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The Behavior Change Wheel as a Complementary Implementation Framework for Heat-Health Action Planning

Julian Wienert

ABSTRACT:

Extreme heat is one of the most significant climate-sensitive public health challenges of the twenty-first century. In response, Heat-Health Action Plans (HHAPs) have become the principal framework for coordinating multisectoral adaptation measures. While the recently updated World Health Organization (WHO) guidance provides a comprehensive strategic framework for HHAP development, translating these strategic objectives into coordinated implementation across sectors remains a persistent challenge. This discussion paper proposes to use the existing Behavior Change Wheel (BCW; Michie et al., 2014) as a complementary implementation framework for Heat-Health Action Planning. Rather than introducing new heat-health interventions, the BCW provides an explicit behavioral implementation logic that systematically links behavioral diagnosis, intervention functions, and policy categories within a common analytical framework. This enables strategic HHAP objectives to be translated into context-specific implementation strategies across individual, organizational, and governance levels. By integrating behavioral diagnosis with intervention design and policy action, the BCW complements the WHO Heat-Health Action Planning guidance and supports the operationalization of existing HHAP core elements. The paper further illustrates how the BCW can facilitate behavioral diagnosis, intervention selection, and coordinated implementation across different implementation contexts. Conceptualizing Heat-Health Action Plans as implementation systems highlights the importance of explicitly addressing the behavioral processes through which heat-health interventions are delivered and coordinated. The proposed integration positions the BCW as a complementary implementation framework that can strengthen the coherence, feasibility, and coordination of HHAP implementation while providing a foundation for future empirical research on behavioral approaches to climate change adaptation.

KEYWORDS:

heat-health action plans; climate change adaptation; behavior change; implementation science; Behavior Change Wheel; heat health

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Introduction

Extreme heat is increasingly recognized as one of the most pressing climate-sensitive public health challenges of the twenty-first century (IPCC, 2022; Romanello et al., 2024; WHO, 2026). Climate change is increasing the frequency, intensity, and duration of heat events across many regions of the world, resulting in substantial health, social, and economic consequences (IPCC, 2022; Romanello et al., 2024). Heat exposure contributes to excess mortality, cardiovascular and respiratory morbidity, impaired mental health, reduced work productivity, and increasing pressure on health and social care systems (Gasparrini et al., 2015; Kovats & Hajat, 2008; Romanello et al., 2024). Vulnerability to heat is unequally distributed, disproportionately affecting older adults, individuals with chronic diseases, socially isolated populations, outdoor workers, and those living in disadvantaged housing conditions (IPCC, 2022; WHO, 2026).

In response to growing heat-related risks, governments and public health authorities have implemented a wide range of heat-health interventions. These include heat warning systems, risk communication campaigns, preparedness measures within health and social care systems, occupational heat protection policies, community outreach programs, and urban adaptation initiatives (WHO, 2026). Increasingly, these interventions are brought together within Heat-Health Action Plans (HHAPs), which aim to coordinate efforts across sectors and support comprehensive heat-risk management (WHO, 2026).

Despite the growing number of heat-health interventions, responsibilities for their development and implementation often remain distributed across sector-specific domains (Preston et al., 2011; WHO, 2026). Heat warning systems, public communication campaigns, healthcare preparedness measures, occupational heat protection policies, urban adaptation initiatives, and building-based cooling strategies frequently operate in parallel, guided by different institutions, objectives, and implementation logics. For example, an effective heat-health response may require municipal authorities to issue and coordinate heat warnings, healthcare organizations to activate preparedness procedures, and individuals to adopt protective behaviors in response to these warnings. If responsibilities, procedures, or behavioral requirements are not aligned across these levels, implementation gaps may emerge even when the individual interventions themselves are available. This fragmentation presents a challenge because heat-related health risks emerge from interactions between individual behavior, organizational practices, environmental conditions, and policy environments. Effective adaptation therefore requires coordinated action across sectors rather than isolated interventions.

Recognizing the need for more integrated approaches, the World Health Organization recently updated its guidance on Heat-Health Action Planning. The revised framework emphasizes multisectoral governance, stakeholder engagement, preparedness, communication, surveillance, monitoring, evaluation, and learning (WHO, 2026). Importantly, the guidance positions HHAPs as implementation-oriented systems that support coordinated action across sectors and levels of governance (WHO, 2026).

Nevertheless, implementation remains a persistent challenge. Many heat-health measures ultimately rely on behavioral responses. Individuals must adopt protective behaviors during heat events, healthcare professionals must recognize and manage heat-related health risks, employers must implement workplace protections, and organizations must integrate heat preparedness into routine

practice (WHO, 2026; Michie et al., 2011; Michie et al., 2014). Although the WHO guidance provides extensive operational direction for implementing HHAPs, it does not include a dedicated framework for systematically diagnosing behavioral determinants and linking them to intervention functions and policy mechanisms. As a result, decision-makers may struggle to translate broad recommendations into context-specific actions that effectively influence behavior.

