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Katherine Kettering
DePaul University College of Law

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DEVELOPING A NATIONAL STRATEGIC PLAN TO ADDRESS THE
EFFECTS OF CLIMATE CHANGE ON HUMAN HEALTH

INTRODUCTION

The health of those inhabiting the planet is inextricably linked to climate change. Over the past ten years, the study of climate change has shifted from largely an ecological and meteorological study to one of the relationships between human health and climate health.¹ Rising temperatures, increased drought, precipitation, and more severe storms will impact human health in one way or another in the coming decades, positioning climate change to be the next major transition regarding public health law and policy.²

This article seeks to emphasize the importance of implementing a comprehensive national climate change action plan by advancing the understanding of how current initiatives and proposed legislation are working strategically to offset impending health risks, specifically within vulnerable populations. In order to achieve this goal, there are two pieces of key legislation that Congress needs to pass. The first is the Climate Change Health Protection Plan of 2019 (CCHPP), which would require the implementation of a national strategic plan within two years of its passing.³ The other is the Climate Health Act (CHA), which would reinstate and fund the Center for Disease Control's (CDC) Climate and Health Program (CHP), which has several progressive initiatives that will help local and state governments proactively prepare.⁴ Natural disasters and national public health emergencies are also significant consequences of climate change, making emergency

¹ CHRISTOPHER J. PORTIER ET AL., NAT'L INST. ENVTL. HEALTH SCI., A HUMAN HEALTH PERSPECTIVE ON CLIMATE CHANGE: A REPORT OUTLINING THE RESEARCH NEEDS ON THE HUMAN HEALTH EFFECTS OF CLIMATE CHANGE, 3 (Apr. 22, 2010), https://www.niehs.nih.gov/health/materials/a_human_health_perspective_on_climate_change_full_report_508.pdf.

² Lindsay F. Wiley, *Adaption to the Health Consequences of Climate Change as a Potential Influence on Public Health Law and Policy: From Preparedness to Resilience*, 15 WIDENER L. REV. 483, 500 (2010).

³ Climate Change Health Protection and Promotion Act of 2019, H.R. 1243, 116th Cong. § 4(b)(1) (2019).

⁴ Climate Health and Protection Act, H.R. 3819, 116th Cong. § 317U (2019).

preparedness another essential part of the national plan. The national plan must incorporate the initiatives from the Pandemic and All-Hazards Preparedness and Advancing Innovation Act (Preparedness Act) to efficiently and effectively prepare both public health departments and healthcare systems to respond to the health effects of climate change.⁵

This article highlights the importance of increased coordination on the federal level, the incorporation of state and local initiatives, and the development of partnerships within governmental and non-governmental entities to mitigate the impact of climate change. It promotes expanding funding for climate research and education and streamlining information and communication to help ensure that policies are created with accurate information to maintain an effective approach and response. The article also emphasizes that the consequences of climate change will not be equally distributed and the importance of identifying and supporting these more vulnerable populations.

Part I of this article will examine the importance of creating a progressive, comprehensive national climate change action plan by passing key legislation that will support the health sector, build capacity, mobilize partnerships aimed at adaptability, and expand the authority of public health departments to address broad climate health concerns. Such legislation will also focus on improving health equity and climate justice for minorities and vulnerable populations.

Part II will explore several of the key considerations necessary to create a successful national plan. This section will examine identifying and assessing vulnerabilities by demonstrating how heat, one of the most important climate factors, affects more vulnerable populations and communities and how the current CHP initiatives in place are helping state

⁵ Pandemic and All-Hazards Preparedness and Advancing Innovation Act, Pub. L. No. 116-22, § 101, 133 Stat. 905, 906–07 (2019).

and local governments identify and prepare for these factors. A case study conducted by “Building Resilience Against Climate Effects” (BRACE) will illustrate the framework implemented to identify, assess, and provide potential solutions to the vulnerable populations in local and state jurisdictions. Part II will also examine the significance of building capacity through diverse partnerships that transcend levels of government and are inclusive of the private sector, as well as how critical adaptability is to plan through continued research and evaluation.

Finally, Part III will focus on enhancing the preparation and response to natural disasters and public health emergencies that have seen a steady increase in frequency and severity as a result of climate change. The national plan will leverage systems in place under the Preparedness Act to ensure both public health and health care facilities are prepared to respond to and recover from natural disasters and public health emergencies.

PART I

NATIONAL STRATEGIC ACTION PLAN

Despite the increasing and significant impacts of climate change on human health, the United States still lacks a national comprehensive plan to respond to the health risks and harms of climate change.⁶ Congress should enact the CCHPP to direct the Department of Health and Human Services (HHS) to develop a national strategic action plan to assist communities and health departments in preparing for and responding to climate-related health risks, including the health-related needs of frontline communities and vulnerable populations that are disproportionately harmed by extreme weather.⁷ The progress made over the past ten years has created momentum in this area that can be seen in government

⁶ H. SELECT COMM. CLIMATE CRISIS, 116TH CONG., SOLVING THE CLIMATE CRISIS: THE CONGRESSIONAL ACTION PLAN FOR A CLEAN ENERGY ECONOMY AND A HEALTHY, RESILIENT, AND JUST AMERICA 314 (2020) (prepared pursuant to H.R. Res. 6, 116th Cong. (2019)).

⁷ *Id.* at 10.

initiatives and strategic plans. A comprehensive plan would streamline communication and the dissemination of research and resources, developing a plan that can adapt and evolve.

