NIH Health and Extreme Weather Program Strategic Framework

Protecting Health During Extreme Weather and Natural Disasters

National Institutes of Health

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NIH Health and Extreme Weather Program Strategic Framework

Extreme weather threatens the health of all people. The National Institutes of Health (NIH) is well-positioned to support research addressing the threats to **human health posed by extreme weather, including weather-related natural disasters and emerging weather-related harms, given the agency's broad scientific expertise.** This Strategic Framework presents the mission, goals, and objectives of the NIH Health and Extreme Weather (HEW) Program, as well as high priority scientific approaches. A product of the NIH HEW Executive and Steering Committees, this framework includes input from NIH Institute and Center (IC) directors, program staff, and scientists.

The framework is intended to guide NIH's short- and medium-term investments by providing concepts and examples of research that would generate scientific knowledge and innovations to address the most critical risks to human health across the lifespan that are associated with extreme weather.

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A Duty to Protect and Improve Human Health

The NIH is part of the U.S. Department of Health and Human Services (HHS). HHS works to enhance the health and well-being of all people by advancing the science underlying medicine, public health, and social services. HHS has been charged to develop solutions that address chronic diseases, protect access to healthy food, eliminate harm from chemicals in our environment, protect younger generations for a prosperous future, and reduce morbidity and mortality from preventable health threats.

NIH, as the nation's and the world's premier biomedical research agency, has a critical role in supporting research into solutions to protect human health from extreme weather, including weather-related natural disasters and emerging weather-related harms. Extreme weather events especially threaten the health and well-being of children, older adults, people with underlying conditions, pregnant women, outdoor workers, those in rural areas, and others who have less access to resources.

The NIH HEW Program aims to support research to increase our understanding of how these extreme weather events and conditions impact human health and to develop interventions and prevention strategies that protect communities and those at heightened risk for harm.

The Issue and Its Importance: What We Know

It is difficult to predict extreme weather events and weather-related natural disasters. Despite their unpredictability, extreme weather events reliably and repeatedly cause death and disability, damage critical infrastructure, degrade water quality, strain economies, and burden communities. Where health is concerned, research shows that these events not only cause acute injuries, but also contribute to a wide range of illnesses, including: asthma,[1] respiratory allergies and airway diseases,[2] cancers,[3] cardiovascular disease and stroke,[4] foodborne diseases,[5] malnutrition,[6] heat-related illness and deaths,[7] adverse birth and child development outcomes,[8] neurological and mental health disorders,[9] vector-borne and zoonotic diseases,[10] and waterborne diseases.[11] Extreme weather is also associated with increased mortality, increased health care expenditures, and prolonged hospitalizations.[12] The severity, irregularity, and variability of weather and environmental conditions will continue to put human health at risk.[13]

NIH has been a leader in this field, funding important studies that examine associations between extreme weather, weather-related natural disasters, and health outcomes across the lifespan and world, including:

Emergency Respiratory Hospitalizations Among Older Adults: Older adults are more likely to experience emergency respiratory hospitalizations on the same day as extreme outdoor heat events. Using data on 12.5 million Medicare beneficiaries across the U.S., researchers found a nearly 5% increase in emergency hospitalizations with each 10-degree Fahrenheit increase in temperature.[2,14]

Stress and Cancer: Researchers are examining the impact of physical and mental stress from Hurricane Maria on hypothalamic-pituitary-adrenal axis functioning, which is known to affect cancer development. They are comparing persons with and without cancer who experienced the hurricane to better understand underlying disease mechanisms.[15]

Kidney Disease Among U.S. Veterans: Chronic exposure to ambient heat may contribute to the development and progression of kidney disease. Using data on U.S. veterans and meteorological variables, researchers are clarifying the underlying mechanisms involved in kidney disease to inform adaptation strategies to protect kidney health.[16]

Cardiovascular Disease Risk: To estimate the cardiovascular disease burden attributable to wildfire smoke, researchers are using chemical transport models and machine learning to understand risks under different wildfire scenarios. Their approach will inform effective emergency response measures to protect cardiovascular health.[17]

Children's Respiratory Health: Children chronically exposed to wind-blown particulate matter from the drying Salton Sea in California were more likely to experience respiratory effects, such as bronchitis symptoms and wheezing.[18] Researchers are studying how these symptoms may worsen as the wind continues to spread metals, pesticides, and other harmful contaminants.[19,20]