Against this background, there is a need for implementation-oriented frameworks that can systematically connect behavioral, organizational, and policy-level determinants of heat-health action (Nilsen, 2015; Craig et al., 2008). Several implementation and behavioral science frameworks offer valuable perspectives on different aspects of implementation, including contextual determinants, implementation processes, and organizational change. However, Heat-Health Action Planning requires an approach that can simultaneously connect behavioral diagnosis, intervention design, and policy action across multiple sectors and levels of governance.

The Behavior Change Wheel (BCW) is an established framework developed by Michie et al. (2011) to support the systematic design of behavior change interventions. Its development addressed the need for a coherent method for moving from an analysis of why a target behavior does or does not occur to the selection of appropriate intervention strategies. The BCW begins by defining a specific target behavior and diagnosing the factors that enable or constrain it. Its core COM-B model distinguishes three conditions that contribute to behavior: Capability, referring to whether an actor has the knowledge and skills required to perform the behavior; Opportunity, referring to whether the physical and social environment enables it; and Motivation, referring to the processes that direct and sustain the behavior. The resulting diagnosis can then be used to select appropriate intervention functions and policy options (Michie et al., 2011; Michie et al., 2014).

This logic may be particularly useful for Heat-Health Action Planning because implementation ultimately depends on multiple actors performing specific behaviors. For example, residents may need to adopt protective behaviors during heat events, healthcare professionals may need to activate heat-response procedures, and municipal authorities may need to coordinate actions across sectors. HHAP guidance can specify that these actions are required, but their implementation may be constrained by different behavioral determinants across actors and contexts. Applying the BCW provides a systematic way to specify the required behavior, diagnose whether barriers relate to Capability, Opportunity, or Motivation, and subsequently select intervention functions and policy approaches that address those barriers (Michie et al., 2011; Michie et al., 2014). The contribution of the present paper is therefore not the development of the BCW itself, but its proposed application as a complementary implementation framework for systematically operationalizing Heat-Health Action Planning across individual, organizational, and governance levels.

In this proposed application, the common BCW/COM-B logic provides a shared analytical basis across these levels, while allowing the relevant behaviors, determinants, and intervention strategies to differ according to the actor and implementation context. The paper therefore examines how an established behavioral intervention-design framework can be applied within HHAP systems to make implementation requirements explicit and to support greater coherence across actors and sectors. Although the framework has been applied across a wide range of public health challenges (Michie et al., 2014), its systematic application to Heat-Health Action Planning remains limited.

This discussion paper therefore proposes the Behavior Change Wheel as a complementary implementation framework for Heat-Health Action Planning. By applying an established behavioral implementation logic to HHAPs, the paper aims to connect strategic heat-health objectives with the behaviors required for their implementation and with intervention and policy approaches that can support these behaviors across different levels of the HHAP system.

From Heat-Health Planning to Heat-Health Implementation

Despite the strategic advancement represented by the updated WHO Heat-Health Action Planning guidance, a central implementation challenge persists: the behavioral and organizational mechanisms through which coordinated action is achieved remain largely implicit. While HHAPs increasingly emphasize multisectoral governance and integrated responses (World Health Organization Regional Office for Europe, 2026), they provide limited analytical structure for understanding how implementation occurs across interacting behavioral, organizational, and policy domains.

This gap is particularly relevant because heat-health risks emerge through interactions between individual behaviors, organizational routines, environmental conditions, and governance structures. Consequently, effective implementation requires more than coordinating interventions across sectors; it requires understanding how the behaviors necessary to deliver these interventions are enabled, supported, and sustained within different implementation contexts.

In this sense, the key challenge is not only fragmentation of interventions, but fragmentation of implementation logics. Different sectors—including healthcare, occupational health, urban planning, emergency management, and social services—operate with distinct professional routines, institutional responsibilities, and decision-making processes. Although these sectors pursue the shared objective of reducing heat-related health risks, the behavioral mechanisms through which implementation occurs often remain implicit, limiting opportunities for coordinated action across the HHAP system.

Against this background, a more explicit implementation perspective becomes necessary. Conceptualizing HHAPs as integrated implementation systems highlights the need for analytical approaches capable of linking implementation across individual, organizational, and governance levels. Such approaches should not only account for individual behavior, but also for the organizational practices, institutional arrangements, and policy mechanisms through which heat-health interventions are delivered and coordinated (Nilsen, 2015; Craig et al., 2008).

