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Small steps creating larger impact: an investigation of Building Resilience Against Climate Effects (BRACE) plans and practitioners

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ABSTRACT

This study examined the climate and health planning activities of public health practitioners participating in the U.S. Centers for Disease Control and Prevention's Climate-Ready States and Cities Initiative during the 2010–2021 funding period. The purpose of this project is to provide an investigative overview of this longstanding federally led effort to support and advance climate and health adaptation implementation and evaluation practice. The study took place at the end of the 11-year grant cycle and used a combination of climate and health adaptation plan analysis and semi-structured interviews to gain insight into the praxes generated by practitioners. Analysis of climate and health adaptation planning documents informed semi-structured interviews with Climate Ready States and Cities Initiative grantees. Comprehensively, the study is conducted through general qualitative inquiry and abductive analyses to triangulate intensive discourses with practitioners, plan analysis, and literature. Themes of partnership building and collaboration emerged across grantees. As the health effects of climate change become more pronounced, understanding the advantages and limitations of climate and health adaptation planning can guide future related planning. The Climate Ready States and Cities Initiative was the only federally led effort that provided significant material investment to plan for the health impacts of climate change.

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Climate change; public health; climate and health adaptation planning; collaborative planning

Introduction

Anthropogenic climate change is exacerbating the societal impacts of air pollution, heat-related illness and mortality, water and vector-borne diseases, food instability, economic instability, and ways of life (Ebi *et al.* 2021). Addressing these and other public health impacts largely falls on state and local governments and varying planning institutions, and represents a complex and pressing challenge especially in regions that are under-resourced (Pendrey *et al.* 2021). Further, vulnerable populations bear the disproportionate brunt of the varying health impacts of climate change (Akerlof *et al.* 2015, Ngcamu 2023). There is thus a growing need for resource investment in local and state health departments to address climate-driven health impacts. The United States Centers for Disease Control and Prevention's (US CDC) Climate-Ready States and Cities Initiative has been the only *longstanding* federally led effort providing significant material and financial investment to deliberately plan for the health impacts of climate change. Thus, it provides an opportunity to investigate existing local climate and health adaptation planning practices across the country, as well as opportunities to explore

existing gaps and consider the outlook for continued and expanded climate and health planning and implementation at state and local levels.

The three research questions guiding this work were: 1) What factors facilitate and/or constrain adaptation plan development within public health agencies? 2) What are the institutional contexts of climate-health practitioners and how did they influence planning processes? and 3) What mechanisms support or hinder the implementation and evaluation of climate and health adaptation actions? These questions are explored through the US CDC Climate Ready States and Cities Initiative cohort of grantees from 2010–2021, which included 16 states and two municipalities. These 18 grantees were awarded a grant in the form of cooperative agreements administered by the US CDC and represent a mix of state and local health departments and universities. The US CDC Climate Ready States and Cities program aims to build and enhance the public health department and community resilience of US cities and states by implementing and evaluating state and local-level adaptation actions, advancing health equity, and generating evidence to improve the ability of the public health sector to

address the effects of climate-related hazards. As listed in Table 1, the 18 grantees include:

Table 1. List of grantees during 2010–2021 funding period.

Arizona Department of Health Services	Wisconsin Department of Health Services
Minnesota Department of Health	Michigan Department of Health and Human Services
Oregon Health Authority Public Health Division	Rhode Island Department of Health*
New Hampshire Department of Health and Human Services	Maine CDC BRACE Program
San Francisco Department of Public Health	Maryland Climate Change Health Adaptation Program*
California Department of Public Health	Massachusetts Department of Public Health
North Carolina Department of Health and Human Services	BRACE – Illinois*
Vermont Agency of Human Services*	New York City Department of Health and Mental Hygiene*
New York Department of Health*	Florida State University*

*Did not have a health adaptation plan at time of study.

To advance these programmatic aims, the grantees utilized the Building Resilience Against Climate Effects (BRACE) framework, which is a five-step operationalizational approach to guide climate and health planning activities (Marinucci *et al.* 2014):

- (1) Anticipate Climate Impacts and Assess Vulnerabilities;
- (2) Project the Disease Burden;
- (3) Assess Public Health Interventions;
- (4) Develop and Implement a Climate and Health Adaptation Plan;
- (5) Evaluate Impact and Improve Quality of Activities (Marinucci *et al.* 2014).

Thus, the grantees carried out their work through the development of state or local ‘BRACE programs’ and are hereafter referred to as practitioners and grantees. Of the 18 grantees, 11 had a climate and health adaptation plan at the end of the grant cycle. Broadly, this study is an assessment of these climate and health adaptation plans and planning activities generated by the grantees and practitioners at stages 4 and 5 of the BRACE framework.

The US CDC Climate Ready States and Cities Initiative began in 2010, and the initiative represents a unique and *continued* practice of protecting human health through the BRACE framework. As global projections point to more severe potential health impacts, the US CDC Climate Ready States and Cities Initiative’s longstanding experience spanning diverse geographic, institutional, and political terrains provides unique insight into climate and health planning and implementation (Marinucci *et al.* 2014, Lange *et al.* 2025). The present study aims to understand how grantees have extended their efforts into the creation and implementation of climate and health

adaptation plans and identify promising practices to advance future efforts at state and local levels.

This study used a qualitative mixed-methods abductive approach consisting of climate and health adaptation plan analysis and semi-structured interviews to examine the planning activities of the US CDC Climate Ready States and Cities Initiative practitioners and programs who participated in the during the 2010–2021 funding period. The findings are framed in two major interdependent themes that arose through the data analysis:

- Programmatic Progression into Climate and Health Plan Development – This theme shares the important aspects and processes of *developing* climate and health adaptation plans and actions, and thus the creation of a formalized public health policy response to climate change.
- Partnerships and Collaborations as a Driver of Public Health and Climate Planning – This theme goes into detail regarding how collaborative and partnership-based planning processes serve as the core of climate and health adaptation programs.

This article first provides an overview of the literature regarding the processes that support climate and health adaptation plan creation, implementation, and evaluation, followed by a description and overview of the study’s methods, findings, and by extension the discussion section. The final section concludes with potential next steps and recommendations for advancing climate and health adaptation planning and research.

Literature review - climate and health adaptation planning processes

The field of climate and health planning is a growing area of inquiry. However, the literature is predominantly limited to evaluating specific interventions rather than plan formulation, plan implementation, and other programmatic considerations. As such, a federal program such as the US CDC Climate Ready States and Cities Initiative is a vital resource for more comprehensive research understandings. Presently, two studies have analyzed and assessed the US CDC Climate Ready States and Cities Initiative grantees’ construction and use of climate adaptation health *profiles*, which are the supporting documents made manifest through the first three steps of the BRACE framework (Marinucci *et al.* 2014, Sheehan *et al.* 2017). Simply, climate and health profiles are data collection and analysis exercises that culminate into guidance documents for climate and health adaptation *plans* – the fourth stage of the BRACE framework and the focus of this study.

Broadly, the US CDC Climate Ready States and Cities Initiative has played an instrumental role in

helping to assist and support state and local health agencies to address the increased health challenges posed by climate change. Grossman *et al.* (2019) assessed four key areas of success generated through state level health department mini-grants to local health departments to prepare for climate change:

- (1) Increased knowledge about climate change and health on the part of [local health department] personnel;
- (2) Stakeholder engagement in activities related to climate change;
- (3) The inclusion of information about climate change into health communications for existing or new public health programs;
- (4) Efforts to identify people and places at increased risk (vulnerability) to the adverse health consequences of climate change (p. 10).

