HEADS, MANAGERS AND ADMINISTRATORS

**Box UAB5.7. Actions for school and childcare facility heads, managers and administrators in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Activating the response stage of the HHAP | • Implement the predefined procedures outlined in the school or childcare facility heat–health plan or protocol upon receiving an official heat alert or when local thresholds are reached.<br>• Activate school and childcare facility emergency communication channels to brief all staff (teachers, school nurses, and maintenance, catering and security staff) on the alert level and required actions. |
| Staying in contact with authorities | • Follow guidance and instructions from education and health authorities. Report any incidents or unexpected issues promptly. |

DURING EXTREME HEAT EVENTS CONTINUED

| Action area | Actions |
|---|---|
| Providing immediate cooling and relief | • Ensure that children and students drink water frequently, under supervision if necessary, and offer oral rehydration solutions if needed.<br>• Ensure that children and students are always allowed to get and drink water during lessons and activities, not only during breaks. Ensure that drinking vessels (such as cups and glasses) are available for children who do not have a water bottle.<br>• Ensure that classrooms and childcare rooms are well ventilated and cool, and close windows if outdoor air is hotter. If the outdoor air quality is poor, follow locally relevant guidance (see also Annex 1 for more details on actions to manage combined exposure to extreme heat and vegetation fires).<br>• Allow children and students to use safe cooling measures such as damp cloths or mist to cool their head, face, neck and armpits where appropriate and supervised.<br>• Move any child, student or staff member showing heat-related illness symptoms immediately to a designated cool area, and ensure that they are monitored by an appropriate staff member (see also Annex 3 on signs and symptoms of heat-related illness).<br>• Follow first aid procedures for heat exhaustion and heatstroke. Contact emergency medical services if the condition is serious or worsening. |
| Enhancing monitoring and vigilance | • Check indoor temperatures frequently in all classrooms, childcare rooms and common areas. Instruct staff, including school nurses, to watch for signs of heat illness in children and students and colleagues, and to take immediate action if symptoms are noticed (see also Annex 3 on signs and symptoms of heat-related illness).<br>• Record any heat-related symptoms, incidents and first aid actions taken, relocations, schedule changes, communications with families and referrals to health services. |
| Adjusting schedules and activities | • Consider shortening the school or childcare facility day, or adjusting start and end times to avoid peak heat hours. Postpone sports days, excursions or large gatherings until cooler periods.<br>• Mandate organization of alternative indoor activities in the coolest available spaces. Designate at least one air-conditioned or well-ventilated space for children and students (especially those at increased risk of heat-related harm) who feel unwell. |
| Staff briefing | • Hold a briefing for all staff on the activated heat–health plan or protocol, role assignments, students at increased risk, recognizing signs of heat exhaustion and the steps to take, and escalation contacts (see also Annex 3 on signs and symptoms of heat-related illness). |
| Communication with families | • Keep families informed about the extreme heat event, any changes to the school or childcare facility schedule or activities, and any specific health advice.<br>• Advise families to send children to school or the childcare facility with a clean reusable water bottle, lightweight clothing, a hat, and sunscreen or other sun protection where appropriate.<br>• Provide a single point of contact for family queries during the event, and update families proactively. |
| Considering temporary closure | • In cases of extreme and prolonged heat where the safety and well-being of children and students cannot be adequately ensured, consider a temporary school or childcare facility closure (as a last resort), relocation or remote learning, in consultation with local education authorities. |
| Liaison with health and emergency services | • Maintain open communication lines with local primary care and emergency services, including for situations where students are at imminent risk and transfers may be needed. |

**Box UAB5.8. Actions for school and childcare facility heads, managers and administrators in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Recovery time | • Adjust workloads, deadlines, assessments or duties for any children and students or staff who experienced heat-related illness in line with health advice and school or childcare facility policies (see also Annex 3 on signs and symptoms of heat-related illness).<br>• Identify children, students or staff who experienced heat-related illness, and ensure follow-up with the school nurse, family doctor or occupational health service, as relevant. |
| Post-event review and debrief | • Organize a debriefing meeting with staff to review the effectiveness of the school or childcare facility heat–health plan or protocol and the implementation of procedures during extreme heat events. Gather feedback from staff on any challenges, gaps, successful actions and suggestions for practical improvements.<br>• Document heat-related illness and symptoms, first aid cases, referrals, absences, schedule changes and other heat-related incidents, and identify potential contributing factors such as indoor temperatures, hydration access, activity timing, communication gaps or equipment failures.<br>• Seek family feedback to capture their perspectives on communication, protective measures, schedule changes and support.<br>• Suggest improvements to local HHAP implementation, where relevant. |
| Performance of infrastructure and cooling measures | • Evaluate the effectiveness of any temporary cooling measures implemented, and identify any necessary repairs or upgrades to existing infrastructure.<br>• Use lessons from the event to plan for long-term infrastructure improvements to enhance the school or childcare facility's resilience to future extreme heat events. |
| Replenishing supplies and resources | • Check fans, electrical outlets and drinking-water systems for damage or overuse. Ensure continued access to safe drinking-water, and replenish hydration supplies such as cups and bottles for future events.<br>• Update the school or childcare facility heat response equipment register and procurement schedule based on shortages, equipment failures or documented gaps. |
| Reinforcing learning and awareness | • Discuss the recent extreme heat event with children and students to reinforce key messages about heat safety, encourage symptom reporting, and build awareness of climate change and health impacts. |
| Staff well-being follow-up | • Conduct staff well-being check-ins following the event; document any heat-related occupational illness and coordinate occupational health support where needed (see User action brief 2 – Occupational domain). |