Figure 1 illustrates the proposed implementation layer by linking the WHO HHPA core elements to the behavioral logic of the BCW. The core elements at the top of the figure represent the strategic domains through which heat-health action is organized, while the central implementation gap highlights that the behavioral assumptions underlying these domains may remain implicit. The BCW implementation layer addresses this gap by introducing a sequential analytical logic: the COM-B model is used to identify the Capability, Opportunity, and Motivation factors that influence the behaviors required to implement a given HHPA core element; this diagnosis informs the selection of appropriate intervention functions, which can subsequently be supported through relevant policy categories. Thus, the figure does not propose additional HHPA core elements, but shows how the existing elements can be translated into behaviorally informed implementation strategies.This logic can be applied to different HHPA core elements and to the actors responsible for their implementation. For example,

implementing the “Heat-health warning systems” core element may require municipalities to establish warning procedures, organizations to integrate warnings into their operational routines, and individuals to respond with appropriate protective behaviors. The BCW provides a common analytical structure for identifying the behavioral determinants relevant to these different implementation behaviors and for linking the resulting diagnoses to intervention and policy responses. In this way, the implementation layer connects the strategic content of HHAPs with the behaviors and practices through which their core elements are enacted.

Building on this conceptual perspective, the following section examines how the Behavior Change Wheel may complement the WHO Heat-Health Action Planning framework. Rather than replacing existing HHAP guidance, the BCW is proposed as a complementary implementation framework that provides a systematic approach for analyzing behavioral determinants, selecting intervention functions, and supporting coordinated implementation across multiple actors and levels of governance.

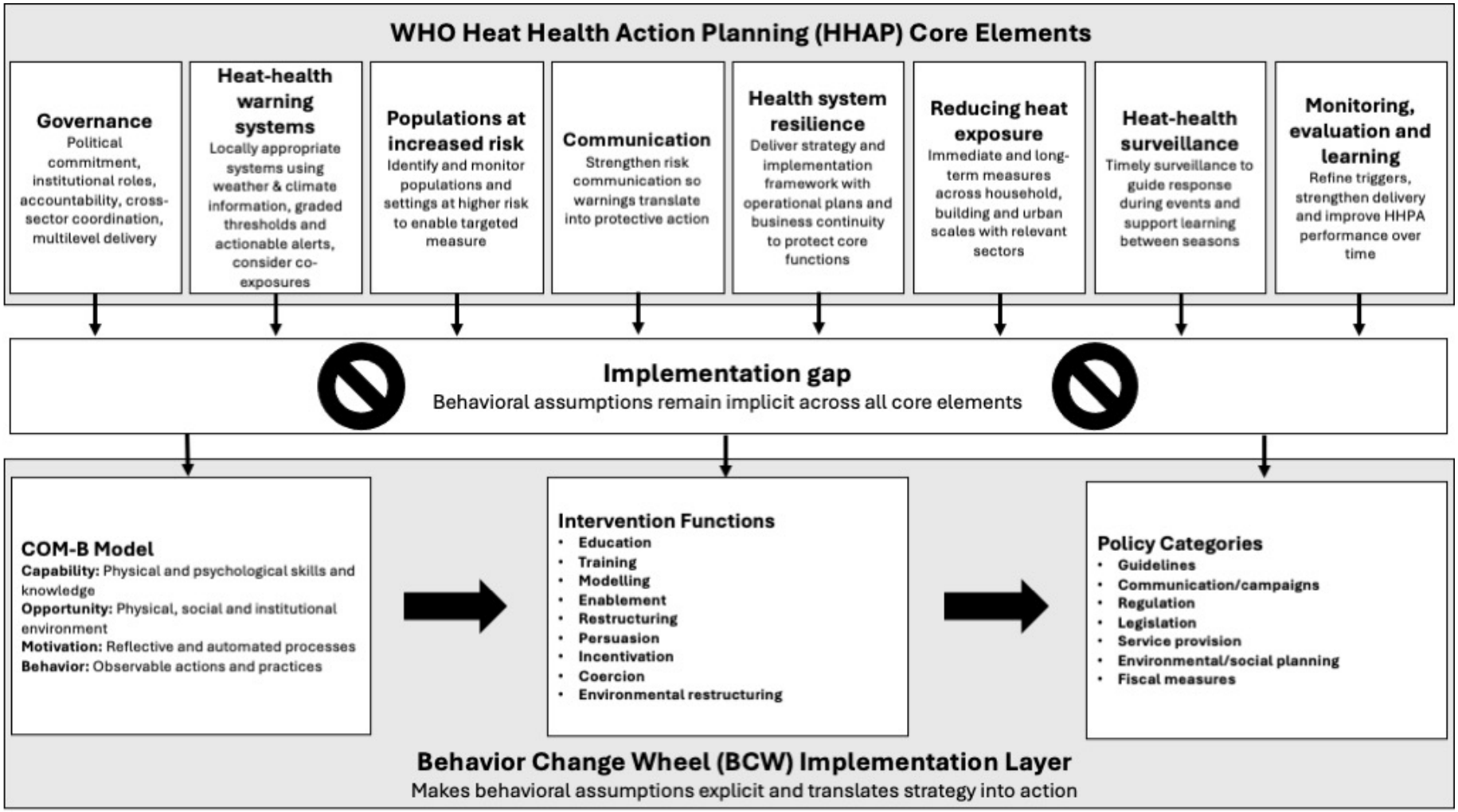

Figure 1. *Conceptual integration of Heat-Health Action Planning and the Behavior Change Wheel (cf. WHO 2026; Michie et al. 2011). The Behavior change Wheel operationalizes each HHAP core element by addressing behavioral determinants at multiple levels.*

The Behavior Change Wheel as an Implementation Tool for Heat-Health Action Planning

Addressing the implementation challenge in Heat-Health Action Planning (HHAP) requires more than identifying relevant interventions; it requires a systematic way to understand and influence the behaviors through which these interventions are delivered, enacted, and sustained. Many of the actions embedded in HHAPs, from heat-protective behaviors among individuals to clinical decision-making, organizational preparedness, and workplace heat protection, ultimately depend on behavior at different levels of the system. Behavior is therefore not a peripheral consideration but a central mechanism through which heat-health adaptation is implemented (WHO, 2026).