The mini-grants that Grossman *et al.* (2019) assessed provided the financial support for capacity-building, forging partnerships with external stakeholders, program analysis, and constructing adaptation plans. Grossman *et al.* (2019) stated that the predominant challenges to climate adaptation and public health are politically sensitive regions that undermine these efforts.

Understanding localized uncertainties and impacts of climate change has taken on increased saliency to public health practitioners. The health effects of climate change occur at the individual, family, and community levels (Sheehan *et al.* 2017, p. 1). The pressure for governmental and public assistance to address the adverse health impacts of climate variability and change has brought attention to institutional structures, operations, and knowledge uncertainties that formulate the frameworks for plans, strategies, and interventions (Lewandowsky *et al.* 2015, Ebi *et al.* 2016). Yet more research is needed to identify and understand the *linkages* between climate, hazards, structural societal inequities, and bodily health across multiple scales (national, regional/state, and local) (Marinucci *et al.* 2014, Grossman *et al.* 2019, Lange *et al.* 2025). Local health departments have begun to collaborate with local stakeholders and community members to generate localized knowledge frameworks and communication pathways to increase awareness of climate health impacts on societies and individuals (Ebi *et al.* 2016, Grossman *et al.* 2019, Khatibi *et al.* 2021).

Rudolph *et al.* (2020) assessed how urban local health departments address climate change, public health, health equity, the incorporation of climate change into program practice, and the level of participation of local health departments in their area's overall climate change work. Through their collaborative learning with 12 local health

departments, they found increasing levels of adaptation, creativity, broadened community partnerships, internal capacities, and further integration of local health departments into local climate planning. These findings from the participating local health departments affirm much of Fox *et al.*'s (2019) perspectives on the increasing need for adaptive management. Previously, Mendez (2015) suggested the need for public health to become more integrated into local planning efforts for the generation of co-benefits (e.g. reducing greenhouse gas emissions to improve air quality).

Despite most state agencies and local health departments wanting to integrate further into external climate planning, resource scarcity is a constant challenge (Davis *et al.* 2010, Marinucci *et al.* 2014, Mendez 2015, Sheehan *et al.* 2017, Mallen *et al.* 2022). This is especially true in supporting and protecting vulnerable populations (Sutherst 2004). Through a participatory action-research framework, Rudolph *et al.* (2020) observed that, 'community-based organizations were essential intermediaries who helped design and communicate the results of vulnerability assessments, and who channeled feedback from specific neighborhoods. Some projects catalyzed a coalition of community-based and governmental organizations that provide services to vulnerable populations' (pp. iv-v). To engage vulnerable populations and address health equity in state agencies more fully, local health departments are utilizing community-engaged practices to better construct strategies, policies, relationships, and interventions that are responsive to local needs (Ebi and Semenza 2008, Wallerstein and Duran 2010, Austin *et al.* 2019, Harrison *et al.* 2023).

Local knowledge(s) based on social and environmental conditions enables innovative health adaptation planning and strategies (Barata *et al.* 2011, Hosen *et al.* 2020). It has been long understood that localized knowledge pathways grant insight into the exposure and magnitude of health burdens across geographical and demographic domains (Hambling *et al.* 2011, Hess *et al.* 2021). As such, public health practitioners at times are placing a greater emphasis on such things as the socio-demographic characteristics of an area rather than on insular hazard mitigation planning (Holmes *et al.* 2022, Fox and Alldred 2016, Few 2007, Lyles *et al.* 2014).

Public health planning approaches based in socio-ecological and relationally based frameworks are often induced by resource or knowledge scarcity, but nevertheless actively construct networks between state/local health departments, NGOs, and community-based partners. These intertwined communicative approaches to climate and health adaptation planning are supporting simultaneous processes that include:

- The generation of localized contextual knowledges;
- Refinement of implementation and community engagement strategies that reach and include vulnerable populations in planning processes;
- The augmentation of institutional boundaries to support systems of care between agencies and communities;
- Garnering material resources and capacity for plan implementation;
- Formulating reciprocal communication networks for responsive approaches to planning strategy modification and evaluation; and
- Methodological practices that elucidate the linkages between climate change and bodily health (Ebi and Semenza 2008, Fagliano and Diez Roux 2018, Austin *et al.* 2019, Rudolph *et al.* 2020, Mallen *et al.* 2022, Harrison *et al.* 2023).

State agencies and local health departments have been incorporating *evaluation* efforts that are interdependent with localities for such things as environmental/hazard monitoring, intervention strategies, and knowledge bases and assumptions (Kipp *et al.* 2019, Fox *et al.* 2019). There is often a need to iteratively modify frameworks and strategies as new knowledge is generated through relational and collaborative practice (Ebi *et al.* 2018, Kauffman and Hill 2021). Evaluation praxes are often best achieved *after* the establishment of communicative networks that span institutional boundaries because of the need for access to resources and reciprocal sources of data and information in *real time* (Bowen *et al.* 2014; Bowen *et al.* 2024). Thus, the continued establishment of evaluation praxes is a growing need as both public health planning practices and climate and health impacts deepen (Brown *et al.* 2018).

Methods and results

The research proposal for this study (STUDY00002383) was granted exempt status by the Florida State University's Office of Human Subjects Protection. Per research protocols, and in accordance with the Declaration of Helsinki, the authors utilized verbal consent with research participants after providing a full pre-interview study information disclosure. Informed verbal consent was obtained from all the participants.

Table 2. Overarching conceptual framework of qualitative inquiry process.

1. All authors are practitioners working with the US CDC Climate Ready States and Cities Initiative and under the BRACE framework.
2. At the end of the 2010-2021 funding period, authors gathered and analyzed climate and health profiles and adaptation plans
3. After the construction of the interview instrument, based upon the analysis of climate and health adaptation profiles and plans, each grantee was interviewed (with the exception of New York City due to COVID-19).
4. All interview transcripts, climate and health adaptation profiles, and plans, were open and associatively coded for the creation of themes. After coding and thematic creation was completed, the analyzed material was triangulated with relevant literature.

Author's positionality, expertise and shared knowledge

Every author in this work is, or was at the time of study, a US CDC Climate Ready States and Cities Initiative practitioner, and during the time of research it was normal for all *grantees* to meet monthly and bi-weekly as part of the construction of institutional knowledge, social learning, and a community of care (Innes and Booher 2018). As highlighted in Table 2, this shared working reality in the US CDC Climate Ready States and Cities Initiative was a fundamental component to the research process. Collectively, the authors provide decades of first-hand experience working in public institutions, public health, climate adaptation/mitigation, and in collaborative institutional and research settings. There are a number of strengths that come from this mutual familiarity and shared base of operational understanding:

- (1) Reflexive Insight (Ide and Beddoe 2024) – All practitioners conducting interviews and coding are familiar with their colleagues permitting for accurately framed interview questions, follow-up questions, and extended discussions. Further, such familiarity and shared understanding strengthened interview discourse, interview coding, and accuracy of understanding between authors.
- (2) Abductive Inference (Earl Rinehart 2021) – Due to operating within the same overarching structural framework of the US CDC Climate Ready States and Cities Initiative, the authors and research subjects alike operate within the same, or very similar, set of operational definitions of actions, institutional frameworks, document/plan construction, challenges/limitation, and planning processes. As such, even though individual program sizes, demographics, and planning document content differ across the US CDC Climate Ready States and Cities Initiative, there is deep mutual understanding across the authors and grantees to generate rigorous and critical scholarship, shared generative institutional knowledge, and connections across geographies and climates.
- (3) Negotiated Agreement and Adjudication (D'Agostino 1989) – It is common in a collaborative research setting, while performing qualitative methodologies, for the need to have a shared foundation of interpretive meaning while performing interview/plan coding and analysis. Negotiated agreement largely took place between the primary and secondary coders of the interview transcripts. Any issues of interpretive discrepancy were mitigated

largely by the plain language of the interviews and climate and health adaptation plans, as well as the shared or complementary operational realities of the authors and grantees. The operational environments of public administration/health, in essence the working realities of authors and practitioners, are exceedingly complementary in approach and subject matter. Please see the following example set of definitions and terms that most commonly occurred during interview and plan coding and analysis.