# Actions for teachers, school nurses, school-based health workers and childcare staff

PREPARING FOR THE NEXT SUMMER

TEACHERS, SCHOOL NURSES, SCHOOL-BASED HEALTH WORKERS AND CHILDCARE STAFF

**Box UAB5.9.** **Actions for teachers, school nurses, school-based health workers and childcare staff in the planning and preparedness stage: ongoing and before the summer or hot season**

| Action area | Actions |
|---|---|
| Knowing heat–health plans and protocols | • Review heat measures within the school or childcare facility heat–health plan or protocol to understand alert levels and required actions during alerts.<br>• Identify the school or childcare facility heat response coordinator, and the specific roles and responsibilities of individual staff during alerts – including communication, supervision, hydration support, activity modification, monitoring of children and students, and escalation of concerns. Locate cool rooms and personal cooling tools, and learn how heat alerts are shared. |
| Coordinating with colleagues | • Work with colleagues to reduce sun exposure by rotating outdoor duties and sharing approaches for managing heat during breaks, outdoor play and activities. |
| Assessing and preparing learning spaces | • Identify and report on overheated rooms, availability of blinds to block sunlight and safe ventilation. Ensure that children and students know the nearest source of drinking-water and shaded outdoor areas.<br>• Check the functionality of drinking-water points and sanitation facilities. Report any problems promptly to the school or childcare facility manager. |
| Adapting lessons and schedules | • With the school or childcare facility head or manager, plan shifting of physical activities to cooler times or locations, and allowing frequent rest and water breaks. |
| Cooling tools | • Keep fans, reusable water bottles and damp cloths for cooling ready in classrooms and childcare rooms for quick cooling.<br>• Practise using cooling equipment, thermometers and first aid kits before the season starts so that they can be used quickly and correctly when needed during extreme heat alerts. |
| Knowing children at increased risk | • Discuss heat–health concerns with the school or childcare facility head or manager, families, school nurses or other relevant health-care professionals. Follow specific instructions for students and children with medical needs or who are on medication. |
| Teaching heat safety | • Include age-appropriate lessons on the health risks of heat, the need to stay cool, recognizing heat illness and staying hydrated. Reinforce daily safety habits. |
| Buddy system | • Use a buddy system for staff and, where appropriate, among children and students to encourage mutual monitoring and hydration, including giving an alert to staff immediately if someone feels unwell. |
| Heat first aid | • Ensure familiarity with recognizing and managing symptoms of heatstroke and heat exhaustion in young individuals (see also Annex 3 on signs and symptoms of heat-related illness). If a student or child is taking medication or has a medical condition, ask health-care professionals and/or families for specific care interventions to protect their health. |
| Personal heat safety preparation | • Plan personal heat safety measures such as light clothing, regular hydration and breaks. Review the applicable occupational heat safety guidance (see User action brief 2 – Occupational domain). |

DURING SUMMER

TEACHERS, SCHOOL NURSES, SCHOOL-BASED HEALTH WORKERS AND CHILDCARE STAFF

**Box UAB5.10. Actions for teachers, school nurses, school-based health workers and childcare staff in the monitoring and early action stage: during the summer or hot season**

| Action area | Actions |
|---|---|
| Encouraging and facilitating frequent hydration | • Remind children and students to drink water regularly, including during lessons and activities, and especially before, during and after any physical activity or being outdoors and exposed to sun. For younger children, offer drinking-water frequently, and make hydration a daily routine. |
| Cooling the learning environment | • Close blinds and shutters to block sunlight in line with school or childcare facility guidance to improve comfort and reduce heat gain.<br>• Keep windows and doors open only if it is cooler outside than inside and the risk of exposure to air pollution is low (see also Annex 1 for more details on actions to manage combined exposure to extreme heat and vegetation fires).<br>• Use fans safely to circulate air, if appropriate and in line with school or childcare facility guidance (see also section 6.3 for further considerations on fan use).<br>• Reduce the use of electronic devices or equipment that generates heat. |
| Modifying activities based on temperature and time of day | • Plan less intense activities during peak heat hours. Use cooler indoor spaces when possible or shaded outdoor areas, with frequent breaks if outside activity is necessary. |
| Appropriate clothing and sun protection | • Remind children and students to wear light-coloured, loose-fitting clothes and hats outdoors, and apply sunscreen or other sun protection measures. |
| Watching for early signs of heat-related illness | • Stay alert for early signs of heat-related illness – such as excessive sweating, pale or flushed skin, rapid breathing or heartbeat, fatigue, dizziness, headache, nausea, vomiting or unusual behaviour (see also Annex 3 on signs and symptoms of heat-related illness).<br>• If a child or student is struggling with the heat, move them to a cooler area, and inform the school or childcare facility head or school nurse immediately. If symptoms persist despite cooling efforts, seek medical assistance without delay. |
| Adapting lessons | • Adjust the pace and content of lessons (incorporating more breaks and calmer tasks) when classroom and childcare room temperatures rise, and explain changes to children and students. |

DURING EXTREME HEAT EVENTS

TEACHERS, SCHOOL NURSES, SCHOOL-BASED HEALTH WORKERS AND CHILDCARE STAFF

**Box UAB5.11. Actions for teachers, school nurses, school-based health workers and childcare staff in the emergency response stage: during extreme heat events**

| Action area | Actions |
|---|---|
| Following heat–health plans and protocols | • Follow the school or childcare facility heat–health plan or protocol for the current alert level. Check for any schedule changes like early dismissal, cancelled activities or additional monitoring requirements. |
| Avoiding strenuous outdoor activities | • Cancel, reschedule or modify outdoor sports, play and physical activity. If activities continue indoors, ensure breaks and recovery time in cool spaces. Always consider frequent breaks so that children, students and staff can rest and recover. |

