



World Health  
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# UPDATING THE EVIDENCE RELATED TO HEAT-HEALTH ACTION PLANNING

## Meeting Report

21-22 November 2018

Bonn, Germany





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## ABSTRACT

On 21 and 22 November 2018, a group of experts in heat–health and heat–health action plans (HHAPs) convened in Bonn to discuss the possible revision of the HHAP guidance published in 2008 by the WHO Regional Office for Europe. They discussed preliminary findings from the evidence reviews that have been undertaken to inform a revised guidance, and they identified knowledge gaps where more evidence reviews or research is indicated. They also considered practical examples of HHAP development and implementation, as well as an example of heat warning notification system. Finally, they discussed a vision for a revised guidance, including the form it might take and the steps needed to develop it.

### Keywords

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## Executive summary

### *Meeting scope and purpose*

In adopting the 2017 [Declaration of the Sixth Ministerial Conference on Environment and Health](#) (the Ostrava Declaration), the Member States of the European Region committed themselves to developing national portfolios of action on environment and health in seven interrelated priority areas, one of which is climate change and health. Annex 2 of the Ostrava Declaration is a compendium of possible actions; the overall objectives of the actions listed for this priority are to strengthen the adaptive capacity and resilience to climate change-related health risks, and to help mitigate climate change and achieve health co-benefits.

For the past several decades, heat waves have been one of the deadliest types of extreme weather events in the WHO European Region, causing tens of thousands of premature deaths. It is anticipated that the situation will worsen with global warming, as global warming is expected to increase the frequency, intensity and duration of heat waves significantly. Nonetheless, the adverse health effects of hot weather and heat waves are largely preventable.

Preventing the consequences of heat waves requires an array of actions at different levels. Recognizing this need, in 2008 the WHO Regional Office for Europe published a guidance entitled [Heat–health action plans](#). Until today more than 20 Member States in the Region subsequently developed national or subnational heat–health action plans (HHAPs) based on this guidance. However, the guidance does not address whether and how the entire HHAP system and its core elements should evolve with the changing climate. In this light, HHAPs would benefit from the rapid expansion of knowledge and experience relating to climate change adaptation and thereby serve as models of effective health adaptation.

A large body of new evidence has emerged since the 2008 HHAP guidance. The WHO European Centre for Environment and Health (ECEH) has committed to updating this guidance in 2018–2019, utilizing the most relevant evidence from recent epidemiological and environmental research and lessons learned from implementation.

The purpose of the present expert meeting was to inform and help launch the work of ECEH in the process of updating the evidence related to heat–health action planning. The meeting was designed to identify and share key resources and to map critical capacity-building needs in the European Region. The meeting had the following **specific objectives**.

- Discuss the preliminary findings from evidence reviews that have been undertaken.
- Identify knowledge gaps and additional areas for which additional evidence is needed.
- Discuss the impact of the updated evidence and how it can best inform the planned revision of the HHAP guidance.
- Assess the need for updating the existing HHAP guidance.

The chief expected **outcome** of the meeting was to identify and substantiate the need for a revised WHO guidance on heat–health action planning at the national and regional levels, and to inform the development of such a revision.

## ***Meeting programme***

The meeting lasted for two days and consisted of an opening session, four thematic sessions, a discussion of evidence needs and how best to package anew guidance, and a brief closing session.

- The [opening session](#) provided an overview of the meeting’s background, objectives and expected outcomes.
- [Session 1](#) focused on developments in heat–health action planning since the 2008 HHAP guidance, a provisional roadmap for updating this guidance, and the WMO/WHO 2015 global guidance on heat wave warning systems.
- [Session 2](#) considered recent evidence on the physiological effects of heat, spatial variations in heat mortality in Athens, worker health and heat, heat–health trends in the European Region, and blue spaces and mental health.
- [Session 3](#) examined governance aspects of HHAPs with a general look at organizing the public health response to heat waves, as well as national case studies from the Region and Canada.
- [Session 4](#) looked at an emergency notification system for extreme heat.
- In [Session 5](#), the assembled experts responded to a proposed plan from ECEH for revising the guidance on heat–health action planning. They discussed evidence gaps, a proposed case survey, the form of the final guidance, and a proposed global symposium.
- [Session 6](#), the closing session, briefly outlined the next steps that would be taken in developing anew guidance. These steps are reproduced immediately below.

## ***Next steps***

During the first quarter of 2019, ECEH will share a draft of this meeting report with all participants, as well as a revised roadmap of the proposed guidance development process, informed by the discussion in [Session 5](#). The ECEH team will also be contacting participants individually about specific supporting roles they might play in the process, including perhaps helping to host a global symposium in late 2020.

## Introduction

This meeting was organized by the European Centre for Environment and Health (ECEH) of the WHO Regional Office for Europe. It took place on the United Nations Campus in Bonn, Germany, on 21–22 November 2018.

The 21 participants in the two-day meeting included experts from a variety of fields working in eight Member States of the WHO European Region and in Canada, as well as representatives from ECEH and the World Meteorological Organization (WMO). See [Annex 1](#) for a full list of participants and their affiliations.

## Opening session. Background, objectives and expected outcome

Oliver Schmoll, Acting Head of Office and Programme Manager for Water and Climate at ECEH, welcomed participants to Bonn and provided an overview of the meeting's **background, objectives and expected outcome**.

In adopting the 2017 [Declaration of the Sixth Ministerial Conference on Environment and Health](#) (the Ostrava Declaration), the Member States of the European Region committed themselves to developing national portfolios of action on environment and health in seven interrelated priority areas, one of which is climate change and health. Annex 2 of the Ostrava Declaration is a compendium of possible actions; the overall objectives of the actions listed for this priority are to strengthen the adaptive capacity and resilience to climate change-related health risks, and to help mitigate climate change and achieve health co-benefits.