- a. Partnerships – Formal and informal relationships that support the construction and implementation of plans and strategies. Partnerships can be across sectoral, scalar, departmental, agency, and discipline boundaries.
- b. Cobenefits – Strategies that bridge climate mitigation with climate and health adaptation.
- c. Resource Scarcity – The circumstantial limitations placed on planning activities that have variable causes, which include but are not limited to labor, financial resources, information, political considerations, and technological.
- d. Capacity – The extent to which grantees could or could not construct or implement strategies and plans alike.
- e. Hazards – Threats to human, non-human, and societal health that span from epidemiological, weather/climate, food/air/water quality and availability, as well as the socio-ecological relationships that happen between them.

Adjudication largely took the form of definitive review by the three lead authors of this study. More, adjudication in terms of resolving interpretive discrepancy took more the form of ensuring that the plans and interview transcripts were thorough and *consistently* coded.

- (4) Covid-Era Research – The COVID-19 period prevented social research from being conducted in person, and further prevented in person followup and observation of praxes. However, the entirety of the collaborative apparatus of the US CDC Climate Ready States and Cities Initiative was already, and had historically been, conducted virtually between practitioners/grantees. As such, the research performed here was an investigative dive into pre-existing relationships and public planning apparatuses with pre-existing technological communication networks. The investigative approach supports the derived themes, to be discussed later, and further support future research and individualized programmatic evaluations.

Research contextualization, relevancy and limitations

This research is limited from true programmatic evaluation (i.e. deliberately linking plan construction and strategy implementation to measured outcomes based on collected data). However, that was not the goal of the research. The research was an overall exploratory investigation, a qualitative inquiry, that could serve to support later implementation and evaluation of programmatic planning activities. The purpose of such exploratory investigation was to address the overall progress of the US CDC climate and health adaptation planning activities in a politically and economically limiting environment (something that is shared by the field of climate and health adaptation across the United States).

The research provided in this study is broad in nature. On one hand this provides the foundation for more precision-oriented future research, which could include case studies of single grantees' planning strategies and quantitatively measuring the impacts of said strategies on disproportionately impacted populations. Moreso, conducting future research that tracks communication alerts to communities to intensely observe behavioral change based upon these communicatively based planning strategies for overall efficacy in mitigating the impacts of extreme heat. This study is an investigation into the breadth and operational boundaries of climate and health adaptation as a field as led by the US CDC's Climate Ready States and Cities Initiative. Such an orientation has elucidated *how* practitioners are 'getting off the ground', their challenges and limitations, and their overall policy successes in deliberately planning for the health impacts of climate change. However, the field of climate and health adaptation planning has been underfunded for years if not decades. As such, research is limited also in its own capacity to equally demonstrate novel insights due to the field's longstanding limitations and challenges.

The challenging circumstances that the grantees operate in meant that there was not a uniform series of documents/plans across all 18 participants. Each grantee within the US CDC Climate Ready States and Cities Initiative has different staff sizes, operates in different geographies, has differing diverse community demographics, and lastly is in different stages of the Building Resilience Against Climate Effects framework. As such, a universal coding framework, purely structured interviews, or even the use of standardized surveys would not guarantee error or bias free results due to the multiplicity of variables. Despite being flexible and inclusive of *available* documents/plans, and interviewing a diverse array of practitioners that rely on recall, this research is still rigorous and substantive. This is due to the multi-staged coding across

multiple authors, the longstanding immersive relationships between authors and grantees (similar to participant observation), substantive document analysis, and the intensive interviews across grantees. Thus, the broad themes later presented are emergent findings through the overall diversity of grantees, their respective programs, and their respective geographies.

Despite being performed in the Summer of 2021, the recent dramatic changes in the U.S. federal priorities make this research very salient. The public health infrastructure has been severely reduced as of December 2025, and thus the current funded cohort of 2021-present, similarly impacted and hamstrung. Thus, this research is an investigation into the US CDC Climate Ready States and Cities Initiative at the height of the program, and before being programmatically reduced. This research provides important best practices for climate and health work moving forward, particularly as federal funding support decreases or goes away. Meaning, the research performed here, if given the opportunity, can help rebuild the climate and health adaptation field when political and economic realities become more supportive of such planning praxes.

Data collection

Data collection began with a climate and health adaptation plan and profile analysis to understand how and to what degree practitioners were addressing climate and health impacts through formalized policy mechanisms (step 4 in the Building Resilience Against Climate Effects model). The plans and documents were acquired directly from program practitioners and their respective public web pages (see Table 3). For each of the state and city climate and health adaptation plans and profiles, we

used an analytical coding framework with the following attributes:

- (1) Plan Type;
- (2) Priority Hazards;
- (3) Plan Process;
- (4) Goal(s);
- (5) Strategies;
- (6) Supporting Documents;
- (7) Implementation Instruments;
- (8) Partners;
- (9) Health Equity;
- (10) Vulnerable Populations;
- (11) Challenges to Planning; and
- (12) Data/Indicators.

The coding framework provided insight into the scope, framing, and intent of these planning documents. Further, the coding framework supported the construction of the interview instrument to keep complementary datasets. A total of 11 climate and health adaptation plans were reviewed. The programs who did not have a climate and health adaptation plan either had not reached that point in the Building Resilience Against Climate Effects framework, or preferred to operate without one to maximize flexibility across small working teams. Due to the relatively approachable, accessibly designed, and common language/frameworks used in the climate and health adaptation plans, the generated spreadsheet containing the dissected plans allowed for broad understanding and linkages to literature and the performed interviews.

Plan analysis was followed by semi-structured interviews with practitioners as part of the 2010-2021 cohort to document the contextual factors surrounding the plans, programs, and practitioners. A total of

Table 3. Listing of analyzed climate and health adaptation plans.

Cameron, L., and A. Ferguson. 2016. Michigan Climate and Health Adaptation Plan (MI-CHAP): 2016-2021 Strategic Plan. https://www.adaptationclearinghouse.org/resources/michigan-climate-and-health-adaptation-program-strategic-plan-update-2016-2021.html .
Maine Department of Health and Human Services (n.d.) Building Resilience Against Climate Effects: Enhancing Community Resilience by Implementing Health Adaptations. Climate and Health Adaptation Plan.
California Department of Health (2017). Safeguarding California: Implementation Action Plans, Public Health Sector Plan. https://resources.ca.gov/CNRALegacyFiles/docs/climate/safeguarding/Public%20Health%20Sector%20Plan.pdf .
Cormford, C. 2017. San Francisco's Climate and Health Adaptation Framework. https://www.sfdph.org/dph/hc/HCAgen/HCAgen2017/June%2020/Climate_framework.pdf .
Massachusetts Department of Public Health (2014). Capacity to Address the Health Impacts of Climate Change in Massachusetts: Findings from a Statewide Survey of Local Health Departments. https://www.mass.gov/doc/climate-change-in-massachusetts-0/download .
Minnesota Department of Health (2019). The Minnesota Climate and Health Strategic Plan: August 2016 - August 2021. https://www.health.state.mn.us/communities/environment/climate/docs/strategicplan.pdf .
New Hampshire Department of Health and Human Services (2010). Preparing for Climate Change: A Strategic Plan to Address the Health Impacts of Climate Change in New Hampshire. https://toolkit.climate.gov/reports/preparing-climate-change-strategic-plan-address-health-impacts-climate-change-new-hampshire .
North Carolina Division of Public Health (2018). North Carolina Climate and Health Implementation and Monitoring Strategy (IMS) for Heat-Related Illness. https://epi.dph.ncdhhs.gov/oe/climate/HeatIMSNorthCarolinaExecutiveSummary.pdf .
Oregon Department of Health (2017). Oregon Climate and Health Resilience Plan. https://www.oregon.gov/oha/ph/healthyenvironments/climate-change/pages/resilience-plan.aspx .
Roach, M., E. Barrett, H. E. Brown, B. Dufour, D. M. Hondula, H. Putnam, and B. Sosa. 2017. Arizona's Climate and Health Adaptation Plan: A Report Prepared for the United States Centers for Disease Control and Prevention Climate-Ready States and Cities Initiative. https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/extreme-weather/pubs/arizona-climate-health-adaptation-plan.pdf .
Wisconsin Department of Health Services Division of Public Health (2016). Wisconsin Climate and Health Adaptation Plan. https://www.dhs.wisconsin.gov/publications/p01447.pdf .