DURING EXTREME HEAT EVENTS CONTINUED

| Action area | Actions |
|---|---|
| Cooling the learning environment | • Close blinds and shutters to block sunlight in line with school or childcare facility guidance to improve comfort and reduce heat gain.<br>• Keep windows and doors open only if it is cooler outside than inside and the risk of exposure to air pollution is low (see also Annex 1 for more details on actions to manage combined exposure to extreme heat and vegetation fires).<br>• Use fans safely to circulate air when the ambient temperature is below 35 °C, if appropriate and in line with school or childcare facility guidance.<br>• Reduce the use of electronic devices or equipment that generates heat. |
| Using cool spaces | • Move children and students showing signs of heat stress (see also Annex 3 on signs and symptoms of heat-related illness) or those in the hottest classrooms and childcare rooms to designated cool rooms or the coolest and most ventilated indoor spaces available. |
| Frequent cool-downs | • Use safe cooling measures, such as damp cloths or sponges to gently wipe children's face, neck and arms. Let children and students splash water on their faces if possible.<br>• Document cool-down measures applied during the event, symptoms observed, actions taken and any escalation in a class log to share with the school nurse and school or childcare facility head or manager. |
| Regular hydration | • Schedule water breaks every 30–60 minutes. Encourage small, frequent sips including during lessons and activities, and supervise younger children to ensure that they stay hydrated. |
| Monitoring for heat-related illness | • Stay alert for symptoms of illness (see also Annex 3 on signs and symptoms of heat-related illness), especially in children and students with asthma or heart conditions, disabilities, chronic illness and medication-related risks, or who seem lethargic.<br>• If a child or student seems unwell, move them to a cool area, offer water if they are conscious and able to drink, begin appropriate cooling measures, and notify the school nurse, school-based health worker, or school or childcare facility head or manager immediately. |
| Supporting anxious or tired children | • Recognize that some children may feel tired or anxious about extreme heat. Others may be losing sleep quality because of heat stress experienced at home, which can result in a rise in stress and an inability to focus at school or in childcare settings. Offer reassurance and explain that steps are in place to keep them safe, which can help to ease the concerns. |
| Communicating with families, children and students | • Provide information for children and students, explaining in an age-appropriate way about the activation of the heat–health plan or protocol. Provide reminders throughout the day about drinking-water, resting and seeking help if they feel unwell.<br>• Inform families about activation of the heat–health plan or protocol and any specific measures being taken. Remind families of the importance of keeping children cool and hydrated at home as well.<br>• Encourage children and students to share heat safety practices at home, and advise families through school communication channels. |
| Self-care and personal well-being | • Take hydration and rest breaks in cool areas and follow staff heat protection measures. Report personal symptoms of heat illness to the school or childcare facility head or manager immediately (see also User action brief 2 – Occupational domain). |

**Box UAB5.12. Actions for teachers, school nurses, school-based health workers and childcare staff in the evaluation and improvement stage: after extreme heat events and at the end of the season**

| Action area | Actions |
|---|---|
| Checking recovery | • Check whether any children, students or staff still feel tired or unwell, dizzy, dehydrated, or unable to concentrate after the event. Refer them to the school nurse or designated first aider, manager or family as appropriate. |
| Resetting classroom and childcare room routines | • Return to usual lesson plans, gradually reintroducing physical activities over several days, taking account of continued heat risk and any children or students recovering from heat-related illness.<br>• Continue to reinforce hydration habits and shaded-break practices for the days following the event, even as temperatures normalize. |
| Reviewing and reporting on experiences | • Reflect on how the extreme heat event was managed in the classroom, childcare room or learning environment. Note which cooling measures were most effective among staff, children and students, and which communication methods worked best.<br>• Contribute to a review and improvement of heat–health plans and protocols and, where relevant, provide feedback to the school or childcare facility head, manager or heat response coordinator on challenges and incidents. |
| Reinforcing heat safety learning | • Discuss the recent extreme heat event with children, students and families, and reinforce the importance of staying safe in extreme heat. Answer any questions children may have about the event and its effects. Share relevant information with families where appropriate. |
| Check and replenish supplies | • Ensure that any used cooling supplies (such as wet cloths and fans) are cleaned or replenished for future use. |

# Part 3.

## Public health message bank

# Introduction

To protect people's health and well-being, this message bank provides relevant messages for the general public about how to prepare for hot weather, what to do during hot periods, and how to recover afterwards, covering various settings. It serves as a practical starting-point for developing tailored and relevant messaging. Core element 4 – Communication provides further information on the rationale for the messaging and considerations on how best to adapt messages to the scope of the HHAP. To avoid duplication, the references underpinning the messaging are not repeated here. The user action briefs in Part 2 provide concise, actionable guidance that also supports contextual adaptation of the messages, based on the specific context, priorities and needs.

Used as a supplement to Core element 4 – Communication, this message bank can be used by anyone responsible for sharing heat–health information with the public and other stakeholders, including:

- health authorities and public health practitioners to integrate heat-related health advice into public health campaigns;
- health and care workers to educate patients and communities on preventing heat-related illnesses;
- community leaders and organizations to inform and support local groups – particularly those most at risk of threats to health from extreme heat;
- schools and day-care staff, as well as parents, to protect the health of children during hot weather;
- employers and employees to ensure safe working environments during hot weather, including for their customers; and
- health communicators and journalists to spread awareness through media and other channels and to tackle mis- and disinformation.

Users should adapt these messages into local languages, ensuring that they fit the cultural context of the target audiences, and should share them in a timely fashion through appropriate channels, depending on the target audience (see also sections 4.5 on dissemination channels and 4.8 on time frame).

For clarity and relatability, the term *hot weather* is used throughout this message bank when addressing the public, rather than technical terms like *extreme heat*.

# Overview of the materials

The public health message bank offers ready-to-use messages and communication materials tailored for both general audiences and groups at increased risk. These messages cover various settings – including homes, workplaces, schools, outdoor and leisure environments, and while travelling and attending mass events.

These public-facing messages can be adapted to local languages and cultural contexts, and disseminated through appropriate channels such as social media, radio, television, printed materials or community outreach.

The message bank contains practical advice developed by and for public health and communications experts, and used by WHO and national authorities. It is organized into sections covering general public health advice for hot weather and specific public health advice for hot weather in various settings:

- at home or in a care home – advice on keeping indoor spaces cool and protecting all members of the household;
- at work – including measures for employees and customers to stay safe in the heat;
- at school and in childcare settings – outlining ways to keep pupils and students safe;
- when travelling or attending mass gatherings and events – advice on planning travel and spending time in unfamiliar surroundings; and
- when outdoors and during leisure or sporting activities.

In addition to this public health message bank, the GHHIN – co-developed by WHO and WMO – offers a valuable repository of heat–health impacts, evidence, interventions and messaging *(1)*. It is a collaborative platform that connects experts, practitioners and policy-makers to promote knowledge and action on heat–health risks. It provides valuable tools, current data and good practices to support countries in their heat–health efforts.

## General public health advice for hot weather

Every year, high temperatures affect the health of many people – particularly older people, infants, people who work outdoors and people who are on certain medications or chronically ill. Heat can trigger exhaustion and heat stroke, and can aggravate existing conditions – such as cardiovascular, respiratory, kidney or mental health conditions. The adverse health effects of hot weather are largely preventable through good public health practice.