CCHPP's approach identifies issues that will need monitoring on a domestic and international scale to prepare for and respond to the health-related impacts of climate change.⁸ The CCHPP also incorporates a climate and health program, instructing the Secretary of HHS to work with the CDC on strategic developments, including communication, forecasting, data, and environmental change tracking, research, partnerships, state leadership, and technical support.⁹

The CDC should utilize the CCHPP to expand the CHP, arguably the most comprehensive and actionable initiative for identifying and addressing the health impacts of climate change in state and local jurisdictions. BRACE is one of the leading entities supporting state, local, tribal, and territorial public health agencies' efforts for climate change adaptation.¹⁰ CHP's BRACE program is the model that should be expanded to every state and major city in the country. Expanding and following the BRACE framework will help increase identification, assessment, and adaptive measures to create plans and policies that will continue the development of more targeted local and state plans to ensure vulnerable populations are taken into consideration.¹¹ BRACE is currently in a "proof-of-concept" phase and is laid out for dissemination beyond the locales in which it is being piloted.¹² The passage of the CHA would reinstate the CHP, guaranteeing annual funding to support the compilation and interpretation of climate science to inform communities and state and local health departments, the creation of tools to continue building capacity, and

⁸ H.R. 1243 § 4(b)(2)(I)(i)–(xii).

⁹ H.R. 1243 § 4(b)(2)(3)(A)–(K).

¹⁰ Gino D. Marinucci et al., *Building Resilience against Climate Effects—A Novel Framework to Facilitate Climate Readiness in Public Health Agencies*, INT'L J. ENVTL. RES. & PUB. HEALTH 6434, 6451 (2014).

¹¹ See generally *id.*

¹² *Id.*

continued leadership in the planning and navigation of the public health impacts of climate change.¹³

Increasing capacity, adaptive management, continued research, and streamlined communication are all essential components when constructing an effective national plan. Increasing the capacity within public health departments through diverse partnerships is essential for the plan to effectively function and address the issues that come with a changing climate. Climate change is an extensive and complex issue that requires a plan that is flexible and policies that are adaptable. Continued research and periodic assessment will be vital in predicting what will be the most pressing issues. The CCHPP instructs the HHS Secretary to establish a permanent science advisory board and partnership with the National Academy of Sciences, Engineering, and Medicine.¹⁴ To ensure that the plan is operating effectively, the HHS Secretary will consult other relevant Federal agencies for periodic assessment and revision to realign goals and systems to meet evolving issues.¹⁵

The changing climate and weather patterns bring more immediate concerns to public health, especially to vulnerable populations, making emergency preparedness for natural disasters and public health emergencies an essential part of the national plan. The plan will need to incorporate the Preparedness Act and rely specifically on the HHS Office of the Assistant Secretary for Preparedness Response (ASPR) to efficiently and effectively prepare both public health departments and healthcare systems to respond to the health effects of climate change. There are many working parts in this plan, and collaboration and cooperation will be essential, but by enacting the CCHPP and the CHA, Congress is taking

¹³ See Climate Health and Protection Act, H.R. 3819, 116th Cong. § 317U(c)(2)(1) (2019).

¹⁴ H.R. 1243 § 5.

¹⁵ *Id.* at § 4(c)(1)–(3).

progressive steps to ensure that the United States is prepared to meet the challenges to human health that climate change will bring.

PART II

IDENTIFICATION AND ASSESSMENT

The effects of climate change have the potential to affect every part of human health.¹⁶ The World Health Organization (WHO) projects that between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths per year from malnutrition, malaria, diarrhea, and heat stress.¹⁷ In terms of climate change, vulnerability is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes.¹⁸ Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.¹⁹

The effects of climate change disproportionately affect vulnerable populations, such as children, the elderly, tribal communities, the poor, and urban dwellers, making it important for state and local governments to identify and pay extra attention to these populations. Each of these vulnerable populations brings with it a unique set of challenges, and it is necessary to identify what the vulnerabilities of these populations are and how the specific characteristics and circumstances of that population make it susceptible to local health hazards.²⁰ For example, urban areas are more susceptible to hotter temperatures. The urban heat island effect is a concept used to explain why temperatures are hotter in more

¹⁶ Lisa Heinzerling, *Climate Change, Human Health, and the Post-Cautionary Principle*, 96 GEO. L.J. 445, 449 (2008).

¹⁷ *Climate Change and Health*, WHO (Feb. 1, 2018), <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>.

¹⁸ CLIMATE CHANGE ADAPTATION TASK FORCE, FEDERAL ACTIONS FOR A CLIMATE RESILIENT NATION: PROGRESS REPORT OF THE INTERAGENCY CLIMATE CHANGE ADAPTATION TASK FORCE 2 (2011).

¹⁹ *Id.* at 3.

²⁰ Susan Martin, *Climate Change, Migration, and Governance*, 16 GLOB. GOVERNANCE 397, 399 (2010).

densely populated urban areas than in nearby non-urban or rural areas.²¹ In fact, the Environmental Protection Agency (EPA) found that the air temperature in cities could be as much as twenty-two degrees Fahrenheit warmer than the air in surrounding areas.²² However, this rising heat index is not consistent throughout urban areas.²³ Certain populations within cities experience the effects of the heat more than others.²⁴

To combat rising temperatures, certain areas of cities use smart growth tactics, like green roofs, vegetative coverage, tree canopies, and cool pavement.²⁵ However, these types of EPA-sanctioned heat-reducing measures require substantial community investment to make the necessary modifications required to reduce temperatures, meaning that more affluent neighborhoods are likely to implement these measures than lower-income neighborhoods.²⁶

Studies have shown that minority populations are less likely to live in neighborhoods and communities integrating smart growth with tree canopies or vegetative covering. Instead, the ground in these communities is covered with impervious surfaces amplifying the effects of the heat in those communities.²⁷ In fact, there is a positive correlation between low-income neighborhoods and communities and the increase in surface temperatures.²⁸ Even though the data shows that low-income communities are hotter, the cost of the air conditioner or the concerns of increased electric expenses makes it less likely that residents will use air conditioning.²⁹ Poor and disenfranchised

²¹ Courtney Lauren Anderson, *Climate Change and Infrastructure*, 18 HOUS. J. HEALTH L. & POL'Y, 2018, at 2.