17 interviews with 25 practitioners (approximately an hour each in length, during July-August 2021) were conducted (New York City could not participate due to the available time shortage caused by the COVID-19 pandemic). These interviews were conducted on Zoom for recording and transcription functions, and to span geographies during the COVID-19 pandemic. Interview questions covered topics related to plan creation, plan implementation and monitoring, collaboration and inclusion efforts, partnerships, equity considerations, challenges, and future programmatic goals (questions complementary to the document coding framework). There was an approximate total of 18 hours of interviews and hundreds of pages of transcriptions.

Data analysis

The semi-structured interviews allowed for contextualized insight into real-time factors that influenced plan development, implementation, programmatic concerns/practices, and overall planning strategies. Further, gaining access to this insight and data was crucial in understanding the behavioral and circumstantial aspects of the practitioners and their practices. Interview recordings were transcribed and manually open coded and then rearranged in associative relationships (Williams and Moser 2019). Associative coding supported the reported major themes provided in the discussion section. However, the major themes are also a reflection of the anchoring research questions and deliberately created interview instrument. Logistically, there were two coders for each interview transcript, a primary and secondary coder. A lead coder conducted post-processing of all materials and synthesized the results for a comprehensive thematic analysis based on all the interviews. The secondary coder reviewed the analyzed interview transcripts and constructed codes/themes for accuracy and logic. The authors collectively met weekly to review the codes, the code associations, and cumulatively constructed themes.

Each planning document was analyzed via the aforementioned coding framework to associate the categorized planning content and policies in a working dialogue between plans, relevant literature, and the generated themes of the interview transcriptions (Lyles *et al.* 2014). The only major differences between the plans are explained by political environments, programmatic size, budgetary capacities, and geographies (i.e. hazards of predominant concern). Otherwise the climate adaptation plans were remarkably similar in construction, intent, and purpose due to the standardized planning approaches as set forth in the US CDC Climate Ready States and Cities Initiative's Building Resilience Against Climate Effects operational model.

Cumulatively, both the interview and plan/profile coding analyses were satisfactory in creating a rich and robust data set that easily reached saturation to serve as the basis for writing (Guest *et al.* 2020). These qualitative analytical methods between policy and practice have served to elucidate the following subsections of the discussion: 1) Programmatic Progression into Climate and Health Plan Development, and 2) Partnerships and Collaborations as a Driver of Public Health and Climate Planning.

Discussion

The challenges faced by grantees have led to an ingenuity that reimagines historical institutional constructs and barriers. Practitioners are constantly innovating ways to overcome governmental silos, institutional inertias, and hierarchical organizational models (Innes and Booher 2018, Aylett 2015, Machalaba *et al.* 2015, Lange *et al.* 2025). The following subsections are organized to elucidate the flexibility and creativity of practitioners who grapple with these challenges:

- Programmatic Progression into Climate and Health Adaptation Plan Development – This theme shares the important aspects and processes of *developing* a climate and health adaptation plan and actions, and thus the creation of a formal public health policy response to climate change.
- Partnerships and Collaborations as a Driver of Public Health and Climate Planning – This theme goes into detail regarding how collaborative and partnership-based planning processes serve as the core of climate and health adaptation programs.

A brief note on how to read the following discussion. In a manner of speaking, the grantees operate as the spokes on a bicycle wheel, and the US CDC Climate Ready States and Cities Initiative operates as the hub. Grantees and US CDC officials meet at a minimum monthly, not including the times grantees discuss their work together in separate working groups. The point of such intensive collaboration is that each grantee, with their respective programs, are operating in different geographies, with differing demographics, differing political and economic realities, and differing programmatic sizes. It is not possible in the length of this article to provide a full accounting of programmatic sizes of the grantees, and to a large extent that is not the intent nor goal of this study. However, and moreso, intensive collaborative structures within and between grantee programs serve as apparatuses to support programmatic progression and problem solving. As such, this study aids in the documentation of

‘what’ they are doing, and then to an extent ‘how’ they are doing it, and not purely seeking synthesized patterns across the entirety of the US CDC Climate Ready States and Cities Initiative and the respective grantees. This work supports future research when the climate and health adaptation ‘as a field’ is not working in very limiting political and economic circumstances. The field, at least currently in the US, is not developed enough to produce such synthesized results for such things as theoretical concept creation or even a true stance on best practices (Rossa-Roccor *et al.* 2021, Salvador Costa *et al.* 2022, Batawalage *et al.* 2023).

Programmatic progression into climate and health adaptation plan development

The Building Resilience Against Climate Effects (BRACE) framework gave clear direction and incrementally supported the progression from generating climate and health profiles (Marinucci *et al.* 2014, Sheehan *et al.* 2017) to climate and health *plans*. During their developmental phases, grantees focused on developing vulnerability assessments and disease burden projections to create climate and health profiles. For the grantees that chose to do so, these profiles were subsequently condensed and positioned into an overall climate and health adaptation *plan*. Interviews confirmed that most grantees do not have a ‘strategic’ climate and health adaptation plan (i.e. a broad state/executive level climate health and adaptation strategic plan). Climate and health adaptation plans, at this stage within the field, *typically* are documents formulated from pre-existing (sometimes with modifications) initiatives and policies to fulfill the grant requirements of the US CDC Climate Ready States and Cities Initiative. Overall, the general frameworks of climate and health adaptation plans contain the following components:

- hazard analyses,
- vulnerability/exposure analyses,
- socio-demographic data,
- climate projections,
- disease burden projections,
- internal capacity-building exercises,
- collaborative frameworks with external agencies and stakeholders,
- public knowledge, awareness, and communication creation strategies,
- plan implementation strategies, and
- data monitoring and strategy evaluation components.

Extreme heat, flooding and vector-borne diseases were the most common hazards of focus in the grantees’ climate and health adaptation plans (Table 4). The

Table 4. Hazards of focus.