> The following messages from the WHO #KeepCool campaign can be used to issue general public health advice for hot weather. See Annex 4 for a ready-to-use example of how to present these general key messages, and Annex 3 on how to recognize signs and symptoms of heat-related illness, and when to seek medical help, for more information.

### Keep cool in the heat

During periods of hot weather, it is important to keep cool to avoid the negative health effects of heat.

- **Keep out of the heat.** Avoid going out and doing strenuous activities during the hottest time of day. Stay in the shade; do not leave children, dependant adults or pets alone in parked vehicles; and, if possible, spend 2–3 hours of the day in a cool place.
- **Keep your home cool.** Use the night air to cool down your home. Reduce the heat load inside the apartment or house during the day by using blinds, shutters or curtains, and by turning off as many electrical devices as possible.
- **Keep your body cool and hydrated.** Use light and loose-fitting clothing and light bed linen; take cool showers or baths; and drink water regularly while avoiding sugary, alcoholic or caffeinated drinks.
- **Keep in touch.** Check on family, friends and neighbours who spend much of their time alone. People at increased risk of threats to health from extreme heat might need assistance on hot days. If anyone you know is at risk, help them to get advice and support.

Older people and people with pre-existing medical conditions – such as asthma, diabetes and heart disease – should pay greater attention to their health as they are more vulnerable to the effects of heat.

Consult a doctor if you feel unusual symptoms, if symptoms persist or if you suspect a fever. If someone has hot dry skin, delirium and/or convulsions or is unconscious, call a doctor or an ambulance immediately.

## At home or in a care home

The health advice for hot weather while at home is also relevant for the care home environment. This is to complement User action brief 4 – Social care domain, which has relevant information for those with responsibility for managing facilities and for social care workers who may support residents in a range of settings.

### Preparing for hot weather

- **Keep your home cool.**
  - Consider installing shades, blinds or heavy curtains on windows – especially those facing the sun – or consider external shutters or awnings for better effect.
  - Place a thermometer in the room where you spend most of your time to help keep an eye on the room's temperature.
  - If possible, acquire portable fans, cool packs and damp cloths for personal cooling and, if you have AC, ensuring that it is in good working condition.
  - Ensure that you have an adequate supply of drinking-water (approximately 2–3 litres per person daily, but individual requirements or restrictions may vary).
- **Know what help or support is available.** Familiarize yourself with official heat advice from local authorities. Identify nearby cool public spaces (such as libraries, pools and shopping centres).
- **Be prepared to help others.** Make plans to help family members, friends or neighbours who may be at higher risk during hot weather. Make sure they have access to a cool environment and enough drinking-water.

## During hot weather

- **Stay informed and follow official advice.** Stay up to date on weather forecasts and heat–health alerts from trusted and official national and local sources, such as meteorological services or public health announcements.
- **Adjust daily routines.** Consider staying in cooler areas, whether indoors or outdoors. If outdoors, prefer shaded and ventilated places. If possible, spend peak heat hours in cool, ventilated and shaded environments. Reschedule outdoor work or physical activities to cooler times of the day, such as early morning or late evening.
- **Keep the sun and heat out.** Use external window covers where available; otherwise, use internal covers (such as shutters, blinds or curtains) during peak heat hours to reduce indoor heat build-up. When the outside temperature exceeds the inside temperature, keep windows and doors closed during the hottest part of the day.
- **Improve ventilation.** If safe and possible, open windows early in the morning or late in the evening to help ventilate your indoor environment. If the outdoor temperature is below indoor temperature, position fans near windows or doors for cross-ventilation, especially at night.
- **Stay hydrated.** Drink plenty of water regularly throughout the day, even if not feeling thirsty. Avoid alcohol and sugary or caffeinated beverages as they can lead to further dehydration.
- **Dress appropriately.** Wear lightweight, loose-fitting and light-coloured clothing. Choose breathable fabrics, such as cotton or linen. When outside, use sun protection like parasols, wide-brimmed hats, sunglasses and sunscreen with a high sun protection factor.
- **Keep medications cool.** If carrying medications, ensure that they are kept at the correct temperature.
- **Check on people at risk.** As temperatures might affect people in different ways, check regularly on family, friends and neighbours at increased risk of heat-related harm to see if they are coping or need some support. Support them in cooling the house late night or early morning.
- **Recognize heat-related illnesses and act.** If you or someone you know experiences heat-related signs and symptoms, move to a cool area and help them to drink water. Seek medical attention immediately if symptoms do not improve.

# At work

This health advice for hot weather while at work is targeted at employees. This is to complement User action brief 2 – Occupational domain, which has relevant information for employers. Some occupational settings are already hot due to the nature of the workplace or the work performed. Hot weather may exacerbate these temperature conditions and may therefore require additional attention beyond normal everyday measures.

## Preparing for hot weather

- **Find out if your workplace has a hot weather plan.** Familiarize yourself with any existing heat–health guidelines or protocols at your workplace.
- **Gather your heat safety essentials and check personal supplies.** This includes refillable water bottles, rehydration salts, sun-protective clothing, sunglasses and sunscreen.
- **Refrain from drinking alcohol the night before and during work.** This can lead to further dehydration.
- **Know when and how to seek medical help while at work.** Learn the signs and symptoms of heat-related illnesses so that you know when to seek help for yourself and others. Check with occupational health service if taking medications.

## During hot weather

- **Stay informed and follow workplace guidance.** Stay up to date on weather forecasts, heat–health alerts and workplace bulletins about heat preparedness and actions.
- **If working indoors, improve ventilation.** If possible, open windows or use fans to improve ventilation in your workspace. Consider use of AC, if available.
- **If working indoors, keep the sun and heat out.** Use blinds or curtains to block out direct sunlight. If outdoor temperatures are higher than indoor ones, close the windows.
- **Dress appropriately.** If possible within your employer's dress code, wear breathable, loose-fitting clothing in light colours to stay cool.
- **If working outdoors, wear light clothing, a hat, sunglasses and sun protection.** For example, wear UV-protective clothing and sunscreen with a high sun protection factor.
- **Take regular breaks.** Hydrate and rest in shaded, ventilated and cooler areas. Let your body cool down before resuming work, especially if using special clothing or if feeling unwell.
- **Adjust tasks if feasible.** If you have a physically demanding job, try to do it in the cooler parts of the day. If working outdoors, try to do as much work as possible in shaded, ventilated and cooler areas. Consider rotating tasks with colleagues.
- **Stay hydrated.** Drink water regularly (at least 2–3 litres per day, but individual requirements or restrictions may vary), even if you do not feel thirsty. Avoid caffeine and sugary drinks. Include rehydration solutions to avoid dehydration.
- **Look out for colleagues.** If you notice anyone displaying signs and symptoms of heat stress, let them know and notify a manager. Move to a cool area and help them to drink water. Seek medical attention if symptoms persist.