The Behavior Change Wheel (BCW) offers a structured framework for addressing this implementation challenge (Michie et al., 2011; Michie et al., 2014). The BCW and its COM-B model serve related but distinct purposes within this process. COM-B provides the behavioral diagnosis: it identifies whether Capability, Opportunity, and Motivation contribute to a target behavior and where change may be required. The BCW builds on this diagnosis by providing a systematic framework for moving from an identified behavioral determinant to the selection of appropriate intervention functions and, where relevant, policy categories (Michie et al., 2011; Michie et al., 2014). Thus, COM-B constitutes the central behavioral model within the BCW, whereas the BCW provides the broader intervention-design framework that connects behavioral analysis to intervention and policy options. At its core is the COM-B model, which conceptualizes behavior as the result of interactions between Capability, Opportunity, and Motivation. Applied to a specific target behavior, COM-B helps identify whether limitations in Capability, Opportunity, or Motivation may constrain its occurrence and therefore where intervention may be required. This provides a systematic basis for behavioral diagnosis by identifying why intended implementation behaviors may or may not occur in practice. Importantly, although the BCW is frequently applied to individual behavior change, its analytical logic is not restricted to individual actors. The same COM-B principles can also be applied to behaviors embedded within professional practice, organizational routines, institutional processes, and governance arrangements, making the framework applicable across the multiple implementation levels addressed by HHAPs (Michie et al., 2011; Michie et al., 2014).

Building on behavioral diagnosis, the BCW links identified determinants to nine intervention functions (e.g., education, training, persuasion, environmental restructuring, enablement) and to policy categories that support their implementation (Michie et al., 2011; Michie et al., 2014). Its overall purpose is therefore to provide a structured pathway from behavioral diagnosis to intervention design: once the determinants of a target behavior have been identified, the BCW supports the selection of intervention functions and policy categories that can address these determinants. This enables a systematic transition from understanding implementation barriers to selecting interventions and policy mechanisms that address them. Unlike implementation frameworks that primarily describe implementation contexts or processes, the BCW explicitly connects behavioral diagnosis with intervention design and policy action within a single framework. This integration makes it particularly relevant for Heat-Health Action Planning, where successful implementation depends on coordinated action across multiple sectors and governance levels.

In the context of HHAPs, this established BCW logic can be applied to behaviors performed by different actors. For example, residents may need to adopt heat-protective behaviors, healthcare professionals may need to activate heat-response procedures, and municipal authorities may need to coordinate heat responses across sectors. These behaviors may be constrained by different combinations of Capability, Opportunity, and Motivation and may therefore require different intervention functions and policy mechanisms. The contribution of the present paper is not to modify the BCW or to propose a new behavioral theory, but to examine how this established behavior change and intervention-design framework can be systematically applied to the implementation of Heat-Health Action Planning across individual, organizational, and governance levels.

Table 1 illustrates this principle by demonstrating how the same analytical logic can be applied across individual, organizational, and governance contexts. Although the specific actors, behaviors, and implementation settings differ, each example follows the same sequence of identifying the behavior of interest, analyzing its determinants through COM-B, and selecting intervention functions that address the identified barriers. This illustrates that the BCW provides a common analytical framework capable of supporting implementation across the diverse sectors involved in HHAPs. It illustrates how the established BCW logic can provide a common analytical basis across different implementation levels, while the specific target behaviors, determinants, and intervention responses remain context-dependent.

Table 1. *Examples for the utilization of the Behavior Change Wheel in Heat-Health Action Planning*.

	Individual level	**Organizational level**	**Governance level**
Required behavior	Adopt heat-protective behavior	Activate heat-preparedness protocols	Coordinate municipal heat response across sectors
COM-B			
Capability	Limited heat-health knowledge	Limited staff training	Fragmented responsibilities
Opportunity	Limited access to cooling	Competing workload	Unclear decision authority
Motivation	Low personal risk perception	Low prioritization of heat preparedness within the organization	Low prioritization of heat-health within political and administrative decision-making
Intervention functions	Education Environmental restructuring Modelling	Training Environmental restructuring Enablement	Environmental restructuring Enablement Education

Importantly, the unit of analysis changes across implementation levels, whereas the underlying analytical logic remains constant. At the individual level, COM-B is applied to understand the determinants of personal heat-protective behaviors. At the organizational level, it is applied to behaviors embedded within professional practice, organizational routines, resource allocation, and institutional procedures. At the governance level, the analytical focus shifts towards behaviors required for multisectoral coordination, strategic decision-making, leadership, and regulatory implementation. In each case, the BCW provides the same structured process for linking behavioral diagnosis to intervention design and policy support, while accommodating the different actors and contexts involved.