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Preventing the consequences of heat waves requires an array of actions at different levels. Recognizing this need, in 2008 the Regional Office for Europe published a guidance entitled [Heat–health action plans](#). Until today more than 20 Member States of the Region subsequently developed national or subnational heat–health action plans (HHAPs) based on this guidance. However, the guidance does not address whether or how the entire HHAP system and its core elements should evolve with the changing climate. In this light, HHAPs would benefit from the rapid expansion of knowledge and experience relating to climate change adaptation and thereby serve as models of effective health adaptation.

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The chief expected **outcome** of the meeting was to identify and substantiate the need for a revised WHO guidance on heat–health action planning at the national and regional levels, and to inform the development of such a revision.

The participants approved the programme for the meeting (see [Annex 2](#) and [Annex 3](#)). Klea Katsouyanni (National and Kapodistrian University of Athens) agreed to chair the meeting and Misha Hoekstra to serve as rapporteur.

## Session 1. Heat–health action planning

The first thematic session focused on developments in heat–health action planning since the 2008 guidance, a provisional roadmap for updating this guidance, and the 2015 WMO/WHO global guidance on heat wave warning systems.

The session began with a quick look at **developments in heat–health and HHAPs in the European Region during the previous 10 years**. Since the publication of *Heat-health action plans* in 2008, heat waves have been getting longer, stronger and more frequent, with the number of warm days almost doubling since 1960. Hot weather is associated with increases in mortality and morbidity, and recent modelling suggests that by the end of this century, it will be responsible for between 35 000 and 96 000 additional deaths in the Region annually. A study published in 2018 found that heat waves were expected to get worse in every one of the 571 European Union (EU) cities examined. At the same time, a variety of studies have shown that the health and economic benefits of climate change adaptation efforts significantly outweigh the costs; for instance, while heat wave warning systems may cost slightly more as global warming continues, their cost–effectiveness is expected to increase dramatically. The WHO Regional Office developed [a free tool](#) to estimate health and adaptation costs to support adaptation planning by Member States, and in 2011 it updated its 2008 guidance with [Public health advice on preventing health effects of heat](#), which provides recommendations for targeting specific populations. The original guidance was supplemented further in 2015, when WMO and WHO headquarters issued [Heatwaves and health: guidance on warning system development](#). Meanwhile, the past decade has seen an intensifying engagement of both the global and the European community in climate change issues and a corresponding increase in evidence. In the European Region, the Ostrava Declaration provides countries with a robust mandate to develop adaptive capacity and resilience, while the Working Group on Health in Climate Change (HIC) of the European Environment and Health Task Force helps facilitate their efforts.

The session then looked at **a provisional roadmap for revising the 2008 guidance**, including some questions that a revision might try to answer. The 2008 guidance consisted of a short evidence review, discussion of the core elements of an HHAP and a set of audience-specific information sheets, which were updated in 2011 and supplemented by the 2015 global guidance on heat warning systems. The goal has been to develop a new guidance rather than *guidelines*, which would require a higher standard of evidence and take much more time and effort to develop. Besides the accumulation of new evidence and experience, the past decade has also



seen the continuing ageing and urbanization of populations in the Europe Region. The old guidance has had a significant impact, and a 2017 survey identified 35 national and subnational HHAPs in the Region, out of the 53 Member States. The evidence for their effectiveness is mixed, however, and much more research and analysis is needed to determine which factors affect heat-related mortality and morbidity, such as the use of HHAPs, climate trends, population adaptation and acclimatization, different governmental arrangements and the involvement of other actors. More research is also needed on the impact of specific interventions, such as creating more green and blue spaces, and how health systems might advocate for the effective ones. A tentative roadmap for developing the new guidance was presented, beginning with nine reports, including five reviews of scientific and grey literature in these evidence areas, a HIC questionnaire, a report on conceptual work to integrate climate change into HHAPs, questionnaires by HIC and perhaps other bodies, consultation with technical experts and with HIC. These reports would feed into strategic discussions leading to the preparation of the final guidance document. As mentioned, this roadmap was tentative, and it is not clear if it asks all the right questions, how the guidance would be packaged and disseminated, or how it should be coordinated with other ongoing activities. Participants discussed a version of the roadmap at length during [Session 5](#).

The final presentation of Session 1 focused on **the global guidance on heat wave warning systems** issued by WMO and WHO in 2015. It provides detailed, technical assistance on developing warning systems, a key element in HHAPs. The climate component of these warning systems is the responsibility of the national meteorological and hydrological services. It is not clear how widely this 2015 guidance is used in the European Region or if it needs updating. It helped pave the way for two joint WMO/WHO plans in the areas of health, environment and climate: an action plan and a five-year work plan, running from 2019 through 2023. Particularly relevant focal areas of these plans include urban areas, air pollution, climate services and extreme weather. Both United Nations organizations have also been centrally involved in the development of the [Global Heat Health Information Network](#) (GHHIN), which is designed to increase sharing of heat–health information and practices among a broad variety of local, national and global actors. The 2015 guidance addresses subjects as assessing heat stress, establishing local warning thresholds, communicating warnings, developing intervention strategies and seasonal planning. However, it does not sufficiently address some key emerging issues, such as common alert protocols, integration of other hazards, impact-based forecasting, urban heat islands and interactions with air quality. Major questions to be answered include whether it is time yet to revise this guidance, what kind of format would be most useful and how to align it with a revised European Region HHAP guidance.