# At school and in childcare settings

This health advice is targeted at school pupils and students, as well as their teachers and parents or guardians. However, many of the messages would also be relevant in a childcare context for facility managers and carers. This is to complement User action brief 5 – Education and childcare domain, which has relevant information for education authorities, school administrators and staff.

## Preparing for hot weather

- **Keep cool.** Speak with your teachers and parents or guardians about ways to keep cool at school during hot weather, and ask whether there are any specific measures or policies in place in your school.
- **Stay hydrated.** Have a clean reusable water bottle and get into the habit of taking it to school every day. Drink water regularly, even on mild days, to prevent dehydration. Let a teacher know if you have problems refilling your bottle.
- **Find out how to help yourself and others.** Learn about and discuss with your parents, teachers and peers the signs and symptoms of heat stress so that you can tell whether you or other people may feel unwell and need help.

## During hot weather

- **Stay informed and aware.** Keep track of any notifications or information from the school about heat preparedness and actions.
- **Avoid intense sports or running under direct sun.** Save these activities for cooler hours in the morning or evening. If you must be outside, find covered or shaded areas to rest every 20–30 minutes.
- **Seek shade or cooler indoor spots.** If you start to feel too warm during lunch or break times, cool down in the shade and drink some water.
- **Dress appropriately.** Where permitted within school rules, wear lightweight, breathable clothing and wear sunglasses. Use sunscreen with a high sun protection factor regularly, and wear a hat – especially if there is direct exposure to the sun.
- **Drink water regularly.** Even if you do not feel thirsty, drink water – especially during break times and after sports. If necessary, discuss with your teachers and peers the availability of drinking-water points at school and regular hydration breaks during lessons.
- **Prefer light and cool meals and snacks.** Snacks such as fresh fruit help you to replenish fluids and nutrients.
- **Watch for signs of overheating.** Look out for signs such as skin redness, headache or tiredness, and help others to cool down too when necessary.
- **Seek support if you feel unwell.** Tell your teacher, buddy or parent if you feel dizzy, tired or overly hot, so that you can rest and drink water in a cool place.

# When travelling or attending mass events

This advice is for people travelling or attending mass events and gatherings, who may find themselves in unfamiliar surroundings and with potential exposure to hot weather that is not typical in their daily life.

## Preparing for hot weather

- **Check the weather before you travel.** Know what range of temperatures are to be expected at the destination, and pay attention to any warnings or regulations in place.
- **Pack appropriately.** Where permitted, wear light UV-protective clothing, a hat, sunglasses and waterproof sunscreen with a high sun protection factor. Be aware of any dress codes for your destination or event.
- **Familiarize yourself with heat advice.** This should be available from local authorities at your destination, or from the event organizer, and should include information such as access to cool spaces and safe drinking fountains. Know how to seek help if needed, and what the emergency telephone numbers are.
- **Take a drinking bottle with you.** Check whether this will be permitted in the venue if attending an event.
- **Plan your route and travel itinerary.** Ensure that you can seek cooler shelter during the hottest part of the day, and plan your times and modes of travel accordingly.

## During hot weather

- **Stay hydrated**. Carry safe drinking-water with you – especially when on the move or on public transport (as it is easy to be distracted or to forget when travelling). Particularly avoid sugary, alcoholic or caffeinated drinks.
- **Wear sun protection.** When spending time outside, wear sunglasses, sunscreen with a high sun protection factor and a hat. Know where to find some shade or a cool room or space.
- **Plan your day.** Make sure that you can be in the shade or a cool place during the hottest part of the day. Be prepared to be flexible with your plans to adapt to local conditions.
- **Keep your accommodation cool.** Close any blinds or curtains in your accommodation to keep the sun out, and check the ventilation or AC settings.
- **Never leave children or dependents unattended in vehicles.** Do not leave a child, a dependent adult or your pets alone in a parked vehicle, even for only a few minutes, as temperatures inside can become dangerously high very quickly – even in the shade.

# When outdoors and during leisure activities or sport

Being physically active naturally has health benefits, but during hot weather it can put you at risk, even if you are healthy.

## Preparing for hot weather

- **Get to know cool-off spots.** Identify local areas with shade or water access (such as parks, lakes and public pools) where you can retreat if it gets too hot.
- **Prepare basic hydration and supplies.** Stock up on portable large refillable water bottles or hydration packs. Depending on the activity, stock up on waterproof sunscreen with a high sun protection factor and UV-protective clothing.
- **Learn the basics about heat and health**. Familiarize yourself with common signs and symptoms of heat-related illnesses, and what steps to take if they appear during your time outdoors.
- **Be safe in and near water.** If you are planning to cool off by swimming or close to bodies of water, prepare yourself and the people accompanying you with general safety measures to prevent drowning. Be aware of local safety instructions and key emergency contacts.

## During hot weather

- **Stay informed and follow guidelines.** Stay up to date on weather forecasts and heat–health alerts. Avoid strenuous activity, especially during peak heat hours. Shift outdoor plans to cooler times of day or move events indoors if possible. Postpone or cancel if necessary.
- **Keep medications cool.** If carrying medications, ensure they are kept at the correct temperature.
- **Reduce exposure to heat and direct sunlight.** While outdoors, avoid being fully exposed to sunlight, and prefer shaded areas. If possible, keep trips short, and take frequent breaks in cooler or air-conditioned spaces or near water if available.
- **Dress appropriately.** Wear loose-fitting, breathable, light-coloured and UV-protective clothes, as well as sunglasses and sun hats. Apply waterproof sunscreen with a high sun protection factor, and reapply as necessary – especially during and after water sports.
- **Stay cool.** Use cooling methods to cool down, including use of wet cloths, mist sprays or dipping feet in cold water regularly for 5–10 minutes, if possible.
- **Increase hydration and replenish electrolytes.** Carry water with you. Regularly drink more water than usual (check with your health-care provider for any adjustments needed), and include drinks or snacks that replenish salts (such as oral rehydration solutions or fruit).
- **Watch for warning signs and look out for each other.** If you or someone you know experiences heat-related signs or symptoms, move to a cooler place and drink some water. Seek medical attention immediately if symptoms do not improve.
- **Keep others informed.** Let friends or family know your location and check in often – especially if you are going to remote or sunny spots.
- **Never leave children or dependents unattended in vehicles.** Do not leave a child, a dependent person or your pets alone in a parked vehicle, not even for only a few minutes, as temperatures inside can become dangerously high very quickly – even in the shade.