²² *Id.*

²³ *Id.* at 2–3.

²⁴ *Id.* at 3.

²⁵ *Id.*

²⁶ *Id.*

²⁷ *Id.*

²⁸ *Id.* at 2.

²⁹ *Id.* at 4.

communities will experience more widespread suffering and displacement as the result of insufficient socioeconomic resources. This lack of resources affects health status when it comes to climate-related issues like heat and air pollution, which exacerbate cardiovascular and respiratory disease primarily among populations with reduced socioeconomic resources.³⁰

Identifying and understanding where these vulnerabilities exist allows public health departments to create health intervention and adaptation strategies unique to specific demographics and communities in the state.³¹ The CDC has progressed in the area of vulnerability assessment over the past decade by implementing tools to assess the vulnerability of populations. For example, the Social Vulnerability Index (SVI), which the CDC developed, is based on census data factors such as socioeconomic status and available infrastructure.³² Initially utilized to target those at greatest risk from flooding, the SVI focuses on Geographic Information System (GIS) mapping to help visualize and target emergency response.³³

In 2009, to identify and address these needs, the CHP developed BRACE, a comprehensive climate vulnerability assessment to support local government efforts.³⁴ BRACE assessments are conducted to identify populations and areas most susceptible to the hazardous exposures resulting from climate change and to help implement more targeted public health action to meet the needs of those people and reduce the risks.³⁵

³⁰ Wiley, *supra* note 2, at 495.

³¹ ARIE PONCE MANANGAN ET AL., CTRS. FOR DISEASE CONTROL & PREVENTION, ASSESSING HEALTH VULNERABILITY TO CLIMATE CHANGE: A GUIDE FOR HEALTH DEPARTMENTS 17, <https://www.cdc.gov/climateandhealth/pubs/assessinghealthvulnerabilitytoclimatechange.pdf> (last visited Jan. 10, 2021).

³² Mary Fox et al., *Integrating Public Health into Climate Change Policy and Planning: State of Practice Update*, 16 INT’L J. ENVTL. RES. PUB. HEALTH 3232, 3237 (2019).

³³ *Id.*

³⁴ *Id.* at 3235.

³⁵ Manangan et al., *supra* note 31, at 14.

BRACE has been deployed in 18 public health agencies through the Climate-Ready States and Cities Initiative cooperative grant program.³⁶

These assessments identify populations and communities that otherwise may not have been thought to be susceptible by using an overlay or spatial regression approach, allowing multiple determinants to be considered at once, like sensitivity, exposure, and adaptive capacity.³⁷ BRACE functions using the CDC's policy development approach for adaptation, integrating scholarship on climate change adaptation more generally as well as research on social determinants into policy development and planning.³⁸ These assessments are critical tools that provide public health departments with the information necessary to develop health adaptation and intervention strategies.³⁹

An adaptive management approach, BRACE consists of five sequential steps designed to help health officials identify where climate-related health susceptibilities exist.⁴⁰ Factoring in adaptation is imperative because the climate conditions that are identified will continue to alter the magnitude, frequency, duration, and geographic extent of various climate-related exposures that are detrimental to human health.⁴¹ The first step is to anticipate climate impacts and assess vulnerabilities by identifying what climate effects are relevant locally, and how those might lead to new or expanded health threats, and who is most at risk.⁴²

The next step is to rank the severity of each threat based on its projected disease burden by calculating the impacts on the local population.⁴³ Ranking the severity of each

³⁶ Marinucci et al., *supra* note 10, at 6435.

³⁷ *Id.*

³⁸ *Id.* at 6436.

³⁹ Manangan et al., *supra* note 31, at 17.

⁴⁰ Marinucci et al., *supra* note 10, at 6435.

⁴¹ Manangan et al., *supra* note 31, at 5.

⁴² Marinucci et al., *supra* note 10, at 6436.

⁴³ *Id.*

threat will allow health officials to prioritize the worst risks first.⁴⁴ Step three assesses public health interventions by identifying ways the community can intervene to prevent or reduce health risks.⁴⁵ For example, determining which would be the more effective solution to an over-heating community, community-cooling centers, or collaborative housing development plans to protect vulnerable residents.⁴⁶ Either assessment of intervention will need to take into account the efficacy and suitability of choice for the local jurisdiction.⁴⁷ This step offers a variety of intervention options, which at its most collaborative level would create opportunities for stakeholder participation and education.⁴⁸

Step four focuses on the development and implementation of a climate and health adaptation plan by creating a written plan that is updated regularly.⁴⁹ The goal is to eventually delegate and supervise the implementation of the plan.⁵⁰ This process crosses all of the elements of adaptive management.⁵¹ The plan will create management objectives tailored to the chosen strategy and the measurement of the intervention and adaptation approaches. Having defined systems in place will improve the ability to track metrics, evaluate progress, and adjust as necessary.⁵²

The fifth and final step focuses on evaluating and improving the quality of activities by analysis of the process and the value of the information generated from those activities.⁵³ This information will allow public health agencies to adjust their monitoring systems and evaluation processes to function more efficiently and effectively. This analysis and

⁴⁴ *Id.* at 6437.

⁴⁵ *Id.* at 6436.

⁴⁶ *See generally* Videotape: Climate and Health, CTRS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/climateandhealth/videos.html#brace> (last reviewed Sept. 9, 2019).

⁴⁷ Marinucci et al., *supra* note 10, at 6446.

⁴⁸ *Id.*

⁴⁹ *Id.* at 6436.