In the short **discussion** that ensued, it was noted that other WHO regions have expressed interest in contributing to an HHAP guidance revision with their experience, as well as in receiving capacity-building support and exploring twinning opportunities. Since the European Region is already leading in this area, it makes sense to think about how to make a revised guidance more globally relevant. The goal of this meeting is to clarify the roadmap for developing the guidance; the tentative roadmap presented is an ideal plan in some ways, and it might be better to be less ambitious, which would also make the process quicker. With respect to evidence, the WHO Guidelines Review Committee (GRC) has very strict standards, yet it also recognizes that the nature of evidence in environment and health is different than for topics such as pharmaceutical products, so it is willing to accept good practices, country experiences and the weight of evidence from grey literature. Finally, it was suggested that one particular topic that would be important to address is the ways that local housing characteristics, building codes and retrofits

affect the health impacts of heat, as these factors can often be more significant than the urban heat island effect.

## **Session 2. Evidence updates on heat waves and health**

The second thematic session considered recent evidence on the physiological effects of heat, spatial variations in heat mortality in Athens, and worker health and heat, plus literature reviews on heat–health trends in the European Region, blue spaces and mental health, and again, worker health and heat.

The session kicked off with an examination of **some ways that physiological research might expand the scope of HHAPs**. While heat–health action planning focuses on reducing heat-related mortality and morbidity, it tends to ignore the impact of heat on work performance, especially that of manual outdoor workers, as well as confounding factors such as poverty. In work situations, heat-induced fatigue and impaired performance is a result of psychological factors and respiratory, cardiovascular, neurobiological and muscular changes. In real-life situations, outdoor workers tend to reduce their work intensity in response to heat and take more breaks. Planned breaks end up being cost-neutral because they result in workers taking fewer unplanned breaks. Simple strategies to reduce heat fatigue – and improve productivity – include wearing lighter, more breathable clothing and ensuring regular hydration and electrolyte replacement, including before and after work. Guidelines vary according to occupation; some useful industry-specific suggestions can be found on the [website](#) for the Integrated Inter-sector Framework to Increase the Thermal Resilience of European Workers in the Context of Global Warming (HEAT-SHIELD). It was noted that it is critical to develop separate recommendations for employers and employees. Such recommendations also need to be aligned with occupational health standards, for instance for protective clothing.

Participants then heard about a study on **spatial variability in the effect of high temperatures on mortality** in Athens. Previous research has shown that mortality–temperature association vary from city to city, with the mortality point occurring at lower temperatures in higher latitudes, indicating an adaptation effect. People born in Sicily who move to Milan, which has a cooler climate, are more heat-resistant than Milan natives. That also suggests that tourists and migrants coming from colder climates may be more vulnerable to heat than the native population. Research has also shown that factors associated with higher heat mortality include advanced age, chronic disease, routine use of medicines, low socioeconomic status, air pollution and certain aspects of urban planning, such as a lack of green space. The present study found that while geographical factors such as population density and green space appeared to have an effect on heat-related mortality in Athens, such effects almost disappeared when local temperature differences in the city were factored in. Localized research in London indicates that heat mortality is correlated with the availability of green space but not socioeconomic levels. It is important to note that the pool of urban residents who are vulnerable to heat is increasing in most European cities as populations age, chronic diseases become more widespread and air pollution gets worse. Further research within urban areas using high resolution exposure and health data is needed to better understand the role of environmental and area specific risk factors as well as individual factors is needed.

The next presentation looked at some of the findings from HEAT-SHIELD, **an EU project to increase the thermal resilience of workers** that focuses on the tourism, agriculture, manufacturing, construction and transportation sectors. A systematic review and meta-analysis on worker health and productivity found 111 studies from over 400 million workers in 30 countries, primarily focusing on health rather than productivity. They include 14 studies from the European Region, all within the EU, with many more studies in the pipeline. People who frequently work in heat experience a fourfold increase in the likelihood of heat strain (with 35% experiencing symptoms after a single shift under heat stress) and a 15% increase in kidney problems. The deleterious effects are greater in construction than in agriculture, chiefly because agricultural workers have more opportunities to regulate their behaviour. Productivity losses have been shown to be roughly 1% for every 1° C increase in environmental temperature. As heat stress increases, work intensity decreases and workers take more breaks. Effective adaptation strategies include mechanization, adaptive clothing, more frequent breaks and hydration. Using calorimetry rather than thermometers, one study found that during a heat wave, young people achieve heat equilibrium within two hours, while those who are elderly or have type 2 diabetes take much longer. Other risk factors for heat strain are being overweight or having poor aerobic fitness. The project has also been developing a personalized early heat warning system, both web- and mobile app-based, that draws on the individual user's local weather forecast, physiology and working conditions to provide personalized risk forecasts, hydration advice and industry-specific cooling solutions.

Participants then turned their attention to **a literature review of evidence on heat–health trends in the European Region**. The review looked at 257 articles to answer two questions. The first asked how the relationship between temperature and health outcomes has changed over time, and which variables were associated with the change. The studies showed a general decrease in mortality and morbidity, in large part due to the implementation of HHAPs, though no change was found in the United Kingdom or Ireland. Groups at risk include the elderly, people with chronic or pre-existing conditions, pregnant women, outdoor seasonal workers, people who exercise strenuously, people travelling, those who are socially disadvantaged or isolated, and migrants. The health impacts of heat waves are less pronounced in warmer climates, probably because of greater familiarity with the effects of heat. The impacts are more noticeable in cities due to the urban heat island effect and air pollution, especially when the housing stock is old and there are few green and blue spaces. High-income areas are less susceptible, due in part to air-conditioning and insulation.