Cardiometabolic Health: After Hurricane Maria, people living in Puerto Rico had a higher prevalence of unhealthy behaviors, including consuming alcohol and being sedentary, and chronic health conditions, such as abdominal obesity and hypertension, compared to before the hurricane.[21,22]

Disrupting Diabetes Treatment: Researchers are investigating the short- and long-term effects of Hurricane Katrina on older adults in Louisiana with diabetes. Many study participants reported forgoing their typical treatments and prescribed diets following the hurricane, leading to increased hospitalizations and complications from a lack of routine care.[23-25]

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Contributing to Autism Spectrum Disorder: Exposure to wildfire particulate matter during pregnancy may contribute to autism spectrum disorder in children by triggering maternal allergic asthma and immune responses.[26-28]

Harming Maternal Health and Birth Outcomes: Exposure to extreme weather during pregnancy may confer additional health risks. Researchers are linking exposure to Hurricanes Maria and Irma during pregnancy with preeclampsia, gestational diabetes, preterm birth, low birth weight, size for gestational age, and fetal death.[29]

Short- and Long-term Impacts on Children's Health: Researchers are examining the relationship between exposure to extreme heat and heavy rainfall on a range of health effects in children. They are evaluating short-term effects, including dehydration, asthma exacerbation, respiratory infections, acute gastroenteritis, injuries, and acute care for mental health disorders, as well as chronic health conditions, such as asthma, allergic rhinitis, overweight/obesity, and mental health disorders.[30]

Children's Mental Health: Researchers are building an empirical knowledgebase of which factors cause children to differ in their trajectories of post-traumatic stress symptoms. Results from this work may inform approaches to better identify those most susceptible to long-term distress after disasters.[31]

Vector-borne Diseases: By studying arbovirus transmission and mitigation strategies in Indonesia, researchers are working to inform measures that can be applied to protect health in the U.S., particularly in locations that are more susceptible to arbovirus-transmitting mosquitoes now and in the future.[32]

Hypoglycemia in Insulin Users: Researchers measured the associations between heat and hypoglycemia-related hospital visits in older adults with diabetes from the U.S. and Taiwan, finding that higher ambient temperature was associated with increased hospital visits.[33,34]

Extreme Weather: Unexpected, unusual, unpredictable, severe, or unseasonal weather; typically defined as occurring in the highest and lowest 5% of the historical distribution of similar weather parameters. The HEW Program focuses on extremes in temperature, precipitation, humidity, wind velocity, etc.

Interactions with Medication: Researchers discovered a synergistic effect between exposure to fine particulate matter in wildfire smoke and corticosteroid use on hospitalization and mortality in older adults. The combined exposure resulted in increased hospitalizations for cardiovascular thromboembolic events.[34,35]

School Enrollment and Education: By evaluating the education records of millions of children across 13 countries that experienced tropical cyclones between 1954 and 2010, researchers found that children who lived in areas exposed to such storms during preschool age were less likely to enroll in school than other children. They also observed stronger negative effects on school enrollment with stronger storms.[36,37]

Food Security and Nutrition: Researchers found that low rainfall and cool temperatures were negatively associated with food security and dietary diversity in low- and middle-income countries. They attributed reduced food security to reduced agricultural production and increased food prices.[38,39]

Reversing Damage with Nutrition: Researchers identified how healthy nutrition, specifically omega-3 fatty acids found in fish oil, can protect against lung damage caused by ozone exposure, which is increasing as temperatures rise. In studies with mice, they determined that a diet supplemented with omega-3 fatty acids reduced ozone-induced lung damage and promoted healing, offering a promising strategy to protect people from air pollution-related lung disease.[40,41]

Community Engagement: Using a community-engaged research approach, researchers worked with tribal and community partners to conduct tabletop exercises, surveys (n=231), and interviews (n=65) on extreme heat, harmful algal blooms, health priorities, and resilience factors. Findings informed the development of the Lake County Roadmap to Resilience, which is now being used to guide the development and testing of community driven interventions that supports adaptation to identified extreme heat health stressors and offer insights into successful implementation and scalability.