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² *Id.*

⁵³ CTRS. FOR DISEASE CONTROL & PREVENTION, *supra* note 46.

evaluation will allow public health agencies to sustain their commitment to learning, implementing new skills, and long-term planning.⁵⁴

To illustrate how BRACE operates, the CDC conducted a vulnerability assessment case study of heat-related illness in Georgia from 2002 to 2008, using an overlay analysis to examine health vulnerabilities to extreme heat.⁵⁵ An overlay analysis spatially defines and analyzes prospective health vulnerabilities by combining multiple layers of risk factors.⁵⁶ The study found that every year, during the summer months, emergency departments saw an average of 1,937 individuals for heat-related illnesses.⁵⁷

Analyzing this data for the state of Georgia, a description is provided of the indicators and the data sources and methodology for each indicator. This information is then compiled into an index representing vulnerability.⁵⁸ The study identified three categories based on vulnerability factors: sensitivity, adaptive capacity, and exposure.⁵⁹ The results indicated that vulnerability to heat extends beyond urban areas. An example of one of the vulnerable populations identified was the high concentration of elderly people living alone combined with an increased percentage of impervious surfaces in the surrounding area outside of Atlanta.⁶⁰ The report also showed that the most vulnerable areas were in rural southern Georgia.⁶¹ Exposure to more hazardous heat effects, coupled with insufficient hospital infrastructure and a more prevalent population of elderly individuals living alone, were all factors that contributed to this determination.⁶² Finally, the CDC provides recommendations of solutions to address the needs of each vulnerable

⁵⁴ Marinucci et al., *supra* note 10, at 6436.

⁵⁵ Manangan et al., *supra* note 31, at 14.

⁵⁶ Marinucci et al., *supra* note, 10 at 6441.

⁵⁷ *Id.*

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Id.* at 16–17.

⁶¹ *Id.* at 17.

⁶² *Id.* at 16.

population. The example recommendation provided based on the data for southern Georgia's rural populations were cooling shelters in these locations to assess if vulnerable communities have access to these during extreme heatwaves.⁶³

A BRACE analysis emphasizes the countless climate factors involved in creating a plan to protect vulnerable communities. Initiatives like BRACE transcend governmental levels to project and create adaptive management plans to address the complex and evolving issues of climate change. The CHA recognizes the importance of the CHP, the mobilization of partnerships, and the preparation that programs like BRACE provide to state and local governments. The bill proposes the continuation of CHP programs and increases funding to promote longevity.⁶⁴ In addition to continued funding, the purpose of the bill is to ensure that state and local health departments are informed of the climate change science that will affect their communities.⁶⁵ Further, those tools are created that will help build and expand their capacity to prepare for climate change and ensure that federal agencies are leaders in planning for climate change.⁶⁶

Capacity and adaptability are two of the key elements when it comes to successful planning and preparation. Continued focus on and the implementation of these factors will increase equity for vulnerable populations. The next section examines what is being done to continue to build capacity and adaptive responses and how the progress being made here will be incorporated into a comprehensive national plan.

BUILDING CAPACITY AND ADAPTABILITY

Capacity in terms of climate change is the ability to acquire data that is relevant to climate-related health risks, generate actionable information from that data, and use the

⁶³ *Id.* at 17.

⁶⁴ Climate Health and Protection Act, H.R. 3819, 116th Cong. § 317U (2019).

⁶⁵ *Id.* § 317U(a)(1).

⁶⁶ *Id.* § 317U(a)(2).

information to create effective population health interventions.⁶⁷ Legislation authorizing the development and implementation of a national plan is required to build capacity.⁶⁸ It is a key component to creating an effective national strategic action plan that can function effectively and accomplish goals efficiently.

Capacity is central to the CCHPP strategic action plan, focusing directly on assessing the capacity of the health system in the United States to identify gaps and determine how coordination and collaboration with other states, jurisdictions, federal agencies, and partners can help fill those gaps.⁶⁹ There are several tactics to develop the required capacity, including; sources of surveillance and monitoring; information systems to gather and analyze data; tools to design, implement, and evaluate population health adaptation interventions; partnerships with other government agencies and private sector organizations; extensive communication channels; supportive legal authority and financial resources; and a workforce skilled in applying these elements.⁷⁰

Partnerships across governmental and non-governmental agencies will be fundamental to build strategic systems that will increase capacity and authority.⁷¹ The strategic plan laid out by the CCHPP instructs the Secretary of HHS to consult with a host of federal agencies, such as the Director of the CDC, the Administrator of the EPA, and the Secretary of Defense, when developing or making any revisions to the national plan.⁷² In addition to the overall strategic national plan, CCHPP specifically directs the HHS Secretary to coordinate with the Director of the CDC and other related federal agencies to

⁶⁷ Anthony D. Moulton, *Legal Authority and State Public Health Response to Climate Change*, 108 AM. J. PUB. HEALTH S109 (2018).

⁶⁸ *Id.*

⁶⁹ *Id.* at S109–10.

