PROJECT BRIEF 2022–2024

Informing decision-making about indoor heat risks to human health

GLOBAL HEAT HEALTH INFORMATION NETWORK

World Health Organization

Public Health Agency of Canada

PROBLEM STATEMENT

Climate change is exposing increasingly large populations to longer heat seasons; more frequent, hotter, and longer heatwaves; and more hot days and nights (Romanello et al, 2021). Without cooling technologies and behaviours, warmer outdoor temperatures almost always equate to increased indoor temperatures (WHO, 2018). The result is that more people across all world regions are being faced with serious health risks from exposure to high temperatures inside their own homes, or in public or privately managed facilities, such as schools, health facilities, prisons or care homes.

Without respite and access to cooling, high day- and night-time indoor temperatures pose significant health risks, particularly for older people and those with pre-existing medical conditions. High indoor temperatures affect multiple aspects of human health, with the strongest evidence for respiratory health, diabetes management and core schizophrenia and dementia symptoms (Tham et al, 2020). Studies increasingly show that prolonged exposure to high indoor temperatures is also responsible for sleep disturbances, cognitive impairment of workers, reduced learning uptake in students, and domestic violence. The temperature thresholds at which health impacts begin to occur from indoor overheating is the topic of active investigation by many research teams around the world.

As climate change accelerates worldwide, so will the growing global health problem of indoor overheating. Today, the local and global scale of this problem is poorly understood. The lack of strong epidemiological evidence of morbidity and mortality observed at diverse indoor temperature thresholds is limiting strong preventive action. Yet, from preliminary work in multiple countries, it is clear that public authorities are concerned about this issue and have faced public scrutiny following high profile deaths and failure to provide cooling during extreme heat events.

Additionally, it remains commonplace that the responsibility for addressing indoor overheating risks often fall outside existing policy, regulations, and public health interventions in most countries. This situation is reflected in the recently published WHO Housing and health guidelines (WHO, 2018). The authors conducted a systematic review on indoor heat risk to health, but found limited published studies to support strong protective action. Based on limited evidence they were only able to "conditionally" recommend that "in populations exposed to high ambient temperatures, strategies to protect populations from excess indoor heat should be developed and implemented."

Given the context of climate change coupled with a lack of strong pre-existing evidence; protecting public health from dangerous indoor temperatures requires further interrogation and broad collaboration to support decision makers in confronting this multifaceted problem. This project proposes to address the following themes and gaps, throughout the proposed activities.

THEMES & ACTIVITIES

1. Lack of epidemiological synthesis and awareness on indoor thermal comfort and safety conditions

Despite the substantial role that indoor heat exposure plays in heat–related mortality, few epidemiological studies have fully examined the health effects of exposure to indoor heat. As a result, knowledge gaps regarding indoor heat–health thresholds, vulnerability, and adaptive capacity persist (O'Lenick et al, 2021) and present important limitations for protective interventions and regulatory action.

Evidence on the effects of indoor heat on health also implies that buildings are important modifiers of the effect of climate on health outcomes (Vardoulakis et al, 2015). However, the risks from indoor overheating result from an interaction between the susceptibility of a dwelling's occupants to heat, their behaviour (including occupancy patterns), the building's location and its characteristics (Bundle et al., 2018). Furthermore, where people live and work, and the types of buildings people occupy and how they are cooled are further defined by socioeconomics, geography, and culture.

This project will collaborate with a range of global experts and stakeholders to scope existing evidence, critical exposure pathways, and identify knowledge gaps.

2. Indoor heat conditions limit the effectiveness of other heat protection measures

Heat Early Warning Systems (EWS) are a key intervention for notifying authorities and vulnerable populations of dangerous temperatures resulting during extreme heat days and triggering protective interventions. However, populations living in poor housing conditions and urban microclimates escape the utility and benefits of such systems, since dangerous indoor heat conditions can occur, regardless of whether a heatwave is declared, due to the thermal retention of their housing or environment.

For example, urban slums may be experiencing dangerously hot "heatwave" conditions days or weeks before any public warning may be issued. The inhabitants of these areas are often also the most vulnerable populations to indoor heat, including the impoverished, elderly, or facility-bound individuals. Due to these limitations, they are often not being adequately notified by public advisories to take protective action.