In addition to the health impacts noted, weather-related natural disasters, such as hurricanes, floods, droughts, heat waves, and wildfires, often stimulate the movement of harmful chemicals throughout the environment,[42] increasing the amount of pollution to which people are exposed. Pollutants such as fine particulate matter and polycyclic aromatic hydrocarbons that may be spread during extreme weather events have been linked to depression, anxiety spectrum disorders, autism spectrum disorder, and schizophrenia.[43] Additionally, damage to buildings and facilities during extreme weather events may result in harmful industrial chemical spills,[44] cause housing conditions to deteriorate, and disrupt critical health care services,[12] further increasing the risk to human health across the lifespan. Extreme weather threatens clean water,[45] access to drinking water,[46] and water infrastructure.[47]

Furthermore, weather-related natural disasters can have long-term impacts on nutritional outcomes. Extreme weather and drought[48] have been shown to lower global macronutrient, micronutrient, and fiber supplies[49] through the disruption of crop production. Studies in the U.S. have demonstrated a connection between extreme weather and a decrease in overall nutritional food availability.[50] The lack of healthy foods can make people more susceptible to conditions like obesity, diabetes, cardiovascular disease, and malnutrition, and increase their risk of certain health issues that might be mitigated through a healthier diet. Extreme weather events have significant negative impacts on caloric intake, protein, zinc, vitamin A, and dietary variety,[51] which are all essential in healthy children. Nutritional supplements can be used to alleviate some of the physical and psychological stress[52] of individuals impacted by weather-related natural disasters, when access to essential vitamins and minerals is compromised.

Longstanding History of NIH Research on Extreme Weather

For decades, NIH has supported research on the health effects of weather-related natural disasters and extreme weather. **From 2010 to 2024, NIH funded nearly 240 projects** on topics such as the health impacts of wildfires, hurricanes, and extreme heat.

Weather-Related Threats to Nutrition and Food Security

Extreme weather can harm nutrition and health in a variety of ways. Researchers found that a large algal bloom on the Western U.S. coast during 2015 released potent neurotoxins into the water and resulted in major fishery closures[53] that decreased available seafood for a period of time. Droughts and flooding can also harm agriculture and damage food supply chains, lowering the availability of fresh, healthy food.[6] NIH-funded epidemiologists found that a lack of food access post-disaster negatively affected cardiometabolic health,[21] particularly among older adults and children with diabetes, and that the incidence of diabetes often rises following disasters.[54] Additional behavioral and social science research has demonstrated that adults whose homes were damaged from extreme weather shifted their diets to less healthy foods,[55] such as snacks, sweets, and alcoholic beverages due to social circumstances and the individual's mental well-being.

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Value of Global Research to the Health of the U.S.

Extreme weather outside the U.S. can have profound impacts on the health of Americans, underscoring the importance of global disaster research.

The U.S. benefits directly from comparative research into weather-related health impacts and adaptations around the world. Collaboration with global researchers is critical to strengthen the gold standard, interdisciplinary science that NIH is known for.

Environmental health is interconnected across borders, requiring proactive research and preparedness to effectively protect public health in the U.S. Extreme weather events, such as Canadian wildfires, have repeatedly sent smoke into the U.S., degrading air quality and increasing respiratory illnesses. The 2016 Zika virus outbreak, which began in Brazil and quickly spread across the Americas, required rapid research to understand the virus's link to birth defects. Even dust storms from the Sahara Desert can reach the southeastern U.S., worsening air quality and respiratory conditions. Americans travel, work, and live all around the world and are exposed to extreme weather beyond our borders. Environmental health is interconnected, which is why global research is so valuable to improving public health in the U.S.

The Need to Address Critical Gaps in Research

Research is an integral component of preparedness and response to protect health in the context of weather-related natural disasters and other extreme weather events. Although current studies highlight the acute harms of such weather-related events, little is known about their long-term and downstream effects and what can be done to prevent or ameliorate these harms moving forward. There are also gaps in the research into how extreme weather affects the health of some populations more than others. Rural populations,[56, 57] children and adults with chronic pre-existing medical conditions,[58] pregnant women,[59] newborns,[60] agricultural and other outdoor workers,[61] older adults,[62] military personnel and veterans,[63] first responders,[64] patients using electricity-dependent equipment,[65] communities that experience additional stressors, such as poverty,[66] limited access to health care,[67] or poor housing conditions,[68] and others may also experience disproportionate harm from weather-related hazards.