In this way, the BCW can be understood not as an alternative to existing heat-health frameworks, but as a complementary implementation framework that extends the strategic orientation of the WHO Heat-Health Action Planning guidance. Whereas the WHO framework defines the components and governance structures required for comprehensive heat-health adaptation (WHO, 2026), the BCW provides an explicit analytical approach for understanding and supporting the behaviors through which these components are implemented in practice.

This perspective positions the BCW not simply as a framework for changing individual behavior, but as a means of supporting coordinated implementation across behavioral, organizational, and governance levels. The following section demonstrates how this analytical logic can be operationalized within specific HHAP components.

Applying the Behavior Change Wheel to Heat Health Action Planning

The practical value of the Behavior Change Wheel (BCW) lies in its ability to translate strategic objectives into actionable implementation strategies. Within the context of Heat-Health Action Planning (HHAP), this process begins by identifying the specific behaviors required to achieve a given heat-health objective and subsequently examining the behavioral determinants that influence these behaviors. Rather than starting from predefined interventions, the BCW follows a structured analytical process in which behavioral diagnosis informs the selection of intervention functions and supporting policy categories (Michie et al., 2011; Michie et al., 2014).

A central example is risk communication and public awareness in relation to heat events. Many HHAPs assume that improved communication will lead to reduced heat-related morbidity (WHO, 2026). However, the relevant outcome is not communication itself, but the consistent adoption of heat-protective behaviors such as adequate hydration, reduction of physical exertion, use of cooling spaces, and checking on vulnerable individuals. Where these behaviors are not consistently enacted, the BCW encourages a structured examination of the underlying behavioral determinants before selecting implementation strategies (Michie et al., 2011; Michie et al., 2014).

At the individual level, such a behavioral diagnosis may identify deficits in psychological capability (e.g., limited heat-health knowledge), physical opportunity (e.g., limited access to cooling environments), reflective motivation (e.g., underestimation of personal heat risk), or social opportunity (e.g., weak

social norms supporting heat-protective behavior). These determinants can subsequently be linked to intervention functions such as education, environmental restructuring, and modelling, thereby increasing the likelihood that heat warnings result in appropriate protective action (Michie et al., 2011; Michie et al., 2014).

The same analytical logic can be applied to behaviors performed by different actors across the individual, organizational, and governance levels. As illustrated in Figure 2, the COM-B model provides a common structure for examining whether Capability, Opportunity, or Motivation constrain a target behavior, while the specific actors, behaviors, and contextual determinants vary between implementation levels. At the individual level, the focus may be on heat-protective behaviors of residents, patients, workers, or caregivers; at the organizational level, on behaviors embedded in professional practice and organizational routines; and at the governance level, on behaviors related to coordination, decision-making, and implementation of heat-health measures.

