# Chapter 7. Preparedness: planning for heat–health risks in health and social care settings

## Summary

Progress on prevention and response measures to heat within the health sector has been limited in national and local planning. Most national HHAPs do not include much detailed information or sufficient guidance on the management of heat–health risks in health and social care settings. Some improvement in information for and responses of health and social care staff was observed, as well as preparedness and response in residential care settings due to increased awareness of the vulnerability of elderly people in these settings. Remaining challenges relate to lack of evidence on whether emergency and response measures are followed and effectively implemented; risk perception of patients, who do not feel that heat-waves are a risk for them; and the lack of evidence on response protocols by staff.

Few health authorities have systems in place to monitor overheating in health care buildings or to assess the impacts on staff, patients, visitors and equipment. Research is needed to implement protective measures and effective heat management in the health sector. Solutions to address both short-term risks related to heat-waves and long-term climate change risks, as well as mitigation measures that promote healthy well-being and environmental sustainability, need to be developed.

## Key messages

- With some exceptions, little progress has been made in planning for heat risks to health systems and facilities, such as emergency protocols in response to heat-waves, climate-resilient health care facility design and mapping of health care facilities in regions that experience heat-waves.
- Awareness of the high vulnerability to heat of many people in residential care is increasing.
- Greater effort needs to be put into sharing best practice planning and response measures in the health sector.
- More research is needed on the risks of overheating and adaptive solutions in hospitals, residential care homes and other settings.
- Health sector goals for carbon mitigation are a priority for action, and may affect the identification and implementation of measures to manage heat risks.

## 7.1 Introduction

Heat affects the health of individuals and populations in several ways, not only through direct impacts related to environmental exposure among the population but also by disrupting the ability of health providers and social care systems to perform their core functions. The WHO Regional Office for Europe's guidance on heat–health action planning (Matthies et al., 2008) identified the preparedness of health care and social services as a core element of an HHAP. It highlighted the need for hospitals, clinics and retirement and nursing homes to define a plan with specific procedures to be adopted against high temperatures, and for health authorities to provide guidance and standards on how to do so. Within that framework, individual elements addressed included:

- preparedness of health care providers and facilities for the hot season, including for adequate treatment and care of heat-related illnesses;
- building modifications and interventions to reduce indoor overheating in health care facilities (such as air-conditioned rooms and wards);
- thermal environment standards for hospitals;
- reductions of the carbon footprint of health care facilities and promotion of environmentally sustainable interventions.

To a large extent, the explorations of interventions to prevent indoor overheating and building envelope modifications in Chapters 5 and 8 are applicable to health and social care systems. Chapter 5 also covers elements of thermal comfort standards, which partly cover the issues of thermal environments in hospitals.

This chapter therefore updates the evidence in two main areas. The first – preparedness for and management of heat events in health systems and social care institutions – is complex and multifaceted, spanning a multitude of elements from clinical guidelines to the complexities of health systems governance in countries. Moreover, this topic has only a weak presence in the formal peer-reviewed scientific literature; a deep exploration would require an extent of primary data collection that is beyond the scope of this publication. Thus, what is presented here is a selection of the peer-reviewed and government literature, illustrating the key aspects where updates have been significant.

The second area – the reduction of the carbon footprint of health care facilities – is conversely a growing field of interest in scientific and technical publications. In this case, the topic has been expanded in scope in accordance with the current mainstream scientific and policy discussion. Specifically, reducing the carbon footprint is integrated within broader efforts of environmental sustainability; the scope is expanded beyond health care facilities to overall health systems; and the climate resilience of health systems is included as a complementary and inseparable part of their overall sustainability, as promoted in the recent WHO guidance for climate-resilient and environmentally sustainable health care facilities (WHO, 2020a).