NIH's HEW Program aims to address these knowledge gaps, building on the decades of epidemiological, social, and environmental health U.S.-based and global research conducted at NIH and supported by the NIH ICs. With an emphasis on integrating multidisciplinary expertise — including epidemiology, exposomics, behavioral science, geosciences, nutrition research, longitudinal research, and other disciplines — this program represents a coordinated, NIH-wide effort that aligns with the NIH mission to seek fundamental knowledge about the nature and behavior of living systems and to apply that knowledge to enhance health, reduce illness and disability, and improve longevity and quality of life.

Addressing these knowledge gaps will provide information that can be used to inform prevention, preparedness, and intervention strategies to save lives and improve quality of life for those affected by extreme weather. Ultimately, research into how extreme weather exposure may lead to acute and chronic health effects will inform policy and help the federal government keep Americans healthy in the coming decades.

Research Gaps for HEW to Address

- Generating comprehensive exposure and health data for those impacted by extreme weather.
- Understanding how risks change across the lifespan.
- Identifying preparedness, prevention, and recovery strategies.
- Evaluating efficacy and effectiveness of interventions to protect health.
- Understanding the health impacts of extreme weather on populations at heightened risk for harm.

Monitoring and Evaluation

The NIH HEW Program will have a rigorous evaluation process with detailed metrics to determine the success of its activities in advancing fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability.

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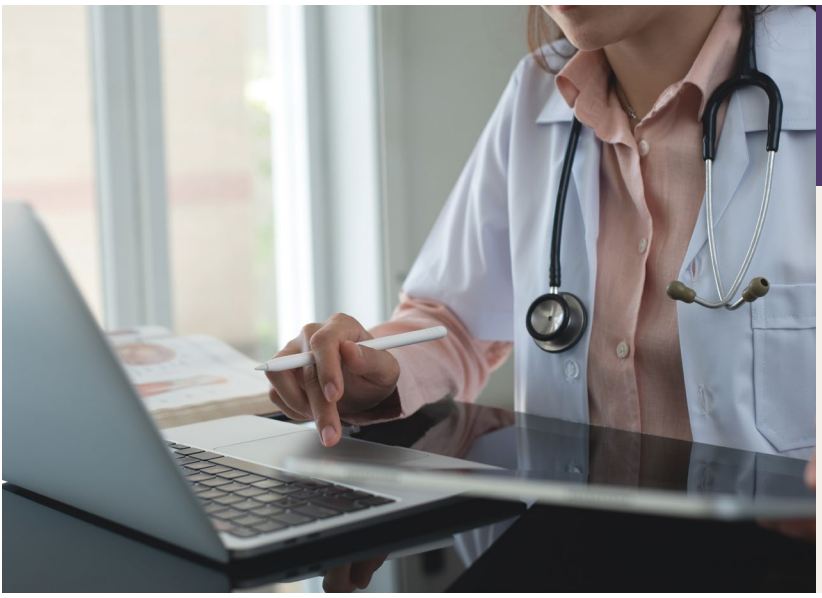
Mission Statement

The HEW Program **aims to understand and address the direct and indirect health impacts of extreme weather, including weather-related natural disasters and emerging weather-related harms.**

The overall purpose of this effort is to support critical health research, disseminate findings to the public, and catalyze interventions that promote health in the wake of extreme weather occurrences.



Prioritized Approaches to Achieve HEW Program Goals

- Connecting Health and Environmental Data
- Training and Capacity Building
- Community Engagement
- Research Translation
- Interventions and Preparedness
- Interdisciplinary Innovation and Collaboration

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Goals and Approaches

The following list outlines the goals for the NIH HEW Program.

GOAL 1: Understand health outcomes of exposures associated with extreme weather and weather-related natural disasters.

NIH will support evidence-based, innovative research that increases collective understanding of the health outcomes associated with exposure to extreme weather conditions and events. Researchers will utilize in vivo, in vitro, and in silico models to understand the mechanistic underpinnings of these health effects.

GOAL 2: Assess short- and long-term health risks across the lifespan and among populations at heightened risk for harm.