⁷⁰ *Id.*

⁷¹ *Id.*

⁷² Climate Change Health Protection and Promotion Act of 2019, H.R. 1243, 116th Cong. § 4(a)(2)(A)–(B) (2019).

establish a climate and health program.⁷³ Many of these Federal agencies already have plans in place that address climate change or health within their particular sphere. The CCHPP climate and health program will not create all new systems; it will leverage the systems and organizations in place to achieve its goals. The CCHPP orders the HHS Secretary and other Federal agencies to continue administering public health programs and initiatives authorized by laws other than the CCHPP in a manner designed to achieve the goals of the national strategic plan and the climate and health program.⁷⁴

The plan includes many of the elements that the CDC already employs in its CHP, such as tracking data on environmental conditions, identifying at-risk populations, communicating health-related aspects of climate change with public health professionals and decisionmakers, and developing partnerships with other government agencies, universities, and non-governmental organizations.⁷⁵ The CDC's CHP offers a prime example of how partnerships have been successfully created between federal government agencies and state governments. A review of the CDC's CHP ten-year anniversary indicated encouraging developments in (i) coordination across different levels of government on health monitoring, diagnosis, and policy implementation, (ii) coordination of public health with non-health sectors (iii) partnerships with private and non-governmental organizations to implement programs to achieve specific health outcomes.⁷⁶

As mentioned in Part I, through its grant program, BRACE has been deployed in 18 public health agencies through the Climate-Ready States and Cities Initiative cooperative grant program.⁷⁷ However, CHP partnerships extend beyond health

⁷³ *Id.* at § 4(b)(3)(A)–(K).

⁷⁴ *Id.* at § 4(d)(2).

⁷⁵ *Id.* at § 4(b)(3).

⁷⁶ Fox et al., *supra* note 32, at 3240.

⁷⁷ Marinucci et al., *supra* note 10, at 6435.

departments, collaborating with other federal agencies, non-governmental organizations, and international governments on various projects to continue promoting innovative projects and effective use of federal agencies.⁷⁸ The CDC's Building Capacity of the Public Health System to Improve Population Health through National, Nonprofit Organization program is one example.⁷⁹ The program facilitates partnerships with non-profit organizations on the state, local, and tribal level to promote the effective use of public health resources.⁸⁰

The CCHPP also addresses developing partnerships with other government agencies and organizations to more effectively address the domestic health aspects of climate change.⁸¹ Public health law has increasingly focused on the disparities within public health, especially the issue of drawing a line between public and private and the widening gap between those with resources and those without.⁸² Current initiatives and legislative proposals are designed to achieve equitable adaptation and further climate justice. Climate justice has become a defining role of public health law, spurred by evidence that public health disparities show that socioeconomically advantaged people live longer, healthier lives.⁸³

The CCHPP specifically includes strategic response plans to identify and support more vulnerable populations, like children, infants, the disabled, low-income populations,

⁷⁸ *Climate and Health: Partners*, CTRS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/climateandhealth/partners.htm> (last reviewed Sept. 9, 2019).

⁷⁹ CTRS. FOR DISEASE CONTROL & PREVENTION, BUILDING CAPACITY OF THE PUBLIC HEALTH SYSTEM TO IMPROVE POPULATION HEALTH THROUGH NATIONAL, NONPROFIT ORGANIZATION, https://www.cdc.gov/publichealthgateway/docs/foa/ot13-1302_initiative_overview_2pg.pdf (last visited Aug. 31, 2020).

⁸⁰ *Id.*

⁸¹ Climate Change Health Protection and Promotion Act of 2019, H.R. 1243, 116th Cong. § 4(b)(3)(G) (2019).

⁸² Wiley, *supra* note 2, at 500.

⁸³ *Id.* at 497.

the homeless, pregnant women, and those with pre-existing illnesses.⁸⁴ The plan then assesses health system capacity by identifying and prioritizing communities and populations that are most susceptible to the impacts of climate change, improving health equity through increased efforts to prepare and respond to climate change.⁸⁵ Many well-established organizations already exist. Increasing coordination and information between new and existing organizations focused on vulnerable communities and populations will improve capacity and continue to generate health equity. One example is the NAACP's Environmental and Climate Justice Program, which recognizes the disproportionate impact of climate change on communities of color and works to support community leadership to address environmental justice as both a human and civil rights issue.⁸⁶

President Bill Clinton's 1994 Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations*, is an example of an initiative within the government that specifically focuses on vulnerable populations.⁸⁷ The executive order created an Interagency Working Group on Environmental Justice to coordinate and advance environmental justice principles across the federal government.⁸⁸ The executive order continues to encourage the strengthening of community partnerships to organize adaptation measures to reduce the effects of climate change at a local level.⁸⁹ By promoting community-driven partnerships with academic and research organizations, the executive order hopes to address problems that are important to

⁸⁴ H.R. 1243 § 2(b)(5)(B)(iii).

⁸⁵ *Id.* at § 4(b)(2)(A)–(E).

⁸⁶ *Environmental & Climate Justice*, NAACP, <https://www.naacp.org/issues/environmental-justice/> (last visited Jan. 10, 2021).

⁸⁷ Exec. Order No. 12898, 59 Fed. Reg. 7629 (Feb. 16, 1994).

⁸⁸ *Id.* at § 1-101.

⁸⁹ *Environmental Justice Working Group Priority Areas of Focus, 2015-2016*, U.S. DEP'T HEALTH & HUM. SERVS., <https://www.hhs.gov/environmental-justice/environmental-justice-working-group-priority-area-of-focus> (last reviewed Nov. 20, 2020).

communities and build capacity among community members to help monitor, identify, mitigate, and respond to environmental emergencies.⁹⁰

The Ruiz-Booker Environmental Justice Act of 2019 would codify and expand this executive order into law, protecting it from being revoked by future Presidents.⁹¹ The bill would strengthen the Executive Order by creating more opportunities for the public to participate and requiring agencies to annually implement and update strategies to address negative environmental and health impacts on low-income and minority communities.⁹² The Ruiz-Booker Environmental Justice Act would strengthen requirements for agencies to develop comprehensive environmental justice strategies through transparent and inclusive processes.⁹³

Data is needed to build effective capacity. Timely research is necessary in order to accurately understand, predict, and prevent climate impacts on human health. The CCHPP calls for the establishment of academic and regional centers of excellence,⁹⁴ the creation of a science advisory board,⁹⁵ and partnerships with universities and academic institutions to provide the information necessary to prepare for and address climate change.⁹⁶ The University of Notre Dame's Global Adaptation Initiative (ND-GAIN) is an excellent example of the type of academic partnership that will build capacity. ND-GAIN has created effective partnerships with governmental agencies, organizations, NGOs, private sector entities, and universities.⁹⁷

⁹⁰ *Id.*

⁹¹ Environmental Justice Act of 2019, S. 2236, 116th Cong. (2019).