## 7.2 Preparedness and management of heat events in health and social care systems

Health systems are defined by WHO as "(i) all the activities whose primary purpose is to promote, restore and/or maintain health; (ii) the people, institutions and resources, arranged together in accordance with established policies, to improve the health of the population they serve, while responding to people's legitimate expectations and protecting them against the cost of ill-health through a variety of activities whose primary intent is to improve health" (WHO, 2011). Understood in such comprehensive scope, preparedness of health systems for impacts of heat and extreme high temperatures includes not only health care facilities and personnel but also the networks of utilities, logistics, transport, companies, institutions and social groups that support health system functions. Social care systems similarly encompass a broad range of elements and actors, including nursing and care homes, protection systems for socially disadvantaged groups and homeless people, and community-based organizations operating in the sector, among others. Heat impacts and preparedness are similarly relevant to these broader social care networks.

### 7.2.1 Health systems and heat: preparedness and management

WHO's 2008 and subsequent guidance on heat–health action planning, such as the public health advice factsheets (Matthies et al., 2008; WHO Regional Office for Europe, 2011), elaborate on various types of relevant heat preparedness activities and information for health systems, essentially of three types:

- guidance to health professionals on heat illness risk factors, diagnosis and management;
- guidance to health authorities and residence/care managers on protecting patients, residents and workers from heat;
- guidance to health authorities and residence/care managers on interventions in the built environment to protect health from heat.

Several HHAPs include information on one or more of these areas, as well as specific recommendations or requirements for health systems, hospitals and health care providers for heat preparedness (Casanueva et al., 2019; Mücke & Litvinovitch, 2020). WHO's 2019 survey of heat–health action planning confirms this notion: among the 16 countries that reported the existence of a national HHAP, respondents listed stakeholders to whom targeted advice is delivered, including health care practitioners (81%), nursing homes (75%), health care administrators (69%), social workers (44%) and schools (19%).

The level of implementation of such recommendations may be uneven. Only 44% of respondents considered the core HHAP element of preparedness of health and social systems to be fully implemented. This may, however, not take into account preparedness activities managed and monitored at various subnational levels (several regions and cities in the WHO European Region have their own HHAPs, which include provisions for health and social care preparedness). Moreover, 50% of respondents involved NGO health systems stakeholders such as the Red Cross/Red Crescent in their preparedness and response. The Red Cross, for example, has developed guidance on managing heat-waves (Singh et al., 2019).

Limited progress has been made on resilience in the health sector in response to both significant heat-wave events and the increasing policy need to address climate change adaptation (Paterson et al., 2014; Balbus et al., 2016). This evidence primarily relates to assessments of impacts and response following individual heat-wave events and surveying plans and preparedness measures put in place by health services, hospitals and care homes. Less information is available on the effectiveness of individual interventions or evaluations of specific plans or qualitative research with front-line stuff during and after heat-wave events. A review of HHAP plans in the United States concluded that planning and programming are likely to be most effective if performed in a bottom-up and community-specific manner, and as a collaborative effort among multiple levels of government and local stakeholders (White-Newsome et al., 2014).

### 7.2.2 Heat-waves and hospital care

Extreme high temperatures increase ER and other types of hospital admission for certain disease categories, potentially posing a surge in care needs at a time when health workforce availability may be diminished due to the summer holidays (Gronlund et al., 2014; Hopp, Dominici & Bobb, 2018; Martínez-Solanas et al., 2019). Research in the last decade determined with higher specificity which disease categories are affected by high temperatures and heat-waves. While the increase in respiratory disease admissions is well established, the association between heat and cardiovascular outcomes is weak or non-significant in most studies and only observed among the very old at ages 85 years and over (Hopp, Dominici & Bobb, 2018; Cheng et al. 2019).

A recent study of urgent ER admissions in the Netherlands found that heat increased the relative risk for potential heat-related diseases and respiratory diseases (Van Loenhout et al., 2018). Hopp, Dominici & Bobb (2018) conducted a detailed analysis of the medical diagnoses in hospital admissions that were most influenced by heat, and from 50 outcomes from broad disease groups previously associated with heat-wave-related hospitalizations, they identified 11 diagnoses with a higher admission risk on heat-wave days, including three heat-related illnesses, four fluid and electrolyte disorders, two diagnoses of septicaemia, one of acute kidney failure and one of urinary tract infection. Other recent studies have reported an increase in admissions for mental health outcomes (Thompson et al., 2018). The evolving knowledge about specific heat-related acute effects requiring hospital care may facilitate better planning and preparedness of hospitals for heat.

