Where, How, and How Much Climate Change Is Impacting the Health of Communities: Regional Assessment of the United States for the Climate Communities Network—Summary

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Introduction. Climate hazards have significant health effects and contribute to health inequities. The authors of this piece examine the impact of climate change on health in the United States and how it intensifies climate-related health inequities. By synthesizing the latest research, national data, and current climate strategies, the authors aim to provide the National Academy of Medicine's (NAM) Climate Communities Network with a regional assessment of the United States, examining where, how, and to what degree climate change is impacting the health of communities in order to promote a clearer understanding for making informed decisions in collaboration with affected communities. The assessment explores the direct and indirect health effects of climate change, emphasizing its disproportionate impact across ten geographic regions in the United States: Northeast, Southeast, Midwest, Northern Great Plains, Southern Great Plains, Southwest, Northwest, Alaska, Hawaii, and the US Caribbean. Additionally, the authors assess how communities are developing strategies to mitigate and adapt to these impacts.

Five National Climate Assessments (NCAs) have been published using these ten geographic regions. The NCAs describe climate change and its effects on the United States, with a particular focus on human health. Over the various iterations of the NCA, progress has been made in developing a clear understanding of health impacts from climate change. The first NCA, published in 2000, acknowledged potential health effects but expressed high uncertainty. The fifth NCA, published in 2023, connects the challenges of climate change with current and historical social inequities with higher certainty.

Climate Impacts and Health Inequities. As climate change increases the frequency and severity of natural disasters, frontline populations face higher costs and limited accessibility to basic services such as housing and transportation, in addition to increased exposure to pollution and various environmental burdens. Climate change disproportionately impacts populations that experience occupational exposures, systemic and policy discrimination, structural racism, poverty, and other socioeconomic, historical, and political factors. This disproportionate impact emphasizes the convergence of environmental and climate justice issues that compound the challenges faced by communities.

Extreme weather events caused by climate change are increasing negative health impacts. Rising temperatures and longer heat waves kill as many as 1,200 people a year in the United States. Wildfires negatively affect air quality, severely impacting individuals with respiratory diseases. Hurricanes and other flooding events cause health impacts beyond the initial dangers posed by fast-moving water. Increases in hot, humid air encourage mold growth, which poses dangers to respiratory health. Researchers are working to understand these rapidly evolving threats to human health.

Previous research has shown that climate hazards have significant health effects and exacerbate health inequities. Building on this prior knowledge, this assessment explores the experiences of populations most impacted by climate change across the ten regions identified by the NCAs, the direct and indirect effects of climate change on health, and the resulting health inequities.

Methodology. The authors conducted a literature review and population synthesis to identify populations disproportionately affected by climate change risks and health disparities across ten US regions. The review included gray and peer-reviewed literature, databases, and case studies to pinpoint strategies for mobilizing resources. A glossary of climate hazards was compiled, including heat, flooding, extreme temperatures, and other events. Populations studied include older adults, children, rural and urban populations, Asian American and Pacific Islander (AAPI) communities, Black communities, Latino/a/e/x and Hispanic communities, Caribbean American communities, Indigenous peoples, and low-income groups. The authors used search terms to gather relevant sources, assessing at least 25 for each group. Two sets of maps were created: one using The Centers for Disease Control and Prevention's Environmental Justice Index (EJI) and the other using geographic information systems and EJ mapping tools to provide a quantitative analysis of climate hazards and health inequities.

Results and Mapping Analysis. Major climate hazards and health impacts vary by region due to topographical and geological factors. Coastlines are at the greatest risk for coastal flooding, while the Northeast faces landslides, and the Midwest is prone to heat waves and strong winds. The Northwest is vulnerable to earthquakes, tsunamis, and volcanic activity, and the Northern Great Plains are prone to avalanches, cold waves, and winter weather. The Southeast is most at risk for hurricanes and tornadoes, and the Southern Great Plains face tornadoes and winter weather. The Southwest is susceptible to avalanches, heat waves, droughts, riverine flooding, earthquakes, and wildfires.

Climate hazards can drive or exacerbate both acute and chronic health conditions, and climate-related health impacts vary by region. For example, cancer and heart disease prevalence are evenly spread across all regions, while asthma, a condition that can be directly triggered by poor air quality/air pollution, is most prevalent in the Southeast, Northeast, and Northwest. High blood pressure, stroke, and high cholesterol are highest in the Southeast. Chronic obstructive pulmonary disease is most prevalent in the Northeast and Southeast, while diabetes is most common in the Southeast and Southern Great Plains. Depression is evenly spread across all regions, excluding the Northern Great Plains, where it is less prevalent. These health conditions can become worse or more difficult to manage in the face of climate hazards.

The authors used a novel Composite Environmental Justice (CEJ) score to identify the disproportionate impacts of climate hazards and related health inequities at multiple geographic levels, down to the census tract (small subdivision of a county or statistically equivalent entity, generally between 1,000-8,000 people). The CEJ score was created using Geographic Information System technology and existing public, reputable mapping tools and databases. It combines data across key domains, including socioeconomic and environmental justice indicators, and provides data on upstream drivers of climate change as well as mitigating and resilience factors. The numeric score ranges from 0.0-1.0, and the closer the score is to 1.0, the more impacted a community is. The average CEJ score for the contiguous United States is 0.50. The Midwest, Southwest, and Northeast have scores above the 50th percentile, while the Southern Great Plains, Southeast, Northwest, and Northern Great Plains are below this threshold. Illinois has the highest CEJ score at 0.68, and Maine has the lowest score at 0.22. Among U.S. census tracts, 16,702 scored above the 80th percentile, indicating high susceptibility to climate change hazards, mainly in Oklahoma, Illinois, Louisiana, Arkansas, Missouri, Indiana, and Washington, DC. Conversely, 16,785 census tracts scored below the 20th percentile, showing lower susceptibility, primarily in Texas, California, Florida, and Georgia.