New methodologies of urban climate modeling and impact-based heat EWS are being developed to better consider indoor thermal comfort and safety levels. Learning from pioneering research is needed to translate knowledge to practice.

A review by WHO European Regional Office (WHO, 2021) revealed that despite the acknowledged importance of indoor thermal data for prevention of the health impacts of heat, availability of such information is low globally – even more so when referring to real-time data (ZCH, 2015; Van Loenhout et al., 2016). Existing Heat Health Action Plans (HHAPs) throughout Europe therefore use outdoor environmental parameters to define heat-related health risks (Casanueva et al., 2019).

This project will consider whether current approaches to heat prevention, including HHAPs, EWS, and safety regulations, are adequately addressing indoor overheating; and identify good practices from innovating partners.

3. Lack of guidance, good practice, and regulation on prevention of indoor overheating

A range of actors are ultimately involved in directly and indirectly ensuring thermal safety of indoor settings: residents, building and facility managers, public housing authorities, and architects.

Indirectly, legislators, utility companies, social services, housing authorities play a role in ensuring safe living and working conditions in indoor environments. Different regulatory standards and protections may also apply to, or need to be applied to, facilities with concentrations of at-risk populations such as elderly care homes, hospitals, schools, prisons, daycares, and other residential facilities where public safety regulations and liability may apply.

Across North America and Europe, it is more common for building regulations to consider minimum cold temperatures, but there is a notable absence for evidence-based thresholds for protection from maximum temperatures. Importantly, issues of legal liability for failure to provide sufficiently cool environments are being raised in the courts in the United States and elsewhere. Local, provincial, and federal level decisionmakers currently lack awareness, evidence-based regulatory and good practice guidance for how to ensure safe indoor temperatures and set appropriate and protective by-laws for indoor settings.

The need for regulatory guidance from the public health community is expected to increase due to elevated exposures to overheating caused by climate change.

This project will help inform the development of such guidance, by providing an authoritative synthesis of current epidemiological evidence, and a clearer understanding of the challenges faced by decision-makers to take preventive actions or policy measures.

Collaboration with experts from occupational health, heat physiology, and public policy are expected to provide relevant knowledge and experience.

4. Inequitable cooling access and overuse of air conditioning leading to maladaptation and inequity

Air-conditioning is considered the de facto technology for protection from indoor overheating, despite the availability of a wide range of alternative cooling technologies and an obvious number of drawbacks, including equity of access and environmental impacts. The use of air-conditioning may also be considered by many a clear example of maladaptation to climate change (WHO, 2021), yet widespread use of low-carbon effective technologies remains limited.

An over-reliance on air conditioning as the singular method to prevent overheating can be deadly during extreme events. Worldwide we see the vulnerability of energy infrastructure which enables cooling is itself is often damaged and malfunctions during heatwaves, storms, landslides, wildfires, and earthquakes. Loss of power and cooling in the aftermath of extreme weather events is well documented to lead to dangerous indoor temperatures and excess mortality.

Barriers to maintaining safe indoor temperatures include energy and cooling access, housing materials and design, and socio-economic conditions. Managing indoor temperatures requires context-appropriate decision making and technology to balance cooling needs, costs, and the environmental impacts of air conditioning.

This project will help interrogate the strength of existing epidemiological/thermal physiology evidence available to better inform the “right to cooling” arguments and decision-making on cooling option choices from a public health perspective.

Collaboration is expected with multi-sectoral experts working on implementation of low-carbon cooling technologies, such as urban planners, architects, engineers, and technical and policy-oriented cooling alliances.

PROPOSED APPROACH

The prevention of indoor overheating and its health effects presents a complex nexus of challenges for public health. Multi-sectoral solutions are required, but knowledge sharing and clarity is urgently needed from public health experts regarding existing evidence and the range of barriers that decision-makers face in trying to address this issue.