In addition to the potential increases in hospitalizations, heat-waves cause problems with the functionality of hospitals and the thermal comfort of patients and staff (Matthies et al., 2008; Carmichael et al., 2012). Further studies and documentation on these aspects are needed to ensure that efficient measures are implemented. Reported impacts of heat-waves include:

- discomfort or distress of patients and their visitors;
- discomfort of staff (including occupational health issues – see Chapter 6);
- equipment failure, such as failure of essential refrigeration systems including morgue facilities;
- disruption of information technology services;
- disruption of laboratory services;
- degradation or loss of medicines.

Hospital design and construction influence thermal comfort and ventilation during heat-waves. Hospitals in urban settings may also be affected by UHIs and the presence of green space or blue space nearby (see Chapter 8). In-depth studies of building and ward types have shown that some building characteristics increase the risk of overheating. For example, few hospital wards in northern Europe are air-conditioned; instead, the internal temperature is maintained by natural or mechanical ventilation. Older designs can be more efficient than more modern structures for space cooling (Short et al., 2012; Iddon et al., 2015; Short, Renganathan & Lomas, 2015). Zoning and control of the heating systems, solar gain and lack of effective natural ventilation were identified as the most significant – and common – contributors to overheating in five hospitals assessed in Scotland (BRE, 2018). The Environmental Audit Committee of the United Kingdom Government recently concluded that the risk of overheating in health care buildings was not being sufficiently managed (EAC, 2018). Little information has been published on the prevalence of overheating in relation to hospital design in European countries. There has been considerable progress in research on measures to address overheating buildings (DCLG, 2012; Porritt et al., 2012; Bundle et al., 2018) – widely discussed in Chapter 5 – but not much that is specific to hospital buildings.

There are also occupational heat risks to health care staff during heat-waves. Working under heat stress conditions for prolonged periods is a health concern for health workers (Flouris et al., 2018) (see Chapter 6). Wearing PPE also exacerbates individual heat exposure. This has been a particular issue for health care workers in 2020 during the COVID-19 pandemic (Roberge, Kim & Coca, 2012; Foster et al., 2020; Morabito et al., 2020; Park, 2020). Box 10 sets out an example of how to build resilience of health facilities to cope with heat-waves at the local level.

Several studies have shown that fragmentation of health services is a barrier to effective heat response measures. Although individual service providers may be familiar with severe weather plans and protocols, problems of communication between personnel in different parts of the health and social care system can result in difficulty in implementing such plans efficiently (Dominelli, 2013; Boyson, Taylor & Page, 2014). Systems of service commissioning can ensure that the various agencies delivering health care exercise responsibility for risks associated with severe weather. There may also be gaps in service provision that need to be addressed by individuals (Dominelli, 2013). As heat-waves become more severe, these problems are likely to increase in the future. Few qualitative studies have been undertaken to assess problems during heat-waves among health staff.

### 7.2.3 Social care systems and heat: preparedness and management

It is well established that older people are more at risk from the health effects of heat-waves (see Chapter 6). Epidemiological studies have confirmed that residents in care homes are relatively more vulnerable to heat-related mortality risks (Hajat, Kovats & Lachowycz, 2007; Kovats and Hajat, 2008; Klenk, Becker & Rapp, 2010). A review of heat-wave plans found that relatively few incorporated specific actions for elderly care settings (Okwuofu-Thomas, Beggs & MacKenzie, 2017). A survey in urban areas in Belgium and the Netherlands also found that elderly care organizations were unfamiliar with national heat-wave plans and gave lower priority to heat than to other factors requiring increased response than other public organizations (Van Loenhout, Rodriguez-Llanes & Guha-Sapir, 2016).

HHAPs may include specific actions for residential care homes. For example, in England (United Kingdom), Italy and Sweden heat plans provide guidance for health and social care workers and information sheets have been developed specifically targeted at residential home managers and workers (PHE, 2020; Ministry of Health, 2015; PHA Sweden,

## Box 10. Building resilience to cope with heat-waves: testing the HHAP in North Macedonia

In order to strengthen preparedness for crisis situations and heat-wave-related emergencies, a simulation exercise took place in the Strumica region of North Macedonia. The key stakeholders included representatives from the Ministry of Health, the Strumica General Hospital (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.