The second question asked for current projections of health impacts for the European Region in the context of climate change, and how these projections could improve early warning systems. The studies indicated that the impacts will be greater in the warmer parts of the Region as heat waves increase in intensity and frequency. Adaptation processes, however, affect vulnerability to heat. As populations age, it is expected that heat-related mortality will increase and there will be greater pressure on health care and emergency services. Minimum mortality temperatures have been increasing, rising for instance in Stockholm from 10.3° C in 1901 to 20.0° C in 2009. The studies also identified a variety of adaptation interventions ranging from individual to public policy interventions. Based on the literature, the review authors suggest that the threshold temperature for HHAPs be revised every three to five years. A worldwide literature review that was consulted found that research on the health impact of heat waves is distributed unevenly around the world, with regions at greater risk being underrepresented; it also concluded that there are not enough studies focusing on morbidity rather than mortality. In discussion, it was noted that there is almost no research on the question of physical adaptation.

The session then turned to mental health issues, starting with a brief account of a systematic review looking at **evidence for the positive effects of blue spaces on mental health and psychological well-being**, particularly with respect to heat waves and hot days. Having identified an initial group of 29 relevant papers, the review authors are now conducting a literature search that they expect to retrieve roughly 10 000 papers. It has proven difficult to define not only mental health and psychological well-being but also blue space, with many papers being very vague about habitat characteristics. They anticipate that the number of papers they identify in addition to the original 29 will be fairly small. In the discussion that ensued, attention was drawn to [BlueHealth](#), a “sister project” of HEAT-SHIELD, as well as studies exploring mental health and heat waves in general. These studies included one finding that people who take mental health medications are increased risk during heat waves; one or two heat studies that included mental health disorders among the morbidities examined; a study on the effects of heat on workers’ mental health; and a study on heat waves and autism, schizophrenia, bipolar disorder and seasonal affective disorder (SAD).

Finally, the session turned its attention to **a systematic review of heat waves and worker health in the European Region**. Covering the publication years 2015–2017, the review identified 13 relevant research articles. Four studies examined heat-related morbidity among Italian workers, addressing the key role of heat waves in occupational allergies, the increased risk of pesticide exposure during heat, the need to reduce occupational exposure to solar radiation and the finding that most summertime work injuries occur during heat waves. Another four studies looked at heat-related mortality, including three projection models and one retrospective analysis, covering multiple countries, multiple cities and the Republic of North Macedonia. Two articles explored the worldwide effects of heat waves; the first found that the most vulnerable workers are those who do heavy outdoor labour in tropical and subtropical countries, and the second projected losses in daylight work output in the same types of settings, including southern Europe. Two studies on risk perception found that in Belgium and the Netherlands, the general population respondents with higher educational background were more aware of risk factors and protective measures, and that key stakeholders were unsure of their responsibilities in the national HHAPs, particularly at the local level. The final article established priority actions for understanding and responding to occupational safety and health risks posed by climate change. Reference was also made to the HEAT-SHIELD systematic review referred to above, which covers scientific papers from the entire world for a larger range of years. There was general agreement among participants that more research is needed.

### **Session 3. Governance of heat–health action plans (HHAPs) in the European Region**

The third session examined governance aspects of HHAPs, looking first at stakeholders who are underrepresented in heat–health action planning and then at a series of national case studies, from both the Region (France, Germany, Italy and the United Kingdom) and Canada.

The session started with an exploration of **stakeholders who are underrepresented in HHAP targeting and development** and should be included in the preparation of a revised guidance. The vulnerabilities to heat of four often-neglected target groups were described, along with suggestions for how institutions could address them. Actions to address the vulnerabilities of the homeless and those with unstable housing include training existing volunteer organizations to recognize and respond to heat illness, equipping emergency housing with cool areas and coordinating with local public institutions and businesses to open up cool spaces during extreme

heat events. For migrants and mobile populations, such actions include training of local providers, translation of heat warning and information materials, equipping temporary housing with cool areas and coordinating with local public and private entities about access to cool spaces. For the disabled, actions include targeting warnings to the learning-disabled, coordinating with workplaces and community organizations and training care providers and volunteers about the group’s special heat-related needs. For people with unreliable access to energy, actions including arranging with utilities not to cut off supplies for non-payment during heat waves and coordinating with local organizations on access to cool spaces. During discussion, a fifth underrepresented group was added, that of people who are incarcerated.

In developing HHAPs, it is important to remember that heat is a cross-cutting issue that affects everyone. It therefore makes sense to involve sectors in addition to the health and environmental sectors, as well as civil society and community leaders. Other people whose participation is important include first responders, caregivers, business owners and experts from the fields of media, meteorology and health. Consulting with local officials, union representatives and groups representing the various vulnerable populations will not only help improve the heat wave response but also increase their sense of ownership. As a rule, good communication and resource sharing improves stakeholder participation. In determining which groups may be being unintentionally left out, it is useful to ask who cannot afford to remain indoors in heat conditions, who is expected to look after vulnerable individuals and whose images are being presented in prevention materials. In general, it is a good idea to share resources and responsibility with people already working with or in contact with vulnerable groups – such as newspaper deliverers – and to piggyback upon existing local structures.