The Midwest has the highest regional CEJ score of 0.56, with Illinois leading at 0.68, while the Southwest and Northeast follow with scores of 0.51 and 0.50, respectively. The Southern Great Plains, Southeast, Northwest, and Northern Great Plains have lower scores, with Nebraska leading the Northern Great Plains at 0.50 and Wyoming at the lowest at 0.27.

The data and maps indicate that the Midwest has the highest exposure to climate hazards, resulting in significant health disparities. The Southwest, Northeast, and Southern Great Plains also face disproportionate impacts, while the Northern Great Plains has the lowest exposure and health burdens related to climate change.

Populations Overview. Populations, including older adults, children, rural and urban populations, AAPI communities, Black communities, Latino/a/e/x and Hispanic communities, Caribbean American communities, Indigenous peoples, and low-income groups are disproportionately affected by climate risks and health disparities due to their unique social, behavioral, environmental, and institutional circumstances. The authors examine the specific factors that make these groups particularly vulnerable to climate-related health impacts and resulting disparities. They also address subpopulations that are often overlooked in existing literature on the health effects of climate change.

Maps and Case Studies. The CEJ score maps highlight the geographic distribution of climate-related health impacts, showing that these issues are unequally spread across populations. The authors indicate that communities across the United States are implementing various strategies to mitigate and adapt to climate change, such as developing climate action plans, working on preservation and restoration initiatives, and building capacity and resilience within their locales. Communities are addressing specific climate hazards, such as extreme heat, flooding, air quality, or drought, while also conducting vulnerability assessments. Notable initiatives include the Northern Manhattan Climate Action Plan, UPROSE Brooklyn, and RISE St. James, which address systemic inequalities and health disparities. Other efforts, like those by the Seabrook-Hamptons Estuary Alliance and the NAACP Gulfport coal plant, focus on local climate adaptation and resilience planning. Communities in Lycoming County, Pennsylvania, and Clear Lake City, Texas, are raising awareness of local climate issues and promoting resilient infrastructure. Additionally, Knoxville, Tennessee, is enhancing citizen awareness and preparedness by providing information on hazard prevention and response, leading to increased collaboration and better outcomes. In Oahu, Hawaii, efforts are underway to restore natural habitats to mitigate climate impacts, including policies for homes and beaches threatened by coastal erosion and the restoration of traditional agricultural practices in collaboration with The Nature Conservancy. Similarly, the Menominee Tribe in Wisconsin is focusing on ecological restoration while supporting local decision-making efforts.

Priority Actions. Authors suggest that the Climate Communities Network prioritize regions and populations most impacted by climate hazards and related health inequities. The data suggests the Midwest is the region with the highest burden, which means it should probably be a key focus for recruitment and qualitative assessments by the NAM. NAM and other organizations committed to addressing climate and health should also consider the challenges faced by specific impacted populations, including low-income households in rural areas, AAPI communities, Indigenous peoples, Latino/a/e/x communities, residents of Caribbean Small Island Developing States, undocumented individuals, and children and older adults in general. These groups are particularly susceptible to adverse climate impacts due to factors such as social marginalization, economic dependency on natural resources, and limited mobility.

Effective support for these priority regions and populations involves addressing communication barriers, investing in resilient infrastructure, and ensuring sustainable funding. Overcoming language and cultural barriers is essential for effectively disseminating important information about weather events and evacuation plans. Establishing platforms for community organization and technical assistance can also enhance engagement and resilience. Infrastructure improvements, particularly in Indigenous communities, and securing sustainable funding through grants and other means, are crucial for long-term impact. Involving community-based organizations in climate-resilience planning and using Environmental Justice Screening and Mapping tools can help identify and target the most vulnerable areas.

To effectively address climate issues, one must prioritize solutions that involve communities and promote innovation. Doing so requires carefully considering the experiences of those most impacted and co-developing strategies that promote growth and health. Progress could be measured using indicators related to both socioeconomic factors and climate justice. Additionally, regional crisis teams should be created to respond most readily and effectively to environmental health hazards, particularly in vulnerable communities. Methods proven effective in certain communities should be prioritized for implementation in other communities to help alleviate adverse environmental effects as quickly as possible.

Discussion. This assessment provides an in-depth examination of how communities that are most affected by climate change across the ten NCA5 regions are working to mitigate, adapt to, and build resilience against its impacts. By reviewing a variety of sources, this work underscores the collaborative efforts of these communities to create strategies for managing health risks associated with climate change. Despite significant advancements, many of these communities remain vulnerable to health threats posed by climate hazards, reinforcing the existing evidence of the disproportionate effects of climate change.

The authors suggest that the NAM enhance its recruitment efforts for the Climate Communities Network especially in regions facing the highest levels of risk. They also stress the need to adopt new conceptual frameworks and conduct qualitative assessments to better understand the factors that increase climate change risks for the most impacted communities.

In summary, the assessment highlights the critical role of the NAM Climate Communities Network in focusing on promotion and recruitment in the most vulnerable areas, emphasizing that this combined approach is necessary to effectively reduce the health impacts of climate change on these disproportionately affected communities.