# Reference[17]

1. Global Heat Health Information Network [website]. Global Heat Health Information Network; 2025 (https://ghhin.org/).

[17] Reference was accessed 14 April 2026.

# Annexes

# Annex 1. Managing combined exposure to extreme heat and vegetation fires

Vegetation fires (also referred to as wildfires, wildland fires or bushfires, depending on the region) are intensifying in frequency, extent and severity under climate change, and increasingly co-occur with extreme heat events. The compound exposure poses two distinct but mutually amplifying hazards for health:

- direct fire-related impacts – including burns, trauma, evacuation-related injuries and mental health consequences; and
- vegetation fire-related air pollution, including fine particulate matter ($PM_{2.5}$), carbon monoxide, oxides of nitrogen, ozone precursors and reactive volatile organic compounds, which act synergistically with heat to increase cardiorespiratory and all-cause morbidity and mortality.

Groups at increased risk during compound events overlap with those identified in Core element 3 – Populations at increased risk. They include older adults; infants and children; pregnant people; people with chronic cardiovascular, respiratory, renal or mental health conditions; outdoor workers; and people in informal or inadequate housing.

## Key considerations for compound events

Heat-protective and smoke-protective measures should be applied simultaneously, even when their conventional advice conflicts. For example, trade-offs may arise between opening windows for night-time cooling and keeping windows closed to limit smoke infiltration. Other heat-protective measures that require careful consideration during compound events include using fans, which might draw in polluted outdoor air; spending time in parks or other outdoor green spaces, where air quality may be hazardous; wearing respirators during physical exertion in hot conditions, which might add significant physiological strain; and scheduling outdoor activities during cooler times of day such as early morning or late evening, when smoke concentrations are often highest.

In all such cases, the priority is to protect against both hazards through indoor, cool and filtered environments rather than relying on rules that work for one hazard alone. Some key considerations for managing compound events include the following.

- During smoke episodes, indoor environments are typically safer than outdoor environments, provided indoor temperatures are kept below health-relevant thresholds.
- The conventional advice to “open windows for night cooling” must be reversed when outdoor air quality is hazardous, unless mechanical filtration is in place; otherwise, smoke ingress will outweigh the cooling benefit.
- Authorities should issue daily guidance derived from a predefined threshold matrix that combines real-time heat and air quality readings, rather than a single rule. The 2021 WHO global air quality guidelines recommend a 24-hour $PM_{2.5}$ value of 15 µg/m³ as an operational reference; national or subnational thresholds should be adopted where these exist.

- Cleaner-air and climate-controlled spaces (such as public, residential, occupational, social care and educational environments) are the central protective intervention. Their availability, accessibility and operational readiness should be planned ahead of the summer or hot season.
- Public communication should be jointly coordinated by health, civil protection, fire, environmental and meteorological agencies to avoid contradictory advice and message fatigue.

For further information, see the list of advice and guidance in the key resources section below.

## Actions by domain

The actions listed in Table A1.1 complement those set out in the user action briefs in Part 2, and should be embedded into existing planning, monitoring and response cycles.

**Table A1.1. Actions to manage combined exposure to extreme heat and vegetation fires, by domain**

| Domain | Actions |
|---|---|
| Health domain | • Co-develop with civil protection, fire and environmental agencies joint protocols including alert thresholds, cascading roles, data sharing and harmonized public advisories.<br>• Plan clinical surge capacity for the combined burden of cardiovascular, respiratory, renal, heat-related and burn presentations, as well as for mental health-care needs following evacuations.<br>• Verify that health facilities can maintain safe indoor temperatures while limiting smoke ingress through appropriate filtration (such as upgraded heating, ventilation and AC filters, recirculation modes, and sealed openings) and can protect patients at increased risk in designated cleaner-air, climate-controlled areas.<br>• Equip front-line staff to recognize combined clinical presentations and to deliver harmonized advice on hydration, ventilation, masking and cleaner-air spaces. |
| Occupational domain | • Update workplace risk assessments to include compound exposure scenarios. Define stop-work requirements, task reallocation, schedule shifting and respiratory protection criteria for simultaneous extreme heat and hazardous air quality.<br>• Provide indoor cleaner-air temperature-controlled rest areas, and ensure that respiratory protection is compatible with heat-protective requirements.<br>• Train workers and supervisors to recognize combined symptoms and to follow compound-event protocols, with particular attention to outdoor workers, workers using PPE that limits heat dissipation, pregnant workers and workers with chronic conditions. |

**Table A1.1 contd**

| Domain | Actions |
|---|---|
| Urban and built environment domain | • Designate and equip cooling centres that can also function as cleaner-air spaces with adequate filtration, sealing and backup power; ensure equitable access for groups at higher risk.<br>• Integrate compound heat-vegetation fire scenarios into local emergency, evacuation and shelter plans and into operational decisions on public events, transport service and outdoor work.<br>• In the medium and long term, embed compound exposure considerations into spatial planning, building codes, retrofit programmes, and green and blue infrastructure investments. |
| Social care domain | • Pre-equip care homes and home care services to maintain both safe temperatures and acceptable indoor air quality during compound events (via filtration, sealing, sufficient active and passive cooling, and backup power).<br>• Apply operational protocols that balance the ventilation needed for heat with smoke-protective measures, and identify designated cleaner-air, climate-controlled rooms for residents at higher risk.<br>• Train staff to recognize combined symptoms in residents and service users (such as breathlessness combined with dehydration or confusion) and to follow facility evacuation and relocation protocols, coordinated with health and emergency services. |
| Education and childcare domain | • Adopt decision criteria – agreed among education, health and civil protection authorities – for adjusting, relocating, suspending or closing school and childcare activities under compound extreme heat and vegetation fire conditions.<br>• Equip selected rooms in each school and childcare setting to function as cleaner-air, climate-controlled spaces. Check filtration, sealing and ventilation ahead of the summer or hot season.<br>• Cancel or relocate outdoor physical activities and breaks during compound events; brief children, students, families and staff on combined protective measures.<br>• Train teaching and childcare staff to recognize combined symptoms in infants, children and adolescents (such as respiratory distress, fatigue, dehydration and behavioural changes) and to act promptly. |

## Key resources[18]


Air quality indexes: key considerations and roadmaps for best practices. Copenhagen: WHO Regional Office for Europe; 2026 (https://iris.who.int/handle/10665/384754). Licence: CC BY-NC-SA 3.0 IGO.