Arizona Department of Health Services	Extreme Heat, Wildfires, Dust Storms, Flooding, Drought, Air Pollution, Infectious/Vector-Borne Disease
California Department of Public Health	Extreme Heat, Drought, Flooding, Air Pollution, Wildfire, Vector-Borne Disease, Poor Water Quality
Maine CDC BRACE Program	Tick-Borne Disease, Mosquito-Borne Disease, Extreme Heat
Massachusetts Department of Public Health	Vector-Borne Disease, Extreme Heat, Air Pollution, Food-Borne Disease, Water-Borne Disease, Extreme Weather Events, Flooding
Michigan Department of Health and Human Services	Extreme Heat, Air Pollution, Flooding, Drought, Water-borne Disease, Vector-Borne Disease
Minnesota Department of Health	Extreme Heat, Flooding/Increased Rainfall, Warmer Winters, Air Pollution, Drought
New Hampshire Department of Health and Human Services	Food/Water/Vector-Borne Disease, Communicable Disease, Air/Water Pollution, Flooding, Drought
North Carolina Department of Health and Human Services	Extreme Heat
San Francisco Department of Public Health	Extreme Heat, Extreme Storms, Sea Level Rise, Flooding, Air Pollution, Wildfire, Water-borne Disease, Food-Borne Disease, Vector-borne Disease, Drought
Oregon Health Authority Public Health Division	Extreme Heat, Air Pollution, Vector/Water/Food-Borne Disease, Drought, Flooding
Wisconsin Department of Health Services	Drought, Flooding, Water/Food/Vector-Borne Disease, Extreme Heat, Increased Intensity/Frequency of Winter Storms

saliency of extreme heat across funded programs was explained by one practitioner as the ‘shortest, clearest causal pathway for modeling purposes’ (practitioner, personal communication). Despite the immediacy of extreme heat as a shared and pressing hazard, interviewees felt the establishment of extreme heat plans and programs were where federal financial support could ‘add the most value and where the most leadership was needed’ (practitioner, personal communication). Broadly, priority hazards such as extreme heat and vector-borne disease reflect *pre-existing* areas of need and focus within grantees’ programs and departments (Rossa-Roccor *et al.* 2021).

Prioritization of hazards goes beyond the hazard of immediate concern – hazard prioritization can be political (Oliver-Smith 2013, Barnett 2020). One practitioner highlighted the reality of determining what receives formal attention: ‘Let’s talk about power dynamics. Who do you want in the room when you make the decisions about how to spend money? There are still people that are very apprehensive about having community organizations in the room’ (practitioner, personal communication). Grantees were universally concerned with how and to what degree political and economic realities shaped matters of vulnerability and hazard prioritization (Barnett 2020, Negev *et al.* 2022). For example, for at least two of the grantees, practitioners were restricted to addressing extreme heat, and only when it was largely dissociated from climate change. However, regardless of

geographic location, hazard prioritization is inescapably linked to political relationships and programmatic survival (Oliver-Smith *et al.* 2017, Roach *et al.* 2017).

After establishing priority hazards of concern, environmental and public health tracking are used to support plan/strategy development and implementation. Further, plan development was pragmatic and focused on existing capacity or building capacity:

What we're being encouraged to do by our advisors is to start with our strengths and our capabilities. What does the public health system do? What are we charged with doing, what are we capable of doing and then building off of those capabilities. (practitioner, personal communication)

Grantees are piggybacking their climate and health programs onto broader pre-existing yet interconnected public health systems to initiate broader climate and health planning activities. In other words, climate adaptation is being 'slotted' into existing public health plans and related planning (e.g. resilience, climate action, or hazard mitigation planning) to generate improvisational progress and programmatic

interdependency (Ford 2008, Abrantes *et al.* 2023) (Table 5). The interdependency between programmatic progress and survival often resulted in an incremental approach to climate and health adaptation strategies and plans (Kates *et al.* 2012).

Climate and public health strategies – whether in a formal plan/policy or not – were built by leveraging pre-existing programs, partners, and structures to meet programmatic goals and grant expectations. Common efforts included providing public health educational opportunities, partnering with community-based organizations to improve public awareness, or co-developing new initiatives or policy recommendations with external partners, agencies, and stakeholders.

We're really limited in our ability to have a sort of on-the-ground local understanding of community needs, community capacity, different threats that people are facing and more local contexts. And that really hampers us in a lot of ways. So, one local project that we've been engaged in under our umbrella for the last few years is working with county emergency management agencies, where

Table 5. Plans, plan type, and major elements of the plan development process.

Grantee (state or city abbreviation)	Climate and Health Adaptation Plan Title (publication year)	Type of Plan V = Vision, I = Implementation E = Evaluation	Major Elements of Plan Development Process
Arizona Department of Health Services	Arizona's Climate and Health Adaptation Plan: A Report Prepared for the United States Centers for Disease Control and Prevention Climate-Ready States and Cities Initiative (2017)	Planning document, V and I	Workshop to gather input from federal, state, and local organizations Collaboration with stakeholders and researchers
California Department of Public Health	Safeguarding California: Implementation Action Plans, Public Health Sector Plan (2017)	Planning document, I	Stakeholder feedback Public workshops Other planning documents
Maine CDC BRACE Program	Building Resilience Against Climate Effects: Enhancing Community Resilience by Implementing Health Adaptations	Planning document, V	Prioritized continuity of day-to-day departmental operations Hazard identification and implementation strategies are core to document
Massachusetts Department of Public Health	Capacity to Address the Health Impacts of Climate Change in Massachusetts: Findings from a Statewide Survey of Local Health Departments (2014)	Report that functions as the plan, V	Legislative mandate that convened a climate change adaptation advisory committee
Michigan Department of Health and Human Services	Michigan Climate and Health Adaptation Plan (MI-CHAP): 2016-2021 Strategic Plan (2016)	Planning document, I	Feedback through training sessions
Minnesota Department of Health	The Minnesota Climate and Health Strategic Plan: August 2016 - August 2021 (2019)	Planning document, V and I	Input from nearly all health department divisions through an advisory committee Formed a workgroup to track progress and implement plan
New Hampshire Department of Health and Human Services	Preparing for Climate Change: A Strategic Plan to Address the Health Impacts of Climate Change in New Hampshire (2010)	Planning document, V and I	Private and public sector stakeholder input through five focus groups to assess the capacity
North Carolina Department of Health and Human Services	IMS (2018)	Implementation and Monitoring Strategy (IMS), I and E	Health assessments to identify most prevalent climate-related health impacts and areas affected. Local stakeholder input and collaboration
San Francisco Department of Public Health	San Francisco's Climate and Health Adaptation Framework (2017)	Adaptation planning framework, V	Literature review and analysis Cross-agency reviews Internal surveys to assess preparedness levels
Oregon Health Authority Public Health Division	Oregon Climate and Health Resilience Plan (2017)	Planning document, V	Stakeholder advisory committee to identify public health issues and vulnerable populations Baseline information collection
Wisconsin Department of Health Services	Wisconsin Climate and Health Adaptation Plan (2016)	Planning document, V, I and E	Partner engagement process involving in-person meetings with climate and health topic experts

there is a really robust county structure and sort of clear local to county to state chain of command. (practitioner, personal communication)

As to be discussed more in Theme 2, grantees commonly worked in mutually beneficial partnerships to support resource and capacity needs, particularly at the local level. These relational approaches for many climate and health programs permitted public health expertise to be inserted into cross-sectoral agencies, and thus make new space for climate and health adaptation planning on pre-existing external planning structures (Emerson *et al.* 2012, Ray-Bennett *et al.* 2020).

One practitioner sent their already completed climate and health adaptation plan to partner agencies in the hope of instantiating new climate and health planning strategies. The grantee noted it ‘absolutely charted our path’ due to the political collisions of climate change and interagency relations (practitioner, personal communication). ‘We, as the public health department, felt uncomfortable telling other departments in a [document] that would be public what to do ...’ (practitioner, personal communication). It is not uncommon for practitioners to work outside of the domains of formal policy to extend their reach with partner agencies. The noted experience within climate and health *practice* highlights how practitioners are aware of the enmeshment between disruptive political optics and relationships of power regarding climate change (Machalaba *et al.* 2015, Lejano and Nero 2020).