The focus then shifted to case studies from specific countries, starting with **the French HHAP**. The purpose of the plan is to avoid excess mortality due to heat by protecting vulnerable people in nursing homes, identifying vulnerable people living at home, alerting people of heat waves and communicating how to respond. The health ministry, meteorological agency and public health agency are jointly responsible for updating and implementing the plan. Local stakeholders adapt the HHAP to local conditions and coordinate local actions. A four-colour alert system is used; a change to the alert level is triggered by meteorological and health assessment. The health assessment relies primarily on the number of emergency consultations for heat, as mortality figures are consolidated monthly, which is too long of a window for heat waves. Excess mortality during heat waves was 15% in 2017, chiefly affecting the elderly, though in 2015 there were also 49 deaths among children due to an early heat wave. An evaluation of public awareness in France found poor knowledge of heat stroke and low perception of risk, even among the elderly, yet good knowledge and implementation of preventive actions. Two thirds of the elderly are in regular contact with family during heat events, yet only 5% have registered with municipal authorities; a stakeholder study is trying to identify barriers in order to increase registration. A 2016 study of local stakeholders also recommended better-targeted prevention materials for vulnerable groups and those responsible for them, city maps of water sources, reinforcement of social links between the vulnerable and their neighbours and families, better formation and sharing of good practices among municipal stakeholders, and more support and resources for hospitals and nursing homes. Analysis has shown that the relationship between heat waves and excess mortality did *not* decline after implementation of the HHAP. Future studies will evaluate specific prevention measures and try to determine how best to adapt the plan to the projected increase in future heat waves.

The next presentation examined the preparation of **German HHAPs**, particularly the process of developing recommendations for local implementation. The German Environment Agency has

been responsible for overseeing implementation of the National Climate Change Adaptation Strategy and its action plans. All public sectors are involved, though it would be beneficial if public health has a more active role. A 2015 vulnerability assessment projects a rise in morbidity and mortality due to heat stress, especially in urban areas, where 75% of the German population resides. Heat waves are expected to increase in frequency, intensity and duration, and the country’s ageing population poses extra challenges. The number of hot days varies greatly by location, and the country has two different temperature thresholds of its Heat Health Warning System operated by the German Weather Service. In 2015–2016, the national working group on health adaptation to climate change elaborated a consolidated approach to implementing local HHAPs, based on German translations of the 2008 WHO guidance and 2011 WHO public health update and drawing upon the experiences of other western European countries. The working group published its recommendations in 2017, and they were reintroduced to regional and local public health bodies as a national framework for implementing their own HHAPs. The existing WHO model will continue to be used, but the threshold values and other numbers are to be updated in consultation with various bodies. The national heat–health warning system was also extended last year, and a survey found that 64% of respondents consider the system important. A new national study will begin in 2019 to review the practicability of the recommendations, assess local HHAPs that are already in place and help pilot communities to develop and implement their own HHAPs.

Participants then turned their attention south to **the Italian HHAP**, focusing on lessons learnt and future steps. The plan is intersectoral and includes all the core elements of the WHO model. The HHAP consists of three major components: a heat warning system, health surveillance and identification of susceptible subgroups most at risk and prevention efforts. The heat-health *warning systems* are city-specific and disseminated both locally and at national level via the Ministry of Health website and an APP, to account for acclimatization to heat throughout the summer and change. . Seasonal forecasts have proven helpful for seasonal response planning with a greater lead-time, although still not formally included in the prevention program.. A heat warning app available for both iOS and Android mobile devices has been developed that includes warning bulletins and a synthesis of local prevention measures (national guidance, local plans, contact numbers and helplines and prevention brochures, factsheets etc) and health guidance of heat wave events and health impacts . The *health surveillance* component consists of rapid surveillance systems for mortality and emergency room visits in the 34 major cities, as well as weekly and monthly evaluation. General practitioners (GPs) have an active surveillance role too, for instance carrying out home visits during heatwaves to elderly susceptible patients identified through standardized protocols and the use of demographic and health registries (hospital admissions, pharmaceutical consumption and social services). Seasonal planning takes winter mortality into account, as bad influenza\higher mortality in the previous summer can be followed by a lower mortality in the next summer. *Prevention measures* include national public health guidance, the identification of vulnerable groups, targeted advice for these groups and for healthcare professionals, and a survey of local prevention plans and adaptation measures every summer. The registration of vulnerable individuals has good uptake among GPs and social workers. Cities have access to all local and regional heat plans, as well as to prevention and information campaigns. Local and national training workshops are offered regularly to stakeholders providing information on how the plan works and an update on the evidence on emerging susceptible subgroups and possible prevention measures. Groups targeted by prevention materials include the elderly, children, people with chronic illnesses, pregnant women and workers. The materials are all accessible through the mobile app and the Ministry of Health website . Various kinds of authorities are responsible for the local HHAPs; one thing that the local plans tend to lack is emergency protocols. Data indicate that there has been some

adaptation to higher temperatures and a decrease in heat mortality over time, despite the ageing of the population and an increase in the prevalence of chronic conditions. The number of heat wave days is projected to double in the next 30 years. Since the same groups are vulnerable to both extreme heat and poor air quality, the national temperature exposure plan began to address air pollution and pollen in 2018. The pollen season has become longer and more intense. Experience has shown that in Italy, the biggest key to HHAP improvement is iterative evaluation.