Prior to the simulation exercise, preparatory meetings were held to establish the parameters, such as expected casualties, trigger indicators for activating the emergency response plan, triage and patient traffic flows and the responsibilities of hospital and emergency medical services staff. The simulation allowed the authorities to test general preparedness and implementation of the national HHAP. The exercise revealed many opportunities related to better management of heat–health risks in the current hospital crisis preparedness plan, including command leadership, preparedness of staff and effective management of incoming patients.

2017). A survey of planning in long-term care homes in the Netherlands found that most institutions had a heat protocol (Kunst & Britstra, 2013).

Further research has been done on indoor temperatures in residential homes. A study in England, United Kingdom (Gupta et al., 2016), found that there was a risk of overheating, especially during short-term heat-waves (2–4 days), with indoor temperatures rising to nearly 30 °C in communal areas in residential homes and residents' rooms. A survey of actions undertaken in care homes in the Netherlands (Kunst & Britstra, 2013) found that outdoor sunshades were used most often to protect residents, but the prevalence of cooling facilities such as AC and rooftop cooling was relatively low (41%). Care managers confirmed the importance of most of the cooling measures recommended by the national heat plan and did not foresee problems with implementation of the recommended measures. Shortages of staff and inadequate expertise, however, together with limited independence of residents, were considered barriers to implementation and to the effectiveness of heat management in residential settings (Kunst & Britstra, 2013).

Important qualitative research has been undertaken in care home settings to determine behavioural and organizational issues that could increase heat risks. A study in three care homes in England, United Kingdom, found several factors that increased heat risks, including fixed daily routines of care home residents making it difficult to accommodate periods of intense heat; management structures and systems that do not always allow front-line staff to alter indoor temperatures; and a culture that focuses on cold as the main climate risk, so that high indoor temperatures are not always considered undesirable by residents or staff (Gupta et al., 2016; Gupta and Gregg, 2017). A study in Germany found that there was a good understanding of risks and responses within nursing homes, but that management of heat risks could be limited by staff shortages (Becker et al., 2019).

The Lazio region's health system in Italy sets out specific guidance to reduce the impact of heat on health among elderly people through the definition of lists of vulnerable subgroups, based on comorbidities and sociodemographic conditions, GP active surveillance and geriatric hospital ward-specific response (Schifano et al., 2009; Michelozzi et al., 2010; de Martino et al., 2019). GP surveillance during heat-waves includes compiling a questionnaire on health status during home visits, requesting additional health and social care, changing medication and referrals to nursing homes where necessary. Geriatric wards have additional beds for vulnerable patients during summer and hospital admittance triage to detect heat-related health effects in elderly people through a multidimensional questionnaire and triage scoring system, which considers health, socioeconomic status and assistance (Michelozzi et al., 2010; de Martino et al., 2019). Throughout the summer, mortality rates and ER admission rates are evaluated among the vulnerable elderly population and also used to evaluate the Lazio regional active surveillance programme at the end of the season.

In another example of subnational action, Sweden's Skåne region's heat-wave plan for elderly care has been used by other regions and municipalities as a foundation for their own health and social care heat preparedness. The health and social preparedness part of the plan consists mainly of a series of checklists aimed at those with responsibilities in the welfare and care systems – specifically nurses, doctors, home care managers and health care professionals. The involvement of social care and nursing staff from the inception ensured the practicality and feasibility of the plan (Belusic et al., 2019).

The fragmented nature of health and social care in many countries can be an effective barrier to effective heat action planning (Kovats & Osborn, 2017). Provision of care services for elderly people in particular is very complex, involving a range of partners and both formal and informal networks of carers (Curtis et al., 2018). Collaboration among government departments and professional institutions is necessary to harmonize and standardize health-related and building thermal comfort-related overheating thresholds, with particular consideration for care settings (Gupta et al., 2016; Kovats & Osborn, 2017).