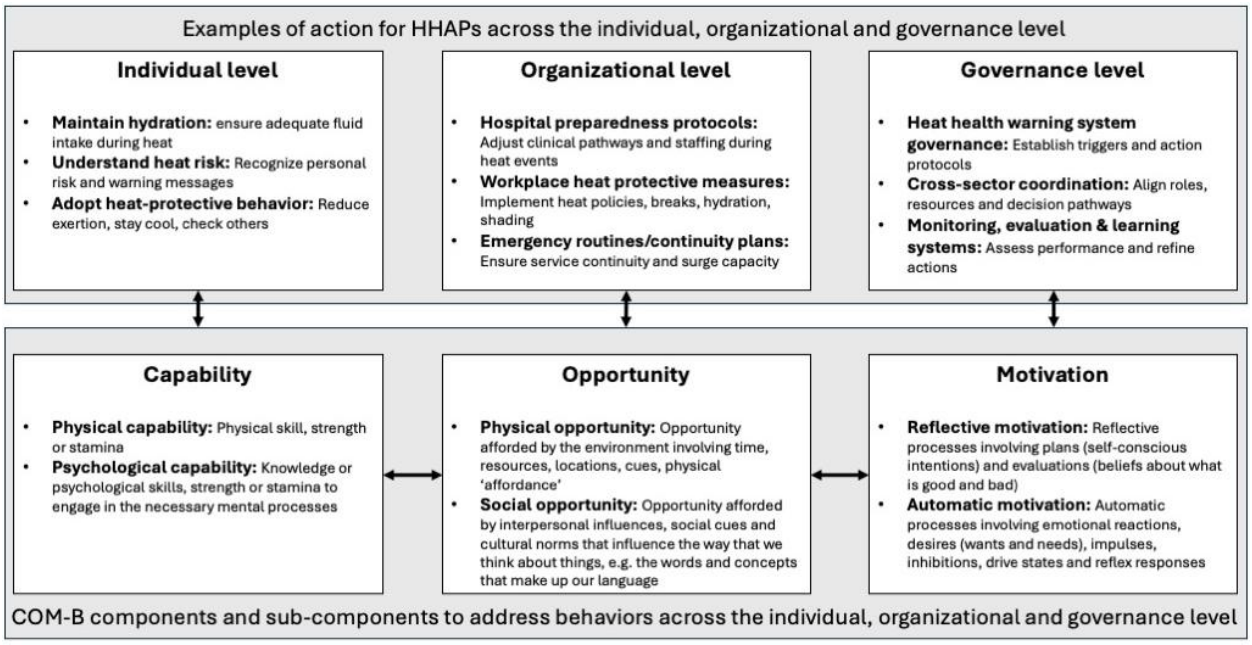

Figure 2. *COM-B components and sub-components to address behaviors across the individual, organizational and governance level.*

As illustrated by Figure 2, applying COM-B across these levels provides a common behavioral diagnostic perspective, but does not in itself establish how implementation processes at the different levels are connected. In HHAPs, a behavioral determinant identified at one level may depend on conditions that can only be modified by an actor operating at another level. The BCW therefore needs to be considered not only as a framework that can be applied separately to different actors, but also as a structured process through which interdependent target behaviors can be linked across implementation levels.

This cross-level application can be understood within the established eight-step BCW intervention-design process described by Michie et al. (2014). The process moves from defining the problem in behavioral terms, selecting and specifying the target behavior, and identifying what needs to change,

to selecting intervention functions, policy categories, behavior change techniques, and modes of delivery. Figure 3 illustrates how this established process can be applied when a behavioral determinant identified at one implementation level cannot be directly modified by the actor performing the target behavior. In such cases, the analysis identifies the actor or actors at the relevant level who can modify the determinant, specifies the behavior required of those actors, and applies the behavioral diagnosis again before proceeding to intervention design.