Monitoring and evaluation have also pointed the way forward in the United Kingdom, specifically for **the Heatwave Plan for England**, which was developed collaboratively by Public Health England and the United Kingdom Meteorological Office. Specific heat wave plans and targets have been developed for hospitals, health and social workers, care homes, children and private homes. An independent evaluation was recently undertaken on the Heatwave Plan's effect on mortality, its implementation, and public heat–health awareness and behaviour, as well as on the effectiveness, cost–effectiveness and acceptability of the heat wave warning system. The evaluation consisted of both outcome and process evaluations. It discovered that most heat-related deaths actually occur below the heat wave temperature threshold because very warm days are much more frequent than hot days. The population survey found that during heat waves, most people in all age groups carry out the majority of the recommended actions, such as avoiding the sun. While awareness of heat risks is high and improving, it proved hard to survey high-risk individuals. Moreover, people who are old or frail do not respond to the advice targeting them because they do not identify as such; another complicating factor is the fact that the English have a positive attitude towards high temperatures, having no personal experience of severe heat waves. Key messages are not filtering down to front-line staff in the relevant institutions, and awareness among care home managers also needs to be better. All of the public health measures in the plan were assessed for uptake, which is invaluable for improving implementation. Unfortunately, very little scientific research has been done on individual interventions, other than a single study finding that fans work well in moderately high temperatures, but not when it is hot. More work needs to be done with retrofitting housing to increase heat resilience. The government is in the process of creating a single adverse weather plan; an auditing committee recommended that warning systems run year round and start targeting those who are at risk at warm temperatures below the heat wave threshold. The presentation concluded with a suggested outline for an updated evidence report that would support the HHAP guidance revision.

The session ventured across the Atlantic Ocean for the final country presentation, on **the Canadian response to extreme heat events**. Although most people think of Canada as having a cold climate, it has experienced several extreme heat events in recent years, resulting for example in 53 deaths last summer in Montreal, despite a fairly effective alert system. Such events and associated mortality are projected to increase dramatically in the coming decades. The government has accordingly been implementing heat alert and response systems, in which community mobilization and engagement are central. The other four key elements in these systems are an alert protocol and plans for community response, communication and evaluation. The national environmental and health agencies work together to establish alert thresholds based on local data. Out of season, a heat special weather statement may be issued even if the threshold is not reached. Typical actions in community response plans are extending hours in cool public places, distributing information, opening cooling centres, setting up temporary water fountains and stations and arranging home visits for the elderly. The authors of 20 Canadian case studies of heat alert and response systems highlighted the importance of a culture of prevention, the use of existing networks, continuous evaluation and innovation, a focus on the most vulnerable, and national and provincial leadership. Examples of effective interventions include distributing heat–

health brochures with spring utility bills, messaging in apartment lobbies to target landlords, and stepped-up monitoring of outdoor spaces for vulnerable populations. A majority of Canadians check regularly for extreme weather alerts and change their routines in response to extreme heat warnings. However, GPs admit they rarely think of discussing extreme heat with patients, regarding it as more of a public health responsibility. Health Canada launched a popular Beat the Heat quiz on its app, and health professionals can earn continuing education credit by taking a heat–health course.

## Session 4. Heat wave warning system development

Andreas Flouris (University of Thessaly) chaired the remainder of the meeting.

Session 4 looked at **an emergency notification system for extreme temperatures**, [EXTREMA](#) is a system that offers real-time surveillance and evaluation of health risks during heat events, by means of a Dashboard for Authorities and a mobile app for the general public. The Dashboard app can help municipal authorities manage heat waves while providing residents with personalized heat risk assessments on their phones. It features a map that shows the spatial distribution of risk based on a 1-km<sup>2</sup> grid, updated every 5 minutes, using satellite-based and model weather forecast data. The app also displays and guides the user to nearby cooling centres, and personalized risk information based upon a simple user profile (age, whether they use medications, whether they have a chronic condition). EXTREMA has been implemented (summer 2018) in Athens, Paris, Rotterdam and the island of Mallorca, with each location adapting it to local needs. For instance, Paris added swimming pools, water games and parks to the map, and Rotterdam added drinking-water sports. It requires local epidemiological data or relevant publications to establish thresholds. The user can create additional profiles, for instance for vulnerable relatives. Options for municipal officials include alerts, the ability to adjust cooling centre availability, and targeted actions, such as messages offering refugees services in their native language. The tool is now being adapted for cold spells in collaboration with a WHO collaborating centre in Finland. In addition, DiscovAir, a similar app for air pollution and pollen risks, is being released soon, and it may be possible to incorporate its features in EXTREMA.

## Session 5. Discussion: developing a revised guidance on heat–health action planning

The last major session was devoted to discussion, in which the assembled experts responded to a proposed plan from ECEH for revising the guidance on heat–health action planning. More specifically, they discussed additional topics that might be good to include in the planned evidence reviews for the guidance, the plan’s proposed survey of best practice, the format and scope of the final guidance, and a proposal to hold a global symposium in connection with the guidance development.

**ECEH proposed developing a new version of the 2008 guidance in two phases.** The *first phase* would culminate in a status report on heat–health and heat–health action planning that provided a picture of current evidence and practice. The evidence portion would draw on the ongoing systematic reviews presented in [Session 2](#), plus any additional systematic reviews that ECEH decides to set in motion. The practice portion would draw on a WHO case survey of HHAPs in the European Region to obtain insight into what is working and what some of the challenges are. To ensure a broad overview of national, subnational and municipal experiences,



the survey would be sent to focal points in each country, plus members of platforms such as the WHO European Regions for Health Network and the WHO European Healthy Cities Network. ECEH suggested conducting the survey in the first half of 2019. The resulting status report would be a rather technical document that distilled in one place findings from the evidence reviews and good practices from the case survey. ECEH would aim to issue the status report by the end of 2019.

The *second phase* would use the status report as a springboard for the development of the revised guidance, which would tentatively be published in late 2020 or 2021. It would be helpful if the participants in the present meeting were to remain involved throughout the process, thereby providing not only expertise, but also continuity.