These challenges are not unique to any specific country, but a global challenge that can benefit from collective knowledge of experts and policy makers worldwide. This project therefore proposes an approach to work with a broad range of multi-sectoral experts to develop a scoping paper that outlines the principal issues that need to be better understood; followed by an expert-led stakeholder consultation process and synthesis report; and the drafting of good practices and recommendations that can be assembled in a health intervention toolkit for decision and policymakers at different levels. The expert-led consultations will be open to public participation and dissemination, enabling increased scope of inputs from around the world and greater awareness raising.

This project will help to identify, synthesize and discuss key issues to clarify options and information for public health protection from indoor overheating. The findings from this project on health impacts of indoor overheating can provide decision-makers additional evidence and guidance to inform multi-sectoral policies such as: behavioral and household cooling approaches, energy efficiency, housing standards, fuel poverty, disaster risk reduction, and climate change strategies.

The WHO Department of Environment, Climate Change and Health (ECH) will collaborate with Health Canada, the World Meteorological Organization, and a broad range of participating academic experts and public health agencies via the Global Heat Health Information Network (GHHIN). This broad engagement will help to guide the global health and public policy community in better understanding the scope of health risks of indoor temperatures and policy options for public safety. The outcomes will help to strengthen access to available evidence and good practice to empower health and public policy professionals to make more informed practical and regulatory decisions and recommendations.

Project objectives

1. Identify and synthesize available information and key issues regarding indoor overheating risks to health, including knowledge, guidance, research and policy needs; and good practices and lessons from worldwide jurisdictions where indoor heat interventions and policy have been developed.

2. Inform expert-based recommendations for research and practice, vis-à-vis synthesis and identification of knowledge and policy gaps, best practices, and emerging issues.

3. Develop a globally relevant health intervention toolkit for public health and other relevant authorities, based on available evidence and good practices to protect at-risk groups from indoor heat in the context of climate change.

WORKPLAN AND TIMELINE

Objective(s)	Activities	Person(s) Responsible	Timeline	Implementation	Expected Output(s)
1. Identify and synthesize key issues regarding indoor extreme heat risks to health; including guidance, research, and policy needs; good practices and lessons from jurisdictions where indoor heat interventions and policy have been developed.	1.1 Scoping paper. Indoor Heat: Evidence and issues for health protection	Consultant(s) to draft scoping paper with external review	Two Months (Oct-Nov 2022)	Contract for developing scoping paper based on outline prepared by expert team (15 days) and coordinating expert meetings and preparing report (40 days)	Scoping paper to identify key issues and gaps informing consultation process
	1.2 A series of 4 thematic web-based consultations with experts and stakeholders on indoor heat, meeting reports.	Consultant(s) coordinate and facilitate online meeting, and prepare consultation reports	Six Months (Nov-April 2023)		Consultation Reports on thematic issues
2. To inform expert-based recommendations for research and practice, vis-à-vis synthesis and identification of knowledge and policy gaps, best practices, and emerging issues.	2.1 In person or hybrid expert synthesis meeting to review consultation outcomes, make recommendations and inform toolkit design.	Consultant (s) to coordinate, facilitate, and report on meetings	One Month (May 2023)	Travel, meeting venue	Recommendations and Synthesis Report
	2.2 Synthesis report summarizing consultation and expert findings	Consultant(s) to draft synthesis report	Two Months (May-June 2023)	Contract for drafting synthesis report (5 days)	Peer-reviewed paper
3. Develop a globally relevant toolkit for decisionmakers, based on available evidence and good practices, to support public health and other authorities in protecting at-risk groups from indoor heat in the context of climate change.	3.1 Health-intervention toolkit – for 3 or 4 different decision-makers	Consultant(s) to draft toolkit	Four Months (July-Oct 2023)	Contract for drafting policy toolkit (27 days)	Draft Health-Intervention toolkit for review
	3.2 Toolkit review and feedback, finalization	Consultant(s) to seek review and revise according to feedback	Three Months (Nov-Jan 2024)	Contract for coordinating review and incorporation of feedback (10 days) Contract for editing, layout, graphics, finalization and dissemination of tool	Validated and final draft of Health-Intervention toolkit
	3.3 Toolkit launch and dissemination	Consultant(s) to organize launch event and dissemination	Spring 2024	Costs for publication and web support	Publication toolkit for online publication and dissemination

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