More research is needed on the risks in hospitals, care homes and community-based care from heat-waves, in terms of risk management, clinical practices and how these relate to building design. Important evidence gaps remain regarding the effectiveness of interventions – especially individual interventions (Mayrhuber et al., 2018). In particular, more evidence is needed regarding behavioural responses to heat-waves, and how people interact with buildings when temperatures increase. Further work is also needed to identify key high-risk areas, such as secure units, where interventions or response measures may be not practical.

## 7.3 Climate resilience and sustainability of health systems

### 7.3.1 Heat preparedness in the context of all-hazards and extreme weather events preparedness

Some of the potential disruptions and preparedness needs for heat-waves are common to other extreme weather events, as recognized by the WHO global strategy on health, environment and climate change. This identifies the goal that "all health care facilities … are resilient to extreme weather events; and capable of protecting the health, safety and security of the health workforce" (WHO, 2020b). In the last decade, the overall thinking and policy and research approaches have transitioned from risk-specific preparedness to comprehensive, all-hazards plans and interventions. The all-hazards approach acknowledges that, while hazards vary in source, they often challenge health systems in similar ways. Thus, risk reduction, emergency preparedness, response actions and community recovery activities are usually implemented along the same model, regardless of the cause. Standard emergency management approaches, such as all-hazards programmes, can be modified to incorporate consideration of extreme events to increase preparedness (Ebi, 2011). Within the overall framework of all-hazards preparedness, the international literature argues specifically for more integrated planning and preparedness for extreme weather (Curtis et al., 2017), on account of the clear interdependencies involved in preparedness and response to various types of extreme weather event.

Countries have aimed to improve emergency planning in health care settings through international initiatives such as the Sendai Framework for Disaster Risk Reduction (UNDRR, 2015). EU countries committed to the principles of the Sendai Framework through the Rome declaration (UNDRR, 2018). In the Ostrava Declaration (WHO Regional Office for Europe, 2017a), Member States in the WHO European Region committed to establishing national portfolios of action on climate change aimed at strengthening adaptive capacity and resilience to climate change-related health risks. The operational implications of the impacts of COVID-19 and related heat–health responses are presented in Box 11.

### 7.3.2 Climate-resilient health systems

The preparedness of health systems for increasingly intense and long heat events can be improved within a larger effort to increase the climate resilience of health systems. The WHO operational framework for building climate-resilient health systems identifies the "building blocks" broadly

## Box 11. Operational implications of the impacts of COVID-19 and related heat–health responses

No conclusive evidence is currently available that either weather or climate has a strong influence on SARS-CoV-2 virus transmission (Bukhari & Jameel, 2020; Chen et al., 2020; Gunthe et al., 2020; Gupta, Raghuwanshi & Chanda, 2020; Jüni et al., 2020; Liu et al., 2020; Luo et al., 2020; Ma et al., 2020; Şahin, 2020; Shi et al., 2020; Tobías & Molina, 2020; Tosepu et al., 2020; J Wang et al., 2020; M Wang et al., 2020; Yao et al., 2020; WHO, 2020c). The COVID-19 pandemic and restrictions put in place to contain it may, however, have contributed to aggravating the health impacts of heat-waves.

Although the evidence is still in the process of being collected and analysed, the pandemic and responses to it may aggravate heat-related health impacts in two main ways. First, as explored in Box 7 in Chapter 6, the groups most vulnerable to heat and those most at risk of severe COVID-19 overlap (Phillips et al., 2020). Second, the physical distancing measures and common space-use restrictions put in place by most countries in the WHO European Region in response to the COVID-19 pandemic may hamper implementation of core heat–health prevention activities and aggravate the population's vulnerability to extreme temperatures (Martinez et al., 2020).