⁹² *Booker, Ruiz Introduce Landmark Environmental Justice Bill*, CORY BOOKER (Oct. 24, 2017), <https://www.booker.senate.gov/news/press/booker-ruiz-introduce-landmark-environmental-justice-bill>.

⁹³ H. SELECT COMM. CLIMATE CRISIS, *supra* note 6, at 304.

⁹⁴ Climate Change Health Protection and Promotion Act of 2019, H.R. 1243, 116th Cong. H.R. 1243 § 4(b)(2)(G) (2019).

⁹⁵ *Id.* at § 5.

⁹⁶ *Id.* at § 4(b)(3)(G).

⁹⁷ NOTRE DAME GLOB. ADAPTATION INITIATIVE, ND-GAIN RECENT ENGAGEMENT, https://gain.nd.edu/assets/256486/nd_gain_engagement_2017.pdf (revised Nov. 2017).

ND-GAIN's mission is to motivate communities to form social, physical, and natural systems focused on saving lives, preserving the environment, and strengthening market and policy positions.⁹⁸ The program helps private and public sectors prioritize climate adaptation to lower risk and enhance readiness.⁹⁹ Similar to BRACE, the Urban Adaptation Assessments conducted by ND-GAIN provide 278 cities in the United States with large datasets that help city leaders make informed decisions to plan and prepare for the potential hazards and risks unique to their community.¹⁰⁰

The National Institute of Environmental Health Sciences (NIEHS) conducts research focused on mitigating and adapting to the effects of climate change on human health.¹⁰¹ The NIEHS Climate Change and Human Health program, an ongoing research program, is aimed at understanding the health impacts of climate change and how the strategies being used to adapt to or lessen climate change might adversely affect health.¹⁰² The NIEHS also offers the Climate Change and Human Health Literacy Portal, which serves as a knowledge management tool for locating the most relevant scientific literature on the health implications of climate change.¹⁰³

The final section of the CCHPP requires that the Secretary of the HHS enter into an agreement with the National Academies of Sciences, Engineering, and Medicine (NASEM).¹⁰⁴ NASEM was created to provide independent, objective advice to inform

⁹⁸ *ND-GAIN: About*, NOTRE DAME GLOB. ADAPTATION INITIATIVE, <https://gain.nd.edu/about/> (last visited Aug. 26, 2020).

⁹⁹ *Id.*

¹⁰⁰ *Urban Adaptation Assessment*, NOTRE DAME GLOB. ADAPTATION INITIATIVE, <https://gain-uaa.nd.edu/?referrer=gain.nd.edu> (last updated Mar. 4, 2019).

¹⁰¹ *Climate Change*, NAT'L INST. ENVTL. HEALTH SCI., www.niehs.nih.gov/health/topics/agents/climate-change/index.cfm (last reviewed July 17, 2020).

¹⁰² *Id.*

¹⁰³ *Id.*

¹⁰⁴ Climate Change Health Protection and Promotion Act of 2019, H.R. 1243, 116th Cong. § 6(a) (2019).

policy.¹⁰⁵ The CCHPP agreement will require NASEM to prepare periodic reports that will help public health and health care professionals prepare and respond to health threats by reviewing scientific developments and recommending adjustments to the CCHPP and the CHP.¹⁰⁶ The inclusion of this final section reiterates the importance of funding research, climate education, and streamlining communication to proactively inform and guide lawmakers. This research will lead to more effective early warning systems and greater public awareness of climate-related health risks to individuals or communities, which should translate into more successful mitigation and adaptation strategies.¹⁰⁷

The CCHPP requires reassessment and revision every four years to identify areas of improvement and incorporate new findings and research to continue effectively addressing issues as they evolve.¹⁰⁸ The CCHPP requirement that the Secretary consult with the other federal agencies before updates are made will ensure that modifications are considered from all angles. Consistent evaluation and reassessment of the national plan will allow HHS to monitor progression, reassess policy goals and objectives, and adjust systems to ensure the plan is operating effectively.

The plan will need to be both agile and durable enough to adapt to climate factors that are progressing at different rates. Adaptive management processes are informed by a new scientific understanding of where and in what manner climate disruptions are likely to occur, creating the opportunity for local jurisdictions to plan and prepare.¹⁰⁹ Coordinated responses are at the core of effective adaptive climate change management. Adaptive

¹⁰⁵ *About US*, NAT'L ACAD. SCI. ENG'G & MED., <https://www.nationalacademies.org/about> (last visited Aug. 30, 2020).

¹⁰⁶ Climate Change Health Protection and Promotion Act of 2019, H.R. 1243, 116th Cong. § 6(a)(1)–(2) (2019).

¹⁰⁷ Portier et al., *supra* note 1, at 4.

¹⁰⁸ H.R. 1243 § 6(a)(1)–(2).