NIH will support research to examine short- and long-term health effects and risk factors associated with extreme weather and weather-related natural disasters across various stages in the lifespan, including the prenatal period, infancy, childhood, adolescence, adulthood, and older age. Populations of focus include, but are not limited to, children and adults with chronic pre-existing medical conditions, pregnant women, newborns, agricultural and other outdoor workers, older adults, military personnel and veterans, first responders, and patients using electricity-dependent equipment.

GOAL 3: Develop evidence-based interventions to reduce health impacts and improve quality of life.

NIH will support the translation of validated and unbiased research findings into practical solutions by designing, testing, evaluating, and disseminating interventions that can prevent or reduce the impacts of extreme weather and weather-related natural disasters on human health.

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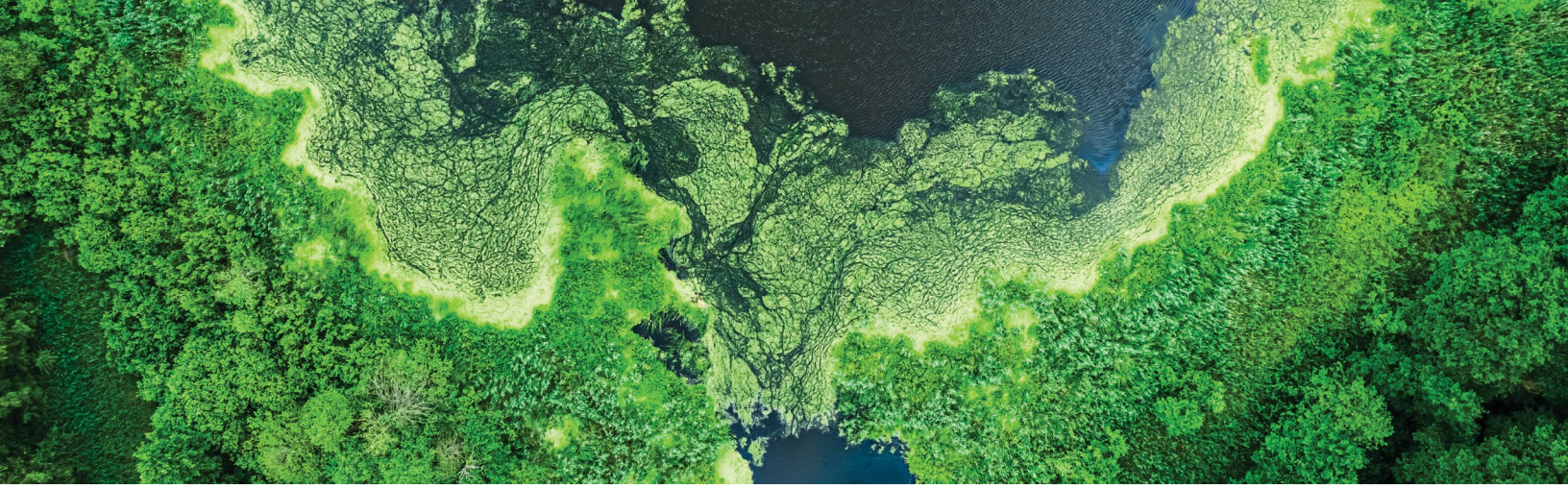
GOAL 4: Maintain an infrastructure that encourages community engagement, research connectivity, and data sharing.

NIH will provide an infrastructure that enables the conduct, methodology, instrumentation, training, and coordination necessary for informative, rigorous, and replicable research. This infrastructure will include aggregated health and environmental data from a variety of sources and their provision in accessible formats that allow for integration, replication, and further analysis. NIH-funded researchers will meaningfully engage with affected communities in the conceptualization and conduct of their studies and will transparently share data with study participants and the larger research community.

GOAL 5: Provide training and build capacity of researchers in various disciplines.

NIH will provide opportunities for researchers in the U.S. and around the world to learn, share, and gain new knowledge or resources that can enhance their ability to comprehend and respond to human health effects of extreme weather. NIH will support a community of practice that provides opportunities for researchers, public health professionals, scientists, policymakers, and community members from various disciplines and backgrounds to come together to share and enhance interdisciplinary research, ideas, methods, tools, and innovations. NIH will emphasize the importance of transparency, as well as the promotion of rigorous and reproducible study designs through the community of practice.