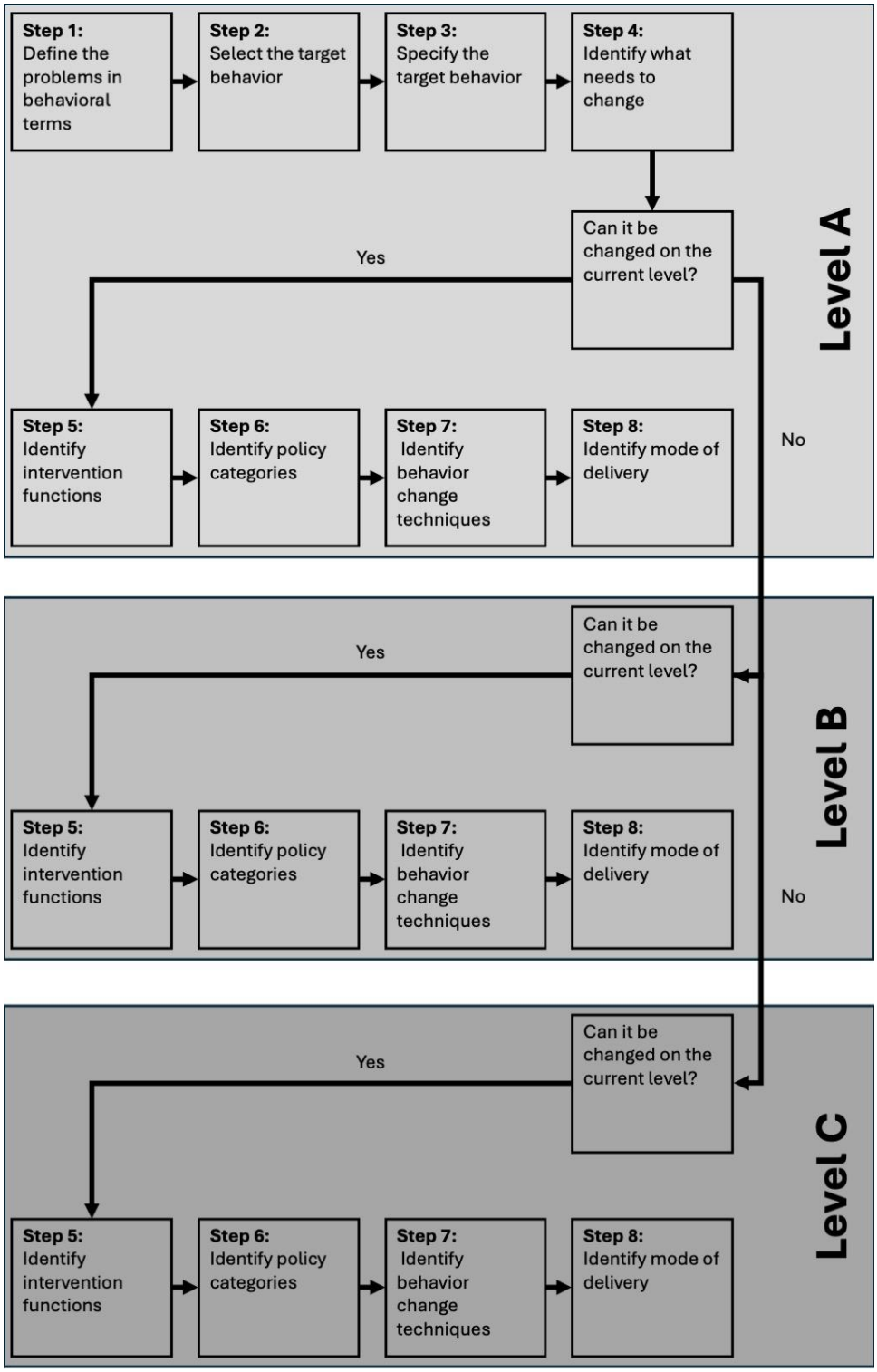

Figure 3. *Cross-level application of the Behavior Change Wheel to Heat-Health Action Planning. The figure illustrates the eight-step BCW intervention-design process described by Michie et al. (2014) and its application across interdependent implementation levels.*

Importantly, the cross-level logic illustrated in Figure 3 becomes relevant when such a determinant cannot be addressed by the individual actor. For example, limited access to suitable cooling environments represents a physical Opportunity barrier to individual heat-protective behavior, but an individual may have limited ability to modify the environmental conditions that create this barrier. The analysis can therefore shift to an organizational or governance actor who is able to influence access to cooling. The required behavior of this actor—such as providing, maintaining, or enabling access to suitable cooling environments—then becomes a new target behavior that can itself be analyzed using COM-B before appropriate intervention functions and policy categories are selected.

A heat-health action plan may establish the objective of ensuring that health and social care organizations implement heat-preparedness procedures consistently during heat events. At the governance level, the required behavior may be to establish the mechanisms, requirements, and support needed for organizations to implement these procedures. If the governance-level analysis identifies that existing mechanisms are insufficient to ensure organizational implementation, the analysis can shift to the organizations responsible for delivering the required action. The new target behavior may then be defined as activating and routinely implementing heat-preparedness protocols within the organization. A subsequent COM-B diagnosis may identify limited staff training as a Capability barrier and competing workload demands as an Opportunity barrier. The BCW can then guide the selection of appropriate intervention functions, such as training, environmental restructuring, and enablement, while governance-level policy mechanisms can support their implementation.

Rather than prescribing specific interventions, the BCW encourages a systematic process of behavioral analysis and intervention design. In this way, it complements the strategic orientation of the WHO Heat-Health Action Planning framework by providing an operational approach for translating planned actions into coherent, context-sensitive implementation strategies. While the WHO framework defines the components and governance structures required for HHAPs (WHO, 2026), the BCW helps specify the behavioral processes through which these components are enacted in practice.

Ultimately, this perspective positions HHAPs not only as collections of recommended measures, but as coordinated systems of behavioral, organizational, and governance-level implementation. The combination of the common COM-B perspective illustrated in Figure 2 and the cross-level process illustrated in Figure 3 provides a structured way to identify behavioral determinants, determine where these determinants can be modified, and connect the behaviors of interdependent actors across implementation levels. By linking behavioral diagnosis with intervention design and policy action, the BCW provides a practical mechanism for strengthening the coherence, feasibility, and coordination of heat-health adaptation across sectors.

Discussion

The updated WHO Heat-Health Action Planning guidance reflects an important shift towards multisectoral and systems-oriented approaches to heat-health adaptation (WHO, 2026). However, as this discussion paper has argued, an important implementation challenge remains while the guidance provides a comprehensive framework for what should be included in Heat-Health Action Plans, it provides less explicit guidance on how the behavioral processes required for implementation can be systematically analyzed and supported across sectors, organizations, and governance levels. The contribution proposed here therefore has two related dimensions. First, the Behavior Change Wheel (BCW) provides a common behavioral diagnostic logic that can be applied to implementation behaviors at individual, organizational, and governance levels. Second, and importantly for the multisectoral nature of HHAPs, the proposed application makes explicit how these levels can be connected when a behavioral determinant identified at one level depends on action by actors at another level. Thus, the approach moves beyond parallel application of COM-B across levels towards a cross-level implementation logic.

From this perspective, the principal contribution of the Behavior Change Wheel (BCW) is not simply that it offers another framework for behavior change. Rather, it provides an explicit implementation logic that links behavioral diagnosis, intervention functions, and policy categories within a single conceptual framework (Michie et al., 2011; Michie et al., 2014). This enables strategic HHAP objectives to be translated into implementation strategies that are responsive to the behavioral determinants influencing implementation in different contexts. Applied across implementation levels, this logic also provides a basis for identifying which actors are able to modify a determinant when the actor performing the initial target behavior cannot do so directly. The resulting shift to a new actor and target behavior allows the behavioral diagnosis to be repeated at the relevant level before intervention functions and policy mechanisms are selected.