¹⁰⁹ Elizabeth Burleson, *Energy Revolution and Disaster Response in the Face of Climate Change*, 22 VILL. ENVTL. L.J. 169, 173 (2011).

management will require the review of vulnerability assessments and climate research to pinpoint where in the national plans preparedness and resilience can be improved. If incorporated effectively, adaptation will limit damages, provide recovery opportunities, and enhance relief from consequences.¹¹⁰ State and local governments have implemented climate action plans to reduce the adverse health effects at a local level. Many state and local governments have started adapting their city planning to reprioritize climate change. For example, Grand Rapids, Michigan, is addressing various climate-related threats such as extreme heat and more intense precipitation by investing over \$240 million in their sewer separation system to maintain the quality of their water supply.¹¹¹

The City of Chicago provides another example of local adaptation. By forecasting hotter and wetter conditions, the city has taken steps to adapt by planting trees that can tolerate warmer conditions and paving alleyways with permeable materials to handle greater rainfall and reduce flood risks.¹¹² Chicago also requires light-colored reflective roofs, while New York offers tax abatement incentives to property owners that use green roofing.¹¹³ States and localities have also started implementing hazard-specific technology such as geospatial mapping into their city planning. San Francisco's health department provides a good example, as their heat vulnerability index identifies and maps six factors that are responsible for 70% variability at risk of heat-related illness.¹¹⁴

Embracing and incorporating technology is an essential part of adaptation. Improving communication is crucial to an effective plan. Therefore embracing new forms of monitoring and evaluation is important. Utilizing cell phones and social media are great

¹¹⁰ Manangan et al., *supra* note 31, at 5.

¹¹¹ CLIMATE CHANGE ADAPTATION TASK FORCE, *supra* note 18, at 3.

¹¹² *Id.* at 4.

¹¹³ Burleson, *supra* note 109, at 181–82.

¹¹⁴ Fox et al., *supra* note 32, at 3237.

examples of adapting to new forms of technology that can provide information and warnings before, during, and after a storm.¹¹⁵ Monitoring “Likes” and “Dislikes” can provide further insight into implementation, effectiveness, and sentiment.¹¹⁶ In fact, researchers found that Twitter data was a more effective means of predicting the location and severity of the storm than models that had been created by the Federal Emergency Management Agency (FEMA).¹¹⁷ Examples like these illustrate how adaptability is also helping increase capacity. Climate change is progressing at different rates and levels of severity, making adaptive management crucial to develop a framework that can be adjusted to address issues as they evolve, efficiently shifting from one priority to another to ensure the needs of as many people as possible are met.

PART III

DISASTER PREPAREDNESS AND RESPONSE

Across the globe, the number of weather-related natural disasters has more than tripled since the 1960s, resulting in over 60,000 annual deaths.¹¹⁸ Climate change projections show that increases in the occurrence and severity of natural disasters will continue.¹¹⁹ A health assessment conducted by the U.S. Global Change Research Program found that health impacts associated with climate-related changes in exposure to extreme events include death, injury, or illness; exacerbation of underlying medical conditions; and adverse effects on mental health.¹²⁰

¹¹⁵ James D. Ford et al., *Big Data has Big Potential for Applications to Climate Change Adaptation*, 113 PROC. NAT’L ACAD. SCI. 10729, 10730 (2016).

¹¹⁶ *Id.*

¹¹⁷ *Id.*

¹¹⁸ WHO, *supra* note 17.

¹¹⁹ ALLISON CRIMMINS ET AL., U.S. GLOB. CHANGE RES. PROGRAM, THE IMPACTS OF CLIMATE CHANGE ON HUMAN HEALTH IN THE UNITED STATES: A SCIENTIFIC ASSESSMENT 10 (Apr. 2016), https://health2016.globalchange.gov/high/ClimateHealth2016_FullReport.pdf

¹²⁰ *Id.* at 11.

In some regions of the United States, climate change will increase exposure risk due to projected increases in the frequency and/or intensity of drought, wildfires, and flooding related to extreme precipitation and hurricanes.¹²¹ In addition to weather-related natural disasters, scientific evidence confirms that rising temperatures can lead to increased transmission of diseases through direct action on infectious agents. Examples include the increased development of malarial parasites in mosquitoes due to hotter temperatures or the effects on vectors like an increased geographic range and longer active seasons for mosquitoes.¹²² Rising temperatures can also cause changes in the behavior of certain animal hosts, such as a shift in the migratory pattern of birds, which will also have an effect on the spread of infectious disease.¹²³

These impacts are hitting low-income households, farmers, and traditionally marginalized communities hardest, driving a downward trend in livability and social resilience.¹²⁴ Emergency and disaster scenarios consistently highlight health and preparedness disparities because they have the potential to cause major disruption and dislocation to disadvantaged populations. Past experiences have illustrated that vulnerable populations and communities are affected by severe weather and natural disasters more acutely and often with more devastating and longer-lasting effects.¹²⁵

Often it is the urban populations that lack the resources required to cope with such disruptions, and coincidentally are the populations that are more likely to suffer from underlying medical conditions such as heart disease or diabetes that make these disruptions

¹²¹ *Id.*

¹²² Daniela Curseu et al., *Potential Impact of Climate Change on Pandemic Influenza Risk*, NATURE PUB. HEALTH EMERGENCY COLLECTION 643–44 (2009).

¹²³ *Id.* at 644.

¹²⁴ H. SELECT COMM. CLIMATE CRISIS, *supra* note 6, at 12.

¹²⁵ Keith Pezzoli et al., *The NIEHS Environmental Health Sciences Data Resource Portal: Placing Advanced Technologies in Service to Vulnerable Communities*, 115 ENVTL. HEALTH PERSP. 564, 565 (2007).

even more dangerous.¹²⁶ One example is the Lower Ninth Ward, a poverty-stricken area of New Orleans, which was devastated after Hurricane Katrina, and roughly fifteen years later, it has yet to fully recover.¹²⁷ Wake up calls like Hurricanes Katrina and Maria emphasize the need for a national strategic plan to ensure there are action plans in place for preparedness and response.