- The effectiveness and outreach of heat warnings and health-protective advice could be diminished in a context of widespread health warnings and information related to COVID-19, as explored in Box 5 in Chapter 4.
- Fear of contracting COVID-19 has reduced or prevented access to necessary health care (Lazzerini et al., 2020). This may also apply to patients experiencing heat-related symptoms – for example, related to pre-existing conditions or interactions with medication.
- The use of public cooling centres may contradict distancing regulations, thus requiring careful planning and management of cooling facilities and/or additional at-home cooling options (Hospers et al., 2020).
- The ability to reach out to and care for vulnerable people (such as those living alone, chronically ill and elderly people) may be impaired if health and social care systems are overwhelmed (Armitage & Nellums, 2020).
- Surveillance systems, a core component of heat plans, may have limited available resources on account of the demands of the pandemic (Ibrahim, 2020; Setel et al., 2020).
- Several climate-influenced exposures (such as air pollution, allergenic pollen and heat) tend to occur concurrently (Linares et al., 2020), and the pandemic situation may further hinder the effectiveness and reach of integrated prevention efforts.
- The use of PPE may require additional assurance of workers' protection against heat risks (Daanen et al., 2020; Morabito et al., 2020).
- Well maintained, regularly inspected and cleaned ventilation and AC systems can reduce the spread of COVID-19 in indoor spaces by increasing the rate of air change, reducing recirculation of air and increasing the use of outdoor air. Systems that recirculate the air (recirculation mode) should not be used (WHO, 2020d).

In the light of the connections identified between the COVID-19 pandemic and its responses and the health impacts of heat and their prevention, it appears prudent to amend HHAPs and their implementation to ensure heat–health protection while the COVID-19 pandemic, or any other pandemic, persists (GHHIN, 2020; Martinez et al., 2020; Morabito et al., 2020).

common to all health systems (leadership and governance, health workforce, health information systems, essential medical products and technologies, service delivery) (WHO, 2015). The recent WHO guidance for climate-resilient and environmentally sustainable health care facilities (WHO, 2020a) builds on this operational framework and provides guidance for action and a set of suggested interventions in four core areas of health care: health workforce; water, sanitation and hygiene and health care waste management; energy and infrastructure; and technologies and products.

As they function, health care systems will suffer increasing shocks and stresses related to climate change – for example, resulting from extreme weather events such as heat-waves and wildfires – which threaten patients, staff and facilities. Thus, the focus of health adaptation to climate change to better manage its impacts is strengthening health systems. Health care facilities need to identify and implement interventions that provide protection from external climate-related shocks and stresses (i.e. to build climate resilience) (Ebi et al., 2018).

A review by Paterson et al. (2014) showed a range of indicators of health care facility resilience to climate change that are relevant to heat-wave planning (Table 9). Other indicators have also been developed for the purposes of measuring adaptation

**Table 9. Indicators of climate resilience in the health sector relevant to heat-wave planning**

| Indicator type | Activities | Indicators |
|---|---|---|
| General resilience | • Assessing the cost–effectiveness of health care facility adaptation to extreme weather events and climate hazards, by quantifying the benefits and costs of implementing new or improved measures to address risks<br>• Ensuring adequate leadership and clear allocation of staff roles and responsibilities | • Governance<br>• Financing<br>• Resources (human resources)<br>• Service delivery |
| Emergency management | • Assessing health risks to staff, patients and visitors from climate-related hazards, including assessments of the effectiveness of existing control measures<br>• Establishing plans specifying how the facility will manage staff-related issues during an emergency (such as when staff are affected while at work or when staff are unable to come to work)<br>• Securing alternative or back-up access to critical infrastructure – such as energy and water supplies<br>• Ensuring sufficient ER surge capacity to manage climate-related emergencies and disasters (including extreme heat events) effectively<br>• As part of the emergency plan, adopting an incident management system, performing rapid needs assessments and implementing incident response plans<br>• Ensuring that coordination and communication mechanisms are in place with external agencies and stakeholders | • Development and implementation of emergency plans<br>• Development of indicators to monitor health impacts and response (injuries, increases in ER visits and hospital admissions) |
| Extreme weather events | • Establishing mutual aid/assistance agreements (mutual aid, transfer of patients, sharing of resources and supplies) with other institutions during response and recovery from an extreme weather event or natural disaster<br>• Ensuring that emergency plans for extreme weather events are consistent with national and local HHAPs<br>• Developing systems with national weather services for extreme weather advisories and warnings<br>• Undertaking ongoing evaluations of heat impact and response protocols<br>• Providing training and exercises on preparing for, responding to and recovering from weather-related emergencies | • Monitoring of extreme weather advisories and warnings<br>• Surveillance of health impacts (non-fatal and fatal outcomes)<br>• Identifying at-risk population subgroups and high-risk areas and settings to better target response measures |