While more than half of the grantees developed climate and health adaptation plans, these plans are not a necessary step for climate and health practitioners and programs. As noted by a practitioner,

We’ve accomplished a lot. But I think that’s in spite of not having a comprehensive climate health adaptation plan ... There’s just no way that a program with 1.5 FTEs [full-time employee] can accomplish all that work across all the different sectors of government. (practitioner, personal communication)

Despite funding support, nearly every grantee expressed capacity constraints, even if they possess a robust staff, and are doing what they can with what they have. Given the scale and complexities of understanding and addressing climate health impacts combined with limited funding, extraordinary demand is being placed upon public health institutions and departments (Keim 2008, Carleton and Hsiang 2016). Table 6 provides select examples of the diversity of key strategies being implemented by practitioners due to being able to address what ‘they can’.

Partnerships and collaborations as a driver of public health and climate planning

The construction of climate and health adaptation plans is a collective effort that spans practitioners, programs, partners, stakeholders, and entire communities. The plan functions as more than a guidance document – it is a living framework to generate and implement action across boundaries, borders, and actors (Lyles *et al.* 2014, Fox *et al.* 2019, Kauffman and Hill 2021). However, as strategies and policies are actualized, the myriad of challenges confronting programs, even in the absence of a formalized plan, are of a *constant* nature. The challenges navigated on a day-to-day basis include knowledge scarcity, uncertainty, government silos, political volatility, competing priorities, limited funding, and resource scarcity (Hartwell *et al.* 2023, Lange *et al.* 2025).

Truly, plan formulation and plan implementation are actualized through collaborations between the community and practitioners (Kipp *et al.* 2019). To maneuver through barriers to practice, practitioners built and utilized strong networks of diverse partners and community collaborators to operationalize plan implementation, evaluation, and future development. According to interview analysis, collaborations and cross-boundary networks aided in the construction of:

- knowledge and data based in embodied societal phenomena,
- capacity for strategy implementation and programmatic reach,
- policy construction and plan refinement,
- asset-based collaborative networks and partnerships,
- strategies that are reflexive, and agile,
- when possible, strategies that are co-constructed with communities,
- monitoring and evaluation strategies that are more easily actualized, and
- the translation of climate models, disease burdens, and other scientific projections into observable understanding (Ebi 2009, McClymont Peace and Myers 2012, Moser and Pike 2015, Hugel and Davies 2020, Suhaeb *et al.* 2024, Lange *et al.* 2025).

Further, all grantees prioritized collaborations with other *institutions* in their climate and health adaptation plans and programs. These collaborations vary in purpose, but regardless were also generative of:

- contributing to the field’s understanding of best practices through research,
- creating co-benefits between climate, health, and other sectors,

Table 6. Diversity of key policy strategies and frameworks in climate and health adaptation plans.

Arizona Department of Health Services	'Form collaborations to design, implement, and evaluate preparedness activities that are based on the problems and impacted communities instead of based on existing jurisdictional boundaries or agency regulations' (Roach <i>et al.</i> 2017, p. 39).
California Department of Public Health	'Facilitate learning that increases community members' understanding of how to analyze and participate in decision-making around climate change, health, and equity, including the ability to plan, organize, fundraise, and take action within the decision-making context' (California Department of Health 2017, pp. 164-165).
Maine CDC BRACE Program	'Tick Borne Disease (Interventions) – Increased education and outreach to vulnerable populations through schools for 5-15 year olds and through libraries for 65+ year olds; Deer herd management; Property management (Barriers and ground maintenance, IPM)' (Maine Department of Health and Human Services ND p. 7).
Massachusetts Department of Public Health	'Evaluate and support service providers in expanding institutional capacity to meet the needs associated with climate change induced increases in vector-borne diseases' (Massachusetts Department of Public Health 2014, p. 77).
Michigan Department of Health and Human Services	'1. Identify & cultivate relationships with stakeholders a) By early 2017, [Michigan Climate and Health Adaptation Program] will recruit at least two Michigan communities and relevant stakeholders to collaborate on developing, piloting, and evaluating an intervention addressing at least one of the priority health impacts. The communities and stakeholders will be representative of the vulnerability and equity issues faced by urban and rural jurisdictions' (Cameron and Ferguson 2016, p. 4).
Minnesota Department of Health	'Identify populations vulnerable to air pollution, outdoor allergens, vector-borne diseases, extreme heat events, drought and flooding, and food and water contaminants as a result of climate change' (Minnesota Department of Health 2019, p. 10).
New Hampshire Department of Health and Human Services	'Inform, educate, and empower about climate change public health issues • We need to educate public health professionals about climate-related health impacts and preparedness planning. • We need to educate the general public about climate-related health threats and preparedness planning' (New Hampshire Department of Health and Human Service 2010, p. 7). *Based directly upon a needs assessment to guide future planning activities and actions.
North Carolina Department of Health and Human Services	'NC [Department of Public Health] will use qualitative data from the heat syndromic surveillance through summer 2017 meeting notes and a future survey of system stakeholders. NC [Department of Public Health] will also use quantitative data on reports distributed through the summer. This data will be used to answer evaluation questions' (North Carolina Division of Public Health 2018, p. 8).
San Francisco Department of Public Health	'Develop a strategy to engage vulnerable populations and the organizations and networks that support them, about health outcomes associated with climate hazard events and how best to design solutions to mitigate, prepare, respond, and recover from them' (Comerford 2017, p. 15).
Oregon Health Authority Public Health Division	'Strategy 1 - Standardize the use of an equity framework: A) Establish an ongoing division-wide Health Equity Committee. B) Adopt a comprehensive health equity conceptual framework. C) Consult and collaborate with the Office of Equity and Inclusion (OEI) and regional health equity coalitions. D) Partner with OEI to provide training for state and local partners on environmental justice' (Oregon Department of Health 2017, p. 15).
Wisconsin Department of Health Services	The Wisconsin Climate and Health Program seeks to expand partnerships, provide expertise, foster collaboration, and develop strategies to address health risk factors related to severe weather event indicators including: extreme heat, precipitation patterns, average temperature increases, drought, impacts on aquifers, surface water impacts and flooding, and winter weather events (Wisconsin Division of Public Health, 2016, p. 4).

- conducting surveillance to help fill or identify gaps in climate-related data,
- formulating appropriate health messaging for target populations, and
- aiding health service provision by external institutions (Amaru and Chhetri 2013, Trell and van Geet 2019, Rasmussen *et al.* 2019, Austin *et al.* 2019, Wamsler *et al.* 2020).

The climate and health adaptation planning process represents an opportunity for programs to identify key partners with similar goals and priorities (Shimamoto and McCormick 2017, Holmes and Eisenman 2020). Facilitating factors for building and maintaining collaborative working relationships and institutional partnerships identified by grantees included steady funding, strong state-level support, and consistency in personnel (Hartwell *et al.* 2023). More, strong state-level leadership and support, such as those under the direction of a governor's office, can lead to effective interagency or interdepartmental collaboration on climate and health

issues, as well as inform legislative action (Carmin *et al.* 2013; Dugassa 2021). Conversely, in states with political barriers to climate and health work, resilience initiatives have emerged in lower regional and local collaboratives where the political environment is more amicable (Holmes and Eisenman 2020).

In response to the transdisciplinary nature of climate and health adaptation practice, common state-level partners for grantees have included departments of emergency management, natural resources or environmental protection, energy, occupational/environmental epidemiology, transportation, offices of sustainability, and housing authorities. Local-level partnerships have commonly included those between local health departments, community health clinics and health care networks, local emergency managers, floodplain managers, universities, community champions, K-12 schools, and non-governmental organizations (Mallen *et al.* 2022).

State-level public health practitioners found difficulty in *directly* reaching all communities and

Table 7. Examples of community collaboration policy.