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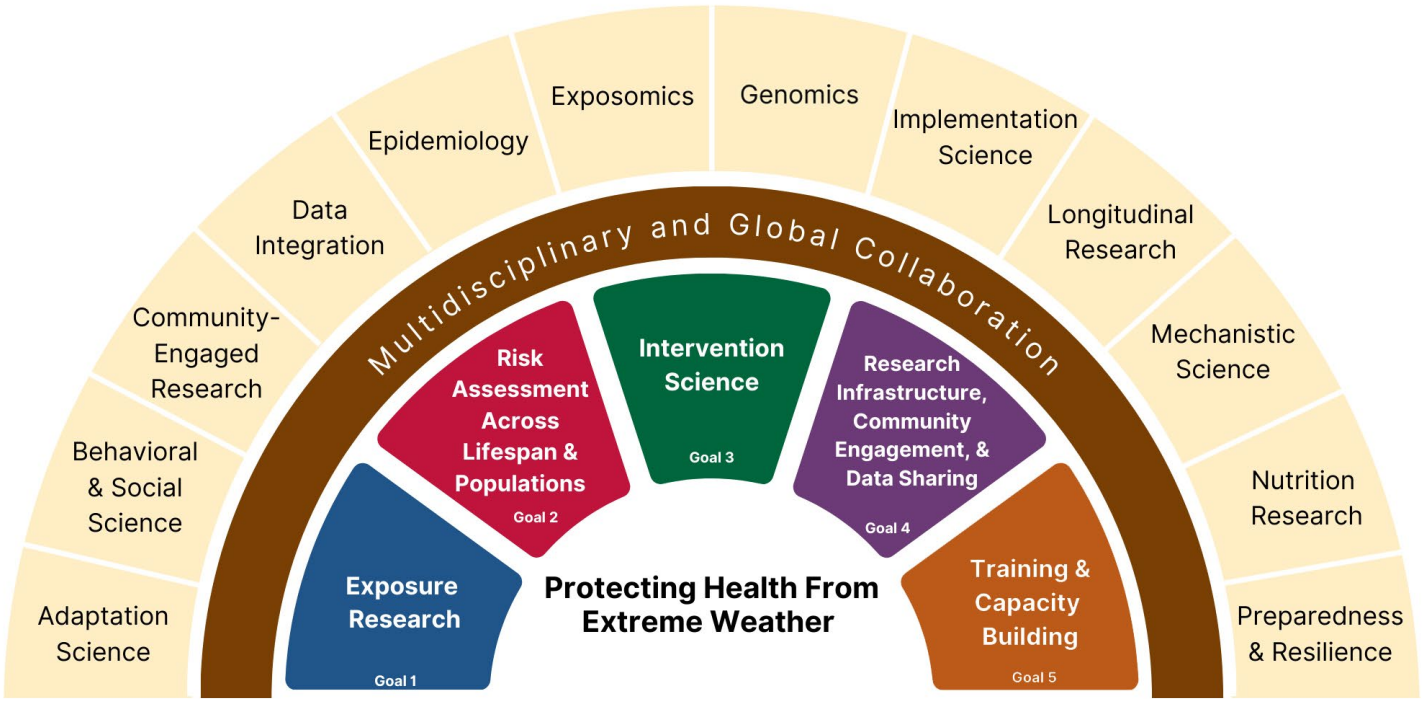
Prioritized Areas of Science

This Strategic Framework will guide NIH-funded researchers and the broader community of practice in conducting health and extreme weather research.