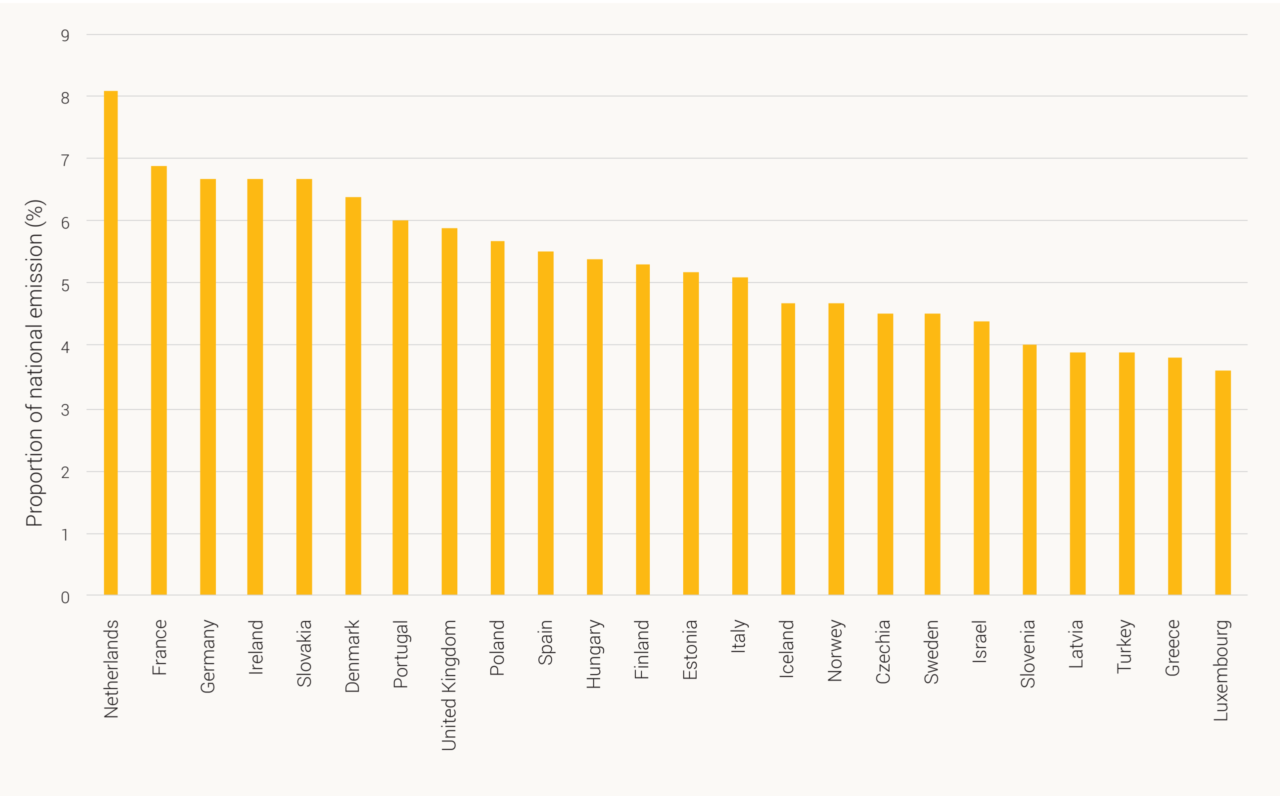
*Source:* adapted from Paterson et al. (2014).

in the health sector to climate change (Committee on Climate Change, 2019). The Pan American Health Organization developed the Smart hospitals online toolkit, which includes guidance documents, training materials, case studies and lessons learned (PAHO, 2017). It was designed for health care facility administrators and technical personnel involved in management, operations and maintenance of health care facilities in the Caribbean. The toolkit includes adaptation measures to improve safety and disaster resilience and green mitigation measures that will improve the environmental performance and sustainability of health care facilities. The United States Centers for Disease Control and Prevention have developed the Building resilience against climate effects framework to support health officials in developing strategies and programmes to help communities prepare for the health effects of climate change (Marinucci et al., 2014). The Canadian Coalition for Green Health Care (2020) has developed the Health care facility climate change resiliency toolkit, which aims to increase awareness of climate change impacts on health care facilities, assess facility resiliency and identify adaptation measures. It includes a facilitator presentation, an online questionnaire on resilience and adaptation tools (Balbus et al., 2016).