Measures to reduce risks for children's health from combined exposure to multiple chemicals in indoor air in public settings for children with a focus on schools, kindergartens and day-care centres. Copenhagen: WHO Regional Office for Europe; 2022 (https://iris.who.int/handle/10665/354225). Licence: CC BY-NC-SA 3.0 IGO.

Personal interventions and risk communication on air pollution : summary report of WHO expert consultation, 12–14 February 2019, Geneva, Switzerland. Geneva: World Health Organization; 2020 (https://iris.who.int/handle/10665/333781). Licence: CC BY-NC-SA 3.0 IGO.


[18] All references were accessed 4 May 2026.

Personal-level actions to reduce air pollution exposure in the WHO European Region. Copenhagen: WHO Regional Office for Europe; 2024 (https://iris.who.int/handle/10665/375889). Licence: CC BY-NC-SA 3.0 IGO.

Public health advice during the wildfires: how to protect your health and keep safe [news release]. WHO Regional Office for Europe; 16 June 2023 (https://www.who.int/europe/news-room/questions-and-answers/item/public-health-advice-during-the-wildfires--how-to-protect-your-health-and-keep-safe).

WHO global air quality guidelines: particulate matter ($PM_{2.5}$ and $PM_{10}$), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/345329). Licence: CC BY-NC-SA 3.0 IGO.

Wildfires and heat-wave in the Russian Federation: public health advice. Copenhagen: WHO Regional Office for Europe; 2010 (https://www.who.int/europe/publications/i/item/WHO-EURO-2010-4095-43854-61747).

Wildfire smoke with extreme heat. Ottawa: Health Canada; 2024 (https://www.canada.ca/en/health-canada/services/publications/healthy-living/combine-wildfire-smoke-heat.html).

# Annex 2. Advice for mass gatherings during periods of extreme heat

Table A2.1 outlines advice to consider for reducing heat-related risks during mass gatherings.

### Table A2.1. Actions to reduce heat-related risks during mass gatherings

| Objective | Actions to consider |
|---|---|
| Know the risk | Obtain historical environmental data on the venue over several years. |
| Reduce environmental heat exposure | Cancel the event or reschedule on a different day. |
| | Reschedule the event earlier/later during the day. |
| | Enable access to green areas with natural shade by:<br>• providing a map and directions<br>• considering extending opening hours, if necessary. |
| | Enable access to public air-conditioned spaces where people can rest from the heat by:<br>• providing a map and directions<br>• considering extending opening hours, if necessary. |
| | Provide temporary shaded areas at event locations using:<br>• umbrellas<br>• tents. |
| | Reduce the need to queue with:<br>• efficient check-in<br>• additional staffing<br>• staggered ticket entry. |
| | Provide water spray, mist area or spraying (such as showers or a garden hose). |
| | Produce and distribute free goodies, such as:<br>• paper fans<br>• caps<br>• sunscreen.<br>These can be printed or accompanied by information about:<br>• heat mitigation<br>• recognition of heat-related illnesses. |

### Table A2.1 contd

| Objective | Actions to consider |
|---|---|
| Hydration | Produce and distribute refillable water bottles or cups. |
| | Provide access to free water with:<br>• minimum 1 tap per 1000 spectators<br>• an objective of 1 tap per 300 spectators on hot days. |
| | Provide access to food and beverage concessions that supply:<br>• cold palatable drinks<br>• water-rich food (such as salad and yoghurt)<br>• Ensure sufficient concessions to avoid the need to queue. |
| Treatment | Erect a large medical tent with a shaded area with fans or AC allowing many people with less severe heat illness to cool down and rehydrate.<br>Provision of such a tent allows the main medical facility to be reserved for more severe cases. |
| | For a sports event, have a dedicated medical facility for athletes (known as a "heat deck") with dedicated and trained personnel, as exertional heat stroke is different from classical heat stroke. |
| | Heat stroke treatment must take place on site and via rapid and aggressive cooling (such as using an ice bath).<br>The principle is: treat first, transport second. |
| Education for prevention | Produce and distribute leaflets (for example, to each ticket buyer).<br>Produce and display posters around the venue.<br>Use digital screens and public announcements.<br>Messages should include:<br>• standard heat mitigation recommendations<br>• local specificities, such as:<br>  • how to access shade<br>  • how to access water<br>  • how to access medical support. |
| | Consider including information on factors that could worsen the effects of heat, such as:<br>• a recent infection<br>• a recent episode of diarrhoea<br>• alcohol consumption<br>• some (prescription) drugs. |

*Source:* adapted from Heat, air pollution and solar ultraviolet radiation: mass gathering-specific considerations and research gaps. Geneva: World Health Organization; 2025 (https://iris.who.int/handle/10665/384582, accessed on 29 April 2026). Licence: CC BY-NC-SA 3.0 IGO.

# Annex 3. Recognizing signs and symptoms of heat-related illness, and when to seek medical help

## Overview

Extreme heat events are dangerous for human health and well-being; they are linked to increased mortality and health issues across different populations *(1,2)*. Prolonged exposure to heat can lead to a variety of heat-related signs and symptoms, ranging from mild discomfort to life-threatening emergencies. Recognizing the signs and symptoms of heat-related illnesses is crucial in order for timely action to be taken to protect health and prevent further complications. This annex contains a brief explanation of common heat-related conditions and their key characteristics.