Discussion of **the systematic evidence reviews** touched on several areas of evidence that participants felt were lacking in the previous guidance and that had not already been identified as lacking during the previous sessions. These areas included gender, specifically the differential effects on men and women of extreme heat and of specific HHAP activities; risk perceptions and health behaviours of different vulnerable groups, including migrants and migrant workers; and the ways technology has or might help people respond to hot days and heat waves. These topics should also be considered for inclusion in the case survey.

As mentioned previously, there is minimal evidence for the effectiveness of specific interventions and actions in heat–health. Effectiveness is also a critical issue in the evaluation part of an HHAP; what criteria should be used, and how should they be assessed? The difficulty that many countries have had in determining whether their HHAPs have had any overall influence on heat-related mortality is telling.

While it was observed that the quality of evidence needs to be scrutinized carefully, it was also noted that it is not feasible to conduct randomized controlled trials for most questions related to heat–health action planning, which involves real-life conditions. It was suggested that a full discussion of evidence quality be included in the status report.

It was also suggested that the systematic reviews be expanded where practicable to include studies published in languages other than English.

With respect to the proposed **case survey**, concerns were raised about the burden that limiting the survey questions and answers to English would impose on respondents, especially respondents from subnational and municipal bodies. While it is not practicable to translate the surveys and responses to all the national languages of the 53 Member States in the European Region, ECEH can certainly make the survey available in the four official languages of the WHO Regional Office for Europe – English, French, German and Russian. National focal points may also be able to assist with language issues.

ECEH was also urged to give respondents enough time to complete the survey properly, especially given the language barriers and the fact that many national working groups on heat–health action meet only semi-annually. Some previous surveys from the Regional Office have had very tight deadlines, which has limited the response rate and the quality of answers. After some discussion, it was agreed that two or three months should be adequate.

Individual participants also requested that, in addition to asking about the topics mentioned previously, the survey ask respondents about the methods they have used to evaluate HHAPs,

and about what they have done to involve different types of stakeholders in HHAP development and implementation.

With respect to **the form of the final product**, the ECEH office noted that, while normative guidelines might be ideal, they would likely take five years to develop and would require a considerable investment of human and financial resources. As defined by WHO, guidelines would also have to be narrower and more programmatic than a guidance. Two things – the relative lack of high-quality evidence in many areas of heat–health and HHAPs, and the fact that a variety of HHAP models are being used for different aims in different settings – argue for a guidance rather than guidelines. Beyond that, however, ECEH expressed openness to the form such guidance might take.

There was general agreement that the 2008 guidance had served its purpose well. One major reason that it has been widely used and referred to is that it is slim, readable and relatively practical – characteristics that would be good to replicate in a revised guidance. That would also make it easier to translate, both into other languages and into action led by different sectors and actors in various settings and scales. It will thus be important to keep in mind that the guidance should be developed with several audiences in mind, some of whom will probably prefer a more traditional conceptually based document, and others who would like more dynamic materials.

Indeed, several participants expressed interest in making the guidance more process-oriented – a toolkit, say, rather than a narrative text. An analogy was made to the difference between a recipe and a paragraph describing how a dish is prepared. One idea would be to develop some supporting materials along with a more traditional guidance – pamphlets, perhaps, or online tools that link to outside resources such as existing warning systems or an example of a hydration app. The prevention materials discussed during the meeting also seemed relevant; brochures and leaflets have been usefully supplemented by web-based and mobile apps with a wide range of functionality.

In the end, there seemed to be agreement that questions about the final form of the revised guidance can wait, and the priority now should be on content development for the status report.

A question was raised of how to address the material covered by the 2015 WMO/WHO guidance on heat warning systems. Participants characterized it as a rather technical and ponderous document, being twice as long as the entire 2008 guidance and poorly illustrated. Some thought should go into the best way to incorporate its content into the revised guidance in a manner that is user-friendly. It is also critical to note that it is not a Regional Office document, so any substantive updating of the material – and there *are* parts of it that are out of date or not best practice – will need to be done in conjunction with the WMO Commission on Climatology, which created the guidance in conjunction with WHO headquarters. The members of the ECEH should therefore confer with their colleagues in the Commission and at WHO headquarters, and if ECEH wishes to change or update anything substantive in the global warning system guidance, it should work with HIC or another European mechanism to make a formal request for an update to the Commission. That would trigger the necessary response from the Commission.

In the roadmap proposed by ECEH, the status report and the final revised guidance are conceived as European Region documents, particularly the status report, which would focus on evidence and experience from the Region. The final guidance would also target stakeholders in the Region, though there was agreement that it should be more universally applicable wherever practicable.

It was then asked whether it did not make more sense to develop a global guidance instead, or at least to involve other WHO regional offices. After all, the Director-General of WHO has made climate change adaptation a priority, and the new guidance could benefit from a cooperative approach that also drew on evidence and experience from other parts of the world. Indeed, the WHO regional offices for both south-east Asia and the western Pacific have requested ECEH for assistance on HHAPs. Yet enlarging the geographic scope of the material and involving other regional offices in guidance development would slow down the process considerably and require additional resources – including at least one new full-time employee – that ECEH does not have. At the same time it would be good to exploit interregional synergies where it can be done manageably, and to invite regional counterparts to reflect and comment upon a draft version of the new guidance.

GHHIN is intended to provide this sort of knowledge-sharing between different parts of the world. WHO headquarters can also provide some connections, even if many of the climate change adaptation projects being undertaken around the world do not explicitly address heat. It was noted that in the area of occupational health, there is an agreement promoting global cooperation in place, so perhaps some topics could be addressed in collaboration with other regional offices while others are developed within the European Region. In the end, however, the general sentiment was that, with the possible exception of the section on heat–health warning systems, it made the most sense to develop the status report and revised guidance within the European Region.