This perspective suggests a reframing of Heat-Health Action Planning in two important respects. First, HHAPs can be understood not only as coordination frameworks for interventions, but as systems in which implementation depends on the alignment of behaviors across multiple actor groups operating at individual, organizational, and governance levels. Second, these behaviors should not be viewed only as parallel implementation activities. They may be interdependent: a behavioral barrier at one level may be created or maintained by conditions that can only be modified by actors at another level. For example, if limited access to cooling environments constrains an individual's ability to adopt heat-protective behavior, addressing this barrier may require organizational or governance-level action to provide or regulate access to suitable cooling spaces. The relevant organizational or governance actor therefore becomes a new target of behavioral analysis. Implementation challenges are not solely organizational or technical in nature; they also reflect behavioral processes that shape how organizations priorities heat preparedness, how professionals integrate heat response into routine practice, and how public authorities coordinate action across sectors. Making these dependencies explicit provides a way of linking implementation processes that would otherwise remain fragmented across institutional boundaries.

This also clarifies why the BCW represents a particularly suitable complementary framework for HHAP implementation. Implementation science offers several established frameworks that make important

contributions to understanding implementation, including frameworks that focus on implementation determinants, implementation processes, organizational embedding, or evaluation (e.g., CFIR, EPIS, RE-AIM, Normalization Process Theory, and the Theoretical Domains Framework; Nilsen, 2015). However, these frameworks address different aspects of implementation and are generally not designed to integrate behavioral diagnosis, intervention design, and policy action within a single analytical structure. By contrast, the BCW explicitly links COM-B-based behavioral analysis with intervention functions and policy categories, thereby providing a coherent decision-making framework for translating behavioral understanding into implementation strategies. This integration is particularly relevant for Heat-Health Action Planning, where implementation requires coordinated behavioral change across multiple sectors, organizations, and governance levels. Rather than replacing the WHO framework, the BCW complements it by providing a structured approach for making behavioral assumptions explicit and linking them to intervention design. When applied recursively across implementation levels, it can additionally make explicit how an implementation barrier identified for one actor may generate a new target behavior for another actor and thereby connect otherwise separate implementation processes. In this sense, the BCW functions as an implementation framework that supports the operationalization of existing HHAP components rather than redefining them.

Future research should now move beyond conceptual applications of behavioral frameworks in heat-health contexts. Empirical studies should examine how BCW-informed implementation processes can be integrated into the development, implementation, monitoring, and evaluation of Heat-Health Action Plans, and whether this contributes to improved implementation quality, multisectoral coordination, and ultimately better heat-health outcomes. Such studies should also examine whether the proposed cross-level logic can help identify and address dependencies between actors, sectors, and governance levels in real-world HHAP implementation.

Several limitations should also be acknowledged. First, the proposed integration remains conceptual and has not yet been empirically evaluated within HHAP implementation. Second, although the analytical logic of the BCW can be applied across organizational and governance contexts, its application beyond individual behavior change requires further empirical validation. In particular, the proposed cross-level application assumes that implementation barriers can be traced to behaviors and actors at different levels, but the extent to which such dependencies can be reliably identified and operationalized in practice remains to be established. Finally, not all components of Heat-Health Action Planning are primarily behavioral in nature. Structural adaptation measures, such as urban planning or infrastructure development, are influenced by technical, financial, and political factors that extend beyond behavioral determinants alone. Consequently, the BCW should be understood as complementing, rather than replacing, existing planning and implementation approaches within comprehensive HHAPs.

Conclusion

The growing health impacts of extreme heat require coordinated adaptation strategies that extend beyond individual interventions and operate across multiple sectors, organizations, and levels of governance. The updated WHO Heat-Health Action Planning guidance provides an important strategic framework for organizing these efforts. However, translating strategic objectives into effective

implementation requires a systematic understanding of the behavioral processes through which Heat-Health Action Plans are enacted in practice.

This discussion paper has proposed the Behavior Change Wheel (BCW) as a complementary implementation framework for Heat-Health Action Planning. Rather than introducing new heat-health interventions, the proposed contribution lies in providing an explicit behavioral implementation logic that links behavioral diagnosis, intervention functions, and policy action within a common analytical framework. In doing so, the BCW complements the WHO guidance by supporting the operationalization of existing HHAP core elements across individual, organizational, and governance levels.

Conceptualizing HHAPs as implementation systems highlights that successful heat-health adaptation depends not only on identifying appropriate interventions, but also on understanding and supporting the behaviors through which these interventions are coordinated, delivered, and sustained. By making these behavioral processes explicit, the BCW provides a structured approach for strengthening implementation coherence across sectors while accommodating the diverse actors and institutional contexts involved in heat-health adaptation.

Although the proposed integration remains conceptual, it offers a practical perspective for strengthening the implementation of Heat-Health Action Plans and provides a foundation for future empirical research. Evaluating the application of the BCW within real-world HHAP development and implementation will be an important next step in determining its value for improving coordinated heat-health adaptation.

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