## Key signs and symptoms of heat-related illnesses

**Dehydration** occurs when the body loses more fluids than it takes in, often due to excessive sweating during hot weather. Common signs and symptoms include (3):

- thirst
- dark yellow and strong-smelling urine
- less frequent urination
- dry mouth or skin
- fatigue
- dizziness or confusion
- headache
- sunken eyes
- no tears when crying (in children)
- irritability (in children)
- sunken soft spot or fontanelle (in children).

**Heat rash** occurs when sweat becomes trapped under the skin, leading to irritation. Common signs and symptoms include *(4)*:

- red clusters of small, itchy blisters, most commonly occurring in the neck, chest and underarms; and
- a tingling or prickling sensation.

**Heat cramps** are painful, involuntary muscle spasms that typically occur in large muscle groups like the legs, arms or abdomen. They result from dehydration, electrolyte imbalances or exertion during high temperatures. Common signs and symptoms include *(4,5)*:

- sudden, painful muscle contractions
- firm muscles
- excessive sweating.

**Heat exhaustion** occurs when the body struggles to regulate temperature, but it can be managed by applying cooling techniques (such as moving to a cooler place, taking cold showers or immersing feet in cold water). Loss of water and electrolytes ("salt") through sweating leads to dehydration and reduced blood volume *(6)*. Common signs and symptoms include *(7)*:

- tiredness
- weakness
- fatigue
- headache
- irritability (especially in children)
- excessive sweating
- dizziness or light-headedness
- nausea or vomiting
- pale, clammy skin
- rapid, weak pulse (palpitations)
- muscle cramps.

**Heatstroke** is a health emergency and the most severe form of heat-related illness. It occurs when the body's thermoregulatory system fails, causing core body temperature to rise above 40 °C *(4,6,8)*. Common signs and symptoms include:

- high body temperature (above 40 °C)
- hot, dry skin (sweating may be absent)
- confusion, agitation or disorientation
- rapid, strong pulse (palpitations)
- seizures
- rapid, strong pulse
- nausea or vomiting
- severe headache
- loss of consciousness or coma.

## When to seek medical help

If the person or their family is unsure whether they might be suffering from heat-related illness, it is advisable to seek help from their health provider even before an extreme heat event occurs.

If the person is suffering from mild signs and/or symptoms of heat-related illnesses (such as dehydration, heat rash, heat cramps and heat exhaustion) during hot weather , it is advisable to hydrate and apply cooling techniques promptly, including modifications in the near environment (such as fans) as well as individual cooling techniques (for example, putting wet towels or cool packs around the neck, under the armpits or to the groin).

If the mild signs and symptoms of heat-related illnesses do not improve after 30 minutes, or the person deteriorates quickly, progressing to heat stroke, this should be considered a medical emergency: medical interventions should be given as soon as possible *(9)*. In this case, seek medical attention immediately (call emergency services) *(10)*. Do not give any medicines or drugs to the person.

## References[19]


1. Ballester J, Quijal-Zamorano M, Méndez Turrubiates RF, Pegenaute F, Herrmann FR, Robine JM et al. Heat-related mortality in Europe during the summer of 2022. Nat Med. 2023;29(7):1857–1866 (https://doi.org/10.1038/s41591-023-02419-z). Erratum in: Nat Med. 2024;30(2):603 (https://doi.org/10.1038/s41591-023-02649-1).
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5. Heat cramps, exhaustion, stroke [website]. National Weather Service; 2022 (https://www.weather.gov/safety/heat-illness).
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10. Leyk D, Hoitz J, Becker C, Glitz KJ, Nestler K, Piekarski C. Health risks and interventions in exertional heat stress. Dtsch Arztebl Int. 2019;116(31–32):537–544 (https://doi.org/10.3238/arztebl.2019.0537).


[19] All references were accessed 28 April 2026.

# Annex 4. #KeepCool campaign poster

This annex contains a ready-to-use poster from the annual WHO #KeepCool campaign displaying the general public health advice for hot weather presented in the public health message bank in Part 3.

Other useful materials can also be provided by local or national authorities or retrieved from other agencies and organizations working on heat–health, such as the GHHIN.[20]

*Source for opposite page:* Health advice for hot weather: advocacy brief. Copenhagen: WHO Regional Office for Europe; 2026 (https://www.who.int/europe/publications/m/item/health-advice-for-hot-weather, accessed on 30 April 2026).

[20] Global Heat Health Information Network [website]. Global Heat Health Information Network; 2025 (https://ghhin.org/, accessed on 30 April 2026).

# Health advice for hot weather

World Health Organization
European Region

Every year, high temperatures affect the health of many people – particularly older people, infants, people who work outdoors and people who are on certain medications or chronically ill. Heat can trigger exhaustion and heat stroke, and can aggravate existing conditions – such as cardiovascular, respiratory, kidney or mental health conditions. The adverse health effects of hot weather are largely preventable through good public health practice.

## Keep cool in the heat

During periods of hot weather, it is important to keep cool to avoid the negative health effects of heat.

### Keep out of the heat.

Avoid going out and doing strenuous activities during the hottest time of day. Stay in the shade; do not leave children, dependant adults or pets alone in parked vehicles; and, if possible, spend 2–3 hours of the day in a cool place.

### Keep your home cool.

Use the night air to cool down your home. Reduce the heat load inside the apartment or house during the day by using blinds, shutters or curtains, and by turning off as many electrical devices as possible.

### Keep your body cool and hydrated.

Use light and loose-fitting clothing and light bed linen; take cool showers or baths; and drink water regularly while avoiding sugary, alcoholic or caffeinated drinks.

### Keep in touch.

Check on family, friends and neighbours who spend much of their time alone. People at increased risk might need assistance on hot days. If anyone you know is at risk, help them to get advice and support.

Older people and people with pre-existing medical conditions – such as asthma, diabetes and heart disease – should pay greater attention to their health as they are more vulnerable to the effects of heat.

Consult a doctor if you feel unusual symptoms, if symptoms persist or if you suspect a fever. If someone has hot dry skin, delirium and/or convulsions or is unconscious, call a doctor or an ambulance immediately.

## More information is available at the links below:

**Heatwaves**
https://www.who.int/europe/health-topics/heatwaves

**Global Heat Health Information Network**
https://www.ghhin.org/

**The WHO Regional Office for Europe**

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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