ECEH suggested another way to engage experts from outside the Region: arranging a **global symposium** on heat–health and heat–health action planning in 2020, sometime during the middle of Phase 2. That would build on the leading role that the European Region has played in the field, inform the guidance development and strengthen relationships with experts elsewhere.

The participants embraced this idea, with representatives from both HEAT-SHIELD and GHHIN expressing interest in helping sponsor the symposium, assuming that the symposium could be expanded appropriately, for instance by including a day on occupational health and heat and holding the symposium to coincide with GHHIN’s second global forum, which is tentatively scheduled for late 2020.

## **Session 6. Next steps and closing**

During the first quarter of 2019, ECEH will share a draft of this meeting report with all participants, as well as a revised roadmap of the proposed guidance development process, informed by the discussion in [Session 5](#). The ECEH team will also be contacting participants individually about specific supporting roles they might play in the process, including perhaps helping to host a global symposium in late 2020.

Oliver Schmoll thanked all the participants for their thoughtful contributions and closed the meeting.

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### **Rapporteur**

Misha Hoekstra

## **Annex 2. Meeting agenda**

1. Registration
2. Opening and adoption of agenda and programme
3. WHO heat health action plan guidance – 10 years later
4. Updating WHO guidance on heat health action planning: a roadmap
5. Updates on new evidence on heat waves and health
6. Update on the evidence of the health effects of heat due to climate change in the WHO European Region
7. Additional areas where updated evidence on heat and health is needed
8. Governance of heat health action plans in the WHO European Region with countries' examples
9. Heat waves warning system development
10. Summary of the meeting
11. Closure

## Annex 3. Meeting programme

### Wednesday, 21 November 2018

- 13:30 – 14:00 Registration of participants and welcome refreshments
- 14:00 – 14:20 Welcome and opening  
*Oliver Schmoll,, WHO Regional Office for Europe*
- Background, objectives and expected outcomes  
*Oliver Schmoll, WHO Regional Office for Europe*
- Introduction of participants
- Election of the chair and rapporteur of the meeting
- 14:20 – 15:30 **Session 1: WHO heat health action planning**
- WHO heat health action plan guidance – 10 years later (*Vladimir Kendrovski, WHO Regional Office for Europe*)
- Updating WHO guidance on heat health action planning: a tentative roadmap and some key questions (*Gerardo Sanchez, Technical University of Denmark, Denmark*)
- Heatwaves and health: Global perspective  
(*Joy Shumake-Guillemot, WHO/WMO Climate and Health Office, World Meteorological Organization*)
- Discussion
- 15:30 – 16:00 Afternoon break
- 16:00 – 17:30 **Session 2: Evidence updates on heat waves and health**
- How physiological evidence/knowledge can contribute to the overall “health agenda”  
(*Lars Nybo, University of Copenhagen, Denmark*)
- Spatial variability in the effect of high temperature on mortality: an analysis at municipality level within the Athens Metropolitan Area  
(*Klea Katsouyanni, University of Athens Medical School, Greece*)
- Integrated inter-sector framework to increase the thermal resilience of European workers in the context of global warming (*Andreas Flouris, University of Thessaly, Greece*)
- Discussion



**Thursday, 22 November 2018**

- 09:00 – 10:30 **Session 2 (cont.)**  
Update of WHO Heat-Health Actions Plans guidance: Heat and health in a changing climate: Evidence from the WHO European Region  
(*Julio Diaz and Cristina Linares, Carlos III Institute of Health, Spain (via WebEX)*)  
Heat and biodiversity in context of blue and green space (*Barbara Livoreil, Fondation Biodiversite, France (via WebEX)*)  
Workers health and heat under the climate change in the WHO European Region  
(*Jordan Minov, WHO Collaborative Center on Occupation Medicine, the former Yugoslav Republic of Macedonia*)  
Discussion
- 10:30 – 11:00 Morning break
- 11:00 – 13:00 **Session 3: Governance of heat-health action plans in the WHO European Region**  
How to organize the institutional public health response against heat waves in a changing climate? (*Melanie Boeckmann, Medical Faculty of the Heinrich-Heine-University Düsseldorf, Germany*)  
Countries examples on heat health action planning:  
The French heat and health action plan: principles, assessment and efficiency  
(*Karine Laaidi, Santé publique France, France*)  
Recommendations for heat health action plans in Germany (*Hans-Guido Mücke, German Environment Agency, Germany*)  
The Italian heat prevention plan: lessons learnt and future steps (*Francesca De’Donato, Department of Epidemiology Lazio Regional Health Service, Italy*)  
Heat health action planning in the UK: monitoring, evaluation and lessons learned (*Sari Kovats, London School of Hygiene and Tropical Medicine, United Kingdom*)  
Questions and answers
- 13:00 – 14:00 Lunch break
- 14:00 – 15:00 **Session 3 (cont.)**  
Canadian Approach to Responding to Extreme Heat Events (*Rebecca Stranberg, Health Canada, Canada*)  
Questions and answers  
Discussion
- 15:00 – 15:30 **Session 4: Heat waves warning system development**  
Emergency notification system for extreme heat, experiences of summer 2018  
(*Iphigenia Keramitsoglou, National Observatory of Athens, Greece*)  
Questions and answers
- 15:30 – 16:00 Afternoon break
- 16:00 – 16:45 **Session 5: Additional areas where updated evidence on heat and health is needed**  
*Moderated discussion*
- 16:45 – 17:00 **Session 6: Conclusions and next steps**  
Closure of the meeting

## 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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