A comprehensive national plan will address both the long and short-term health impacts of climate change, namely incorporating strategies to improve preparedness and response to extreme weather and public health emergencies. The CCHPP plan requires HHS to take a series of actions to address the potential impacts of climate change on public health by calling for the development of a national plan and program to help health professionals and health care systems prepare for and respond to the public health effects of climate change.¹²⁸ The CCHPP will accomplish this by identifying health causes and impacts as well as the future trajectory of climate change health threats.¹²⁹

An effective national plan will incorporate the Pandemic and All-Hazards Preparedness and Advancing Innovation Act of 2019 (Preparedness Act) and the HHS Office of the Assistant Secretary for Preparedness Response (ASPR). Established in 2006 as part of the response to the aftermath of Hurricane Katrina, the Preparedness Act increased the authorization for new public health and medical preparedness programs for regional health care preparedness and enhanced military and civilian partnerships.¹³⁰

¹²⁶ Wiley, *supra* note 2, at 495.

¹²⁷ *Id.*

¹²⁸ H. SELECT COMM. CLIMATE CRISIS, *supra* note 6, at 315.

¹²⁹ Moulton, *supra* note 67, at S109.

¹³⁰ *Pandemic and All-Hazards Preparedness and Advancing Innovation Act*, U.S. DEP'T HEALTH & HUM. SERVS., <https://www.phe.gov/Preparedness/legal/pahpa/Pages/pahpaia.aspx> (last reviewed Sept. 27, 2019).

The ASPR was created as part of the Preparedness Act to lead federal efforts on preparedness and response for public health emergencies.¹³¹ The ASPR National Health Security Strategy (2019-22) provides a high-level strategy for coordinating around emerging public health threats, including climate-related disasters.¹³² The ASPR manages three programs that focus on public health and the medical sectors, including the Regional Disaster Health Response System, the Hospital Preparedness Program, and the Critical Infrastructure Program.¹³³

The Regional Disaster Health Response System ensures that healthcare systems are ready to respond to large-scale emergencies by establishing a network of state-level clinical response assets with the goal to improve organization and coordination, improve situational awareness, increase healthcare coalition participation, and identify and further develop highly specialized clinical capabilities.¹³⁴ Eight-five percent of hospitals are part of the ASPR's Hospital Preparedness Program.¹³⁵ The Hospital Preparedness Program promotes a consistent national focus toward improving health care during emergencies and disasters and enabling rapid recovery.¹³⁶ It is the only source of federal funding for health care system readiness.¹³⁷ The Critical Infrastructure Program focuses on strengthening medical

¹³¹ H. SELECT COMM. CLIMATE CRISIS, *supra* note 6, at 314.

¹³² *See generally* ASSISTANT SEC. FOR PREPAREDNESS RESPONSE, NATIONAL HEALTH SECURITY STRATEGY 2019-2022, <https://www.phe.gov/Preparedness/planning/authority/nhss/Documents/NHSS-Strategy-508.pdf> (last visited Jan. 10, 2021).

¹³³ *Public Health Emergency*, U.S. DEP'T HEALTH & HUM. SERVS., <https://www.phe.gov/about/pages/default.aspx> (last reviewed Jan. 8, 2021).

¹³⁴ *Regional Disaster Health Response System: An Overview*, U.S. DEP'T HEALTH & HUM. SERVS., <https://www.phe.gov/Preparedness/planning/RDHRS/Pages/rdhrs-overview.aspx> (last reviewed Oct. 5, 2020).

¹³⁵ *Hospital Preparedness Program (HPP)*, U.S. DEP'T HEALTH & HUM. SERVS., <https://www.phe.gov/Preparedness/planning/hpp/Pages/default.aspx> (last reviewed Dec. 21, 2020).

¹³⁶ *Id.*

¹³⁷ *Id.*

infrastructure during emergencies and natural disasters by building partnerships between the health care and public health sectors and the private sector.¹³⁸

The Preparedness Act expanded eligible uses of the Public Health Emergency Fund (PHEF), a rapid response fund available for use by ASPR following disasters and public emergencies.¹³⁹ These funds were expanded to include support for coordination among federal and State, Local, Territorial, and Tribal (SLTT) entities for rapid response to public health emergencies.¹⁴⁰ The Preparedness Act also enabled the HHS Secretary to use the PHEF to support activation of the National Disaster Medical System and the Medical Reserve Corps, which are teams of medical professionals and civilian volunteers, respectively, who can provide supplementary medical assistance to SLTT health authorities following disasters.¹⁴¹

Incorporating the Preparedness Act and the ASPR in the CCHPP will be essential to continue developing preparedness and response strategies for natural disasters and health emergencies that are increasing in both frequency and severity. Current events have emphasized how important it is to have solid plans in place that move quickly and effectively to protect the health of the people in the United States.

CONCLUSION

The health consequences of climate change are real. The United States cannot wait to take these progressive measures to protect the health of our country. A cohesive national plan will ensure the country is on the right track. The CHA will continue to assist local and

¹³⁸ *What is Healthcare and Public Health Sector Critical Infrastructure Protection?*, U.S. DEP'T HEALTH & HUM. SERVS., <https://www.phe.gov/Preparedness/planning/cip/Pages/about.aspx> (last reviewed Feb. 8, 2018).

¹³⁹ Pandemic and All-Hazards Preparedness and Advancing Innovation Act, Pub. L. No. 116-22, § 206, 133 Stat. 905, 925–26 (2019).

¹⁴⁰ *Id.* § 207, 133 Stat. 905, 926–27 (2019).

¹⁴¹ *Id.*

state jurisdictions in creating action plans to address the unique threats to vulnerable populations. The CCHPP provides a roadmap for Congress to create a comprehensive national plan that is needed to identify and assess vulnerable populations, build capacity, advance research, and streamline and coordinate the many working parts that will be critical to combat the health threats of climate change.