Arizona Department of Health Services	'Expand and mobilize relationships with existing local, neighborhood, community, and faith-based groups that provide social and health services to residents, and connect preparedness activities with these groups, such as providing cooling refuge at localities that also offer case management, food and shelter, or job training' (Roach <i>et al.</i> 2017, p. 11).
California Department of Public Health	'Support and strengthen community social networks and other assets to build climate resilience (e.g. partner with schools, faith-based communities, neighborhood-based groups and businesses in climate resilience planning)' (California Department of Public Health 2017, p. 165).
Maine CDC BRACE Program	'In addition, [Maine Center for Disease Control] is currently finalizing a time-series meta-analysis in collaboration with colleagues from Brown University and the state health agencies in New Hampshire and Rhode Island to identify a more protective threshold for issuing heat health advisories' (Maine Department of Health and Human Services ND p. 25).
Massachusetts Department of Public Health	'Coordinate the continuous enhancement of the [State Hazard Mitigation and Climate Adaptation Plan] through collaborative partnerships and the active engagement of key stakeholders, including representatives from municipalities, regional planning agencies, and others who play a role in supporting plan implementation through their own plans, policies, programs, or activities' (Massachusetts Department of Public Health 2014, pp. 8-6).
Michigan Department of Health and Human Services	'By early 2017, [Michigan Climate and Health Adaptation Program] will create communication and evaluation plans in consultation with internal and community advisors, and distribute them to community stakeholders' (Cameron and Ferguson 2016, p. 4).
Minnesota Department of Health	'The Minnesota Climate & Health Team, in collaboration with the [Minnesota Department of Health] Climate Change Workgroup and the MN Climate & Health Steering Team, will conduct outreach to the general public through speaking engagements, exhibits and events, and print and electronic media' (Minnesota Department of Health 2019, p. 13).
New Hampshire Department of Health and Human Services	'The contributors to this strategic plan include a diverse array of partners including but not limited to: state and local health departments; other State agencies (including the Department of Safety [DOS], Department of Environmental Services [DES]; Department of Agriculture, Markets and Food, Fish & Game Department, and others); community coalitions; health associations; community health centers; community-based health, mental health and social service agencies; health care providers; insurers; philanthropic and non-profit organizations; public health institutes; academic centers; and hospitals' (New Hampshire Department of Health and Human Services 2010, p. 2).
North Carolina Department of Health and Human Services	'Create a framework to reach out to vulnerable populations in each county. Prevention specialists will use a curriculum designed by NC [Department of Public Health] and Sustainable Sandhills staff to implement the alert protocol. Prevention specialists will reach the targeted population in their county using different communication methods such as email, meetings, etc' (North Carolina Division of Public Health 2018, p. 16).
San Francisco Department of Public Health	'Support the development of a comprehensive interdepartmental webpage that consolidates available city, state, and federal resources to help City departments, community-based organizations, and resident's access funding opportunities' (Comerford 2017, p. 15).
Oregon Health Authority Public Health Division	'Form partnerships with faith community, civil society, and others to design and implement solutions' (Oregon Department of Health 2017, p. 6).
Wisconsin Department of Health Services	'The Wisconsin Climate and Health Program will form a Health Equity Advisory Team (HEAT), which will include organizations that represent Wisconsin's vulnerable populations and representatives from academia to provide expertise on implementing, monitoring, and evaluating BRACE strategies with a health equity lens' (Wisconsin Department of Health Services 2016, pp. 9-10).

vulnerable groups due to staffing capacity and the immense labor required to carry out and sustain local outreach effectively. Thus, growing relationships with local health departments – and inversely for local health departments to access state level resources – is advantageous in helping communities at large whilst operating in times of financial austerity (Lange *et al.* 2025).

There's a new assistant director who was at a local health department that we've been working with very closely. And so she's a bigger champion. So we're kind of hoping that depending how things turn out with a proposal that we would have more of a champion because she really helped us get connected with a bunch of different people. (practitioner, personal communication)

Local partnerships with communities (Table 7) or with organizations that can serve in an advocacy role have been particularly advantageous to state-level climate and health programs. For example, one grantee discussed funding community-based partnerships to support community health needs and goals in ways that are more immediately responsive, personal, and

intimate (Wallerstein and Duran 2010, Center for Climate Change and Health 2016, Fagliano and Diez Roux 2018).

It really does not matter how good your [planning] document is ... Being in the room, having credibility with those partner groups is as important as having those forceful, well researched, well documented [planning] documents to be able to put forth. (practitioner, personal communication)

To reduce health impacts on the most vulnerable, many practitioners aim to conduct targeted education and training to and *with* vulnerable populations (Barata *et al.* 2011, Rasmussen *et al.* 2019, Austin *et al.* 2019). Table 8 provides select policies for addressing health equity and vulnerable populations within the grantees' climate and health adaptation plans. These include designing communications interventions, protocols, and emergency plans that target the communities and populations most impacted by extreme heat or other hazard (e.g. Oregon, North Carolina, Arizona, Maine, Massachusetts, Michigan, New Hampshire); providing trainings to practitioners

Table 8. Examples of health equity and vulnerable population policy in climate and health adaptation plans.

Arizona Department of Health Services	'Activate existing community and social networks and programs to expand real-time monitoring efforts and resource sharing of vulnerable populations during extreme weather events, such as neighbor check-ins during heat waves' (Roach <i>et al.</i> 2017, p. 11).*
California Department of Public Health	'Facilitate learning that increases community members' understanding of how to analyze and participate in decision-making around climate change, health, and equity, including the ability to plan, organize, fundraise, and take action within the decision-making context' (California Department of Health 2017, pp. 164-165).
Maine CDC BRACE Program	'Currently, the Maine [Center for Disease Control's] Climate and Health Program is working closely with the agency's Office of Public Health/Emergency Preparedness, Office of Local Public Health, and several social service organizations throughout Maine to develop a communications plan for directly reaching vulnerable populations during heat waves and other weather emergencies' (Maine Department of Health and Human Services n.d. p. 20).*
Massachusetts Department of Public Health	'Consider promoting an education campaign targeted to vulnerable populations, which could include support for a network of notification procedures for vulnerable communities, cooling centers (gathering places for people to get relief during heat waves), and — check on your neighbor programs' (Massachusetts Department of Public Health 2014, pp. 75-76).*
Michigan Department of Health and Human Services	'By early 2017, Michigan Climate and Health Adaptation Program] will recruit at least two Michigan communities and relevant stakeholders to collaborate on developing, piloting, and evaluating an intervention addressing at least one of the priority health impacts. The communities and stakeholders will be representative of the vulnerability and equity issues faced by urban and rural jurisdictions (Cameron and Ferguson 2016, p. 4)'.
Minnesota Department of Health	'The Minnesota Climate & Health Program, in collaboration with the Minnesota Department of Health Center for Health Equity, will provide training to Eliminating Health Disparities Initiative (EHDI) grantees on the health impacts of climate change (Minnesota Department of Health 2019, p. 13)'.
New Hampshire Department of Health and Human Services	'The primary objective is to communicate the key messages within the State Excessive Heat Plan (i.e. health risks of heat exposure and recommended protective behaviors) to the general public and vulnerable populations during EHEs' (New Hampshire Department of Health and Human Services 2010, p. 24).*
North Carolina Department of Health and Human Services	'Community Outreach Plan – Create a framework to reach out to vulnerable populations in each county. Heat Illness Prevention specialists will use a curriculum designed by NC [Department of Public Health] and Sustainable Sandhills staff to implement the alert protocol' (North Carolina Division of Public Health 2018, p. 16).*
San Francisco Department of Public Health	'The Plan articulates that [San Francisco Health Network] can improve equity and eliminate health disparities. These initiatives would focus on the vulnerable populations most likely to be impacted by climate change' (Comerford 2017, p. 38).
Oregon Health Authority Public Health Division	'Consult and collaborate with the regional health equity coalition' (Oregon Department of Health 2017, p. 15).
Wisconsin Department of Health Services	'In the next grant cycle the Wisconsin Climate and Health Program would like to expand its community engagement work significantly by working with, learning from, and engaging partner groups and organizations that represent impacted communities. This endeavor will bring a health equity lens to climate discussions to provide opportunities for stronger public health practice on climate issues' (Wisconsin Department of Health Services 2016, pp. 9-10).