While health systems protect people from the health impacts of heat-waves, they also form a large and carbon-intensive part of the economy. As a consequence, they release large amounts of greenhouse gases (Fig. 12) and contribute to both climate change and more frequent and intense heat-waves. Thus, health administrators and authorities are increasingly focusing on addressing climate change through mitigation, and WHO is consequently reviewing the evidence (WHO, 2016), proposing strategic directions (WHO Regional Office for Europe, 2017b) and issuing guidance (WHO, 2020a).

Some examples of carbon emission reduction are presented in Box 12.

**Fig. 12. Health care greenhouse gas emissions as a proportion of national emissions in selected countries (based on availability)**




*Source:* based on data from Pichler et al. (2019).

### Box 12. Low carbon health care against climate change

Reducing the carbon footprint of health systems provides benefits and opportunities for health protection and promotion, financial savings and improved efficiency, as well as reduced environmental risks (Naylor and Appleby, 2013; McGain and Naylor, 2014). In the light of the emerging evidence and clear opportunities in this area, WHO published a review of the scientific literature and strategic guidance for creating environmentally sustainable health systems (WHO Regional Office for Europe, 2016; 2017b), including carbon-cutting interventions.

Hospital care represents a large proportion of health systems' carbon emissions, which can be reduced through improved building insulation and heating, ventilation and AC energy efficiency. Examples include replacing fluorescent lamps with light-emitting diodes, and using solar water-heating systems and lower-carbon fossil fuels such as compressed natural gas for boilers and laundry. Several examples from the WHO European Region are available via the Global Green and Healthy Hospitals network (GGHH, 2020).

In addition, a large share of greenhouse gas emissions in health systems also comes from procured equipment and pharmaceuticals (Eckelman & Sherman, 2016; Eckelman, Sherman & MacNeill, 2018; Malik et al., 2018; Sustainable Development Unit, 2019). The enormous purchasing power of health systems can be leveraged towards lower-carbon alternatives when deemed appropriate and safe. The role of low carbon procurement in health systems is being explored in EU-funded research (EcoQUIP+, 2020) and promoted in the EU through legislation as well as innovation actions such as funding pre-commercial procurement consortia for low carbon health care.

Ultimately, however, a true reduction of health systems' carbon footprint would require moving beyond "green" initiatives towards a deep and long-term redesign of current service models to create sustainable care pathways (Tomson, 2015; Charlesworth & Jamieson, 2019). A clear large-scale example of carbon footprint reductions in a national health system in the WHO European Region is the sustainability portfolio of the United Kingdom NHS, which has cut its carbon footprint by about a third and has pledged to become carbon neutral in 2040 (NHS England, 2020).

## 7.4 Conclusions

Limited progress has been made in national and local HHAPs, particularly in relation to emergency planning in the health sector and long-term measures in health care facilities to improve heat-related responses. A key challenge is the lack of evidence on whether emergency and response measures are followed and effectively implemented, following the challenges related to the patients who do not feel that heat-waves are a risk for them, and, the lack of evidence on response protocols by staff.

Relatively little information is still available on the impacts of heat in health care and social settings, the responses and barriers to effective implementation. In addition, few countries have systems in place to monitor impacts such as overheating or loss of staff time.

Heat is not often seen as a priority within health care planning, especially considering the often limited economic resources, but this may change as the frequency of heat events increases. Increased awareness of the vulnerability of people in residential care has led to some degree of improvements in care in these settings. More research is needed, however, to understand how buildings are at risk of overheating, and to find the solutions to address overheating in hospitals and care homes. Heat risks also need to be managed in the context of increasing demand for carbon mitigation in the health sector via promotion of environmentally sustainable interventions.

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