*Plans did not specifically mention equity or health equity but did make specific mention of vulnerable populations.

to increase knowledge of the health impacts of climate change (e.g. California, Minnesota); consulting and partnering with existing health equity coalitions where they exist (e.g. Oregon); and by expanding community engagement with partners from vulnerable communities (e.g. Wisconsin).

The overall scope and boundaries of health equity within the adaptation plans are predominantly focused around two practices; 1) intention setting or future goal(s) itemized in policy; and 2) the construction and implementation of communications strategies that serve as the basis for partnerships, adaptation strategies, and reaching disproportionately impacted 'vulnerable' populations. Across the different grantees' praxes it was observed in the plans and during interviews that there is a purposefully blurred line, for political reasons, between 'vulnerable populations', and deliberative health equity strategies. For example, the North Carolina Department of Health and Human Services – located in a largely conservative state – seeks to create a community outreach plan that will alert vulnerable populations to extreme heat (an intention of a communications strategy). This is contrasted

with the California Department of Public Health's – located in a largely liberal state – policy that deliberately seeks to support learning objectives in climate health disparaged communities for the intended action-oriented outcomes of fundraising, collective organization, and influencing public decision making.

Grantees are overburdened with the scale of climate and health adaptation, and thus the labor, data, and resources needed to address and advance health *equity* is an entirely different matter. The differing climate and health programs have always needed to practice *political tact* when deliberatively planning for disproportionately impacted peoples (Lange *et al.* 2025). Grantees, despite being located in planning and health-oriented agencies/departments – which are largely administrative in nature – are still operating within political domains and within politically charged fields. The enveloping and underlying political winds, and the political direction they blow, have enormous consequences on the degree to which grantees can speak on, acknowledge, mention, or let alone *fund* deliberative climate and health planning strategies anchored in equity. Thus, it can be further inferred that how

grantees' evaluated their own actions, particularly the extent to which they address healthy equity and disparities, is also inseparable from political realities; though future research would need to support this more substantively.

Grantees conducted evaluation in different ways that were often dependent upon available resources such as labor and financial support (Brown *et al.* 2018) (e.g. a full financial accounting versus a periodic check-in with local health departments). Many practitioners evaluated the impact of outreach or communication campaigns as communication campaigns are the typical starting points in public and community engagement (Khatibi *et al.* 2021, Lange *et al.* 2025).

We measure people's readiness to change and their confidence to act. So when they leave a class, at least one of my classes, I'm more confident that they're confident, I know that they have a belief that this is important . . . You get people to feel more confident to act they're going to be in much better shape to remember it in the future and also continue to act on it and teach others. (practitioner, personal communication)

A common concern among practitioners was how to sustain the impact of outreach efforts long term considering that outreach activities are a major component of the planning and behavioral change initiatives (Campbell-Lendrum *et al.* 2023). As stated by one practitioner, 'partnerships only work if you continue to nurture them day by day, week by week, year by year' (practitioner, personal communication).

Practitioners noted that public reporting was helpful for building programmatic accountability and providing incentives to complete contractual work (Berrang-Ford *et al.* 2019). As one grantee expressed:

We want it to be written into people's professional descriptions of their jobs. Like, 5%-10% of your job is spent on climate and health related initiatives so that it is more formalized for people, and they feel like they have space to work on this. Fitting it into their busy schedules is hard. (practitioner, personal communication)

Grantees who have not had historical experience with evaluation are still assessing how and what type of evaluation practices should be utilized (Brown *et al.* 2018). For example, grantees provided financial support to local health departments to fund specific local interventions or initiatives, such as through mini-grants, and most of these programs required the local health departments to report back on outcomes related to their work. This information allegedly provided useful programmatic efficacy data. The value of evaluation is well captured by a grantee who described additional findings, benefits, and achievements from their process (Schoenefeld 2023):

[Evaluation] became part of one of the organization's strategic planning processes . . . We asked just very broad questions of, were there any other policy changes that may have occurred due to this work? Were there

any system changes or changes in your protocol? Were there any cultural changes in your organizational culture? And it was amazing the number of things that they all reported that weren't part of initially what we were funding them to do. (practitioner, personal communication)

Evaluation is increasingly considered a standardized practice for grantees as they implement the BRACE framework to garner planning strategies, implement and update plans, and address data/resource shortfalls (Joseph *et al.* 2023).

Case synthesis

It is important to step back and recognize the role the US CDC Climate Ready States and Cities Initiative has played across the differing grantees. In basic terms, 18 different programs from across the United States actively applied for material resources after identifying real need in their communities. This fundamental recognition of human suffering is the foundation for the entirety of this work; a group of relatively small programs seeking to make lives better, healthier, and safer for those in need. Across all 18 programs and the US CDC, regardless of professional skills and tools, the challenge of addressing the health impacts of anthropogenic climate change is a human endeavor. The use of basic human communications, intention, and will to create collaborations, partnerships, and to reach into vulnerable communities was the primary modality for plan/strategy construction, implementation, and evaluation.

The US CDC Climate Ready States and Cities Initiative has for 16 years assisted in facilitating numerable important objectives: 1) the construction and documentation of evidence linking anthropogenic climate change to the human body; 2) the facilitation and provision of material support to create and implement climate and health adaptation plans/strategies across diverse people and geographies; and 3) create professional communities of care that build knowledge and communicative networks between various funded programs. It is unclear if the US CDC Climate Ready States and Cities Initiative will be Congressionally funded beyond 2026. Nonetheless, we as practitioners, researchers, administrators, and people can ensure what has been accomplished can live on in new directions in the coming years.

Conclusion

US CDC Climate Ready States and Cities Initiative grantees are making progress via a deliberative and collaborative approach of small steps, small wins, and protecting their programs. Funded grantees have emerged as a network of practitioners that stitch together state and local health departments

and institutions *with* the asset-based approaches of other agencies, regional entities, local health departments, non-governmental organizations, community organizations, and communities at large. Near universal resource scarcity demands a health in ‘all policies’ approach for inter-sectoral co-benefits and relational capacity building. In step, the financial support provided through the US CDC is foundational. Many of the programs and practitioners within their respective positions, policies, and efforts would not exist without federal financial support and guidance. The plans and programs analyzed in this work show diversity of style, focus, goals, and scope, but they all are built upon collaborative approaches to networks, knowledge, and actionable strategies.

Moving forward, research is needed on how public health practitioners are operating at the day-to-day level. How are practitioners navigating their complex environments, tasks, and responsibilities to find success at the experiential level and how can successes be translated to other health practitioners and programs? The embodied environment, where the practitioner seeks to generate and *sustain* impact through social/institutional networks, is an understudied dimension of climate and health adaptation planning. More than policy, more than planning, and more than method, what are practitioners and the public going through? It would seem that practitioners are moving ‘forward’ through the combined theoretical dimensions of intensive incrementalism, planning improvisation, and collaborative planning. Such a level of detailed analysis is key in understanding the practitioners who are tasked to find solutions to complex health challenges that span geography, society, and structures of power/inequity.

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