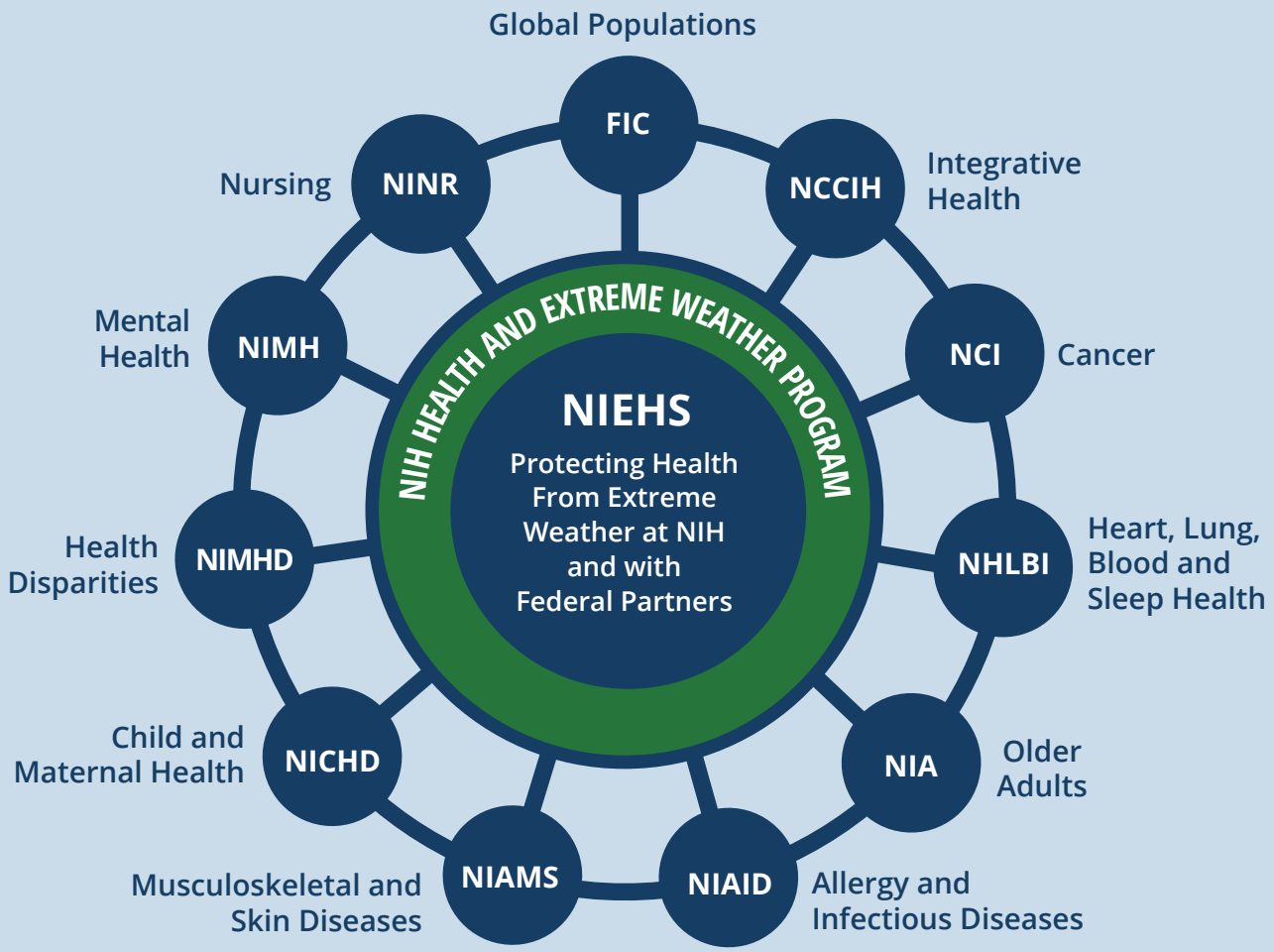
The process of developing the HEW Program Strategic Framework revealed several prioritized areas of science and approaches as they relate to research on the health impacts of extreme weather, weather-related natural disasters, and emerging weather-related harms. These areas of science and approaches are represented in the outer edge of the diagram below and represent highly relevant fields of inquiry. The inner components of the diagram align with the HEW Program goals.

The HEW Program will provide opportunities for meaningful engagement among this community of practice with researchers, public health professionals, industry and technology leaders, patients, scientists, policymakers, students, community members, and other partners, leading to impactful and innovative research focused on the prioritized areas of science in the diagram below.



This diagram depicts prioritized areas of science and approaches in the outer edge, and the inner components of the diagram align with the HEW Program goals.

About the HEW Program



The HEW Steering and Executive Committees have members from the 12 Institutes and Centers (ICs) listed above, while the Working Group has members from 30 ICs and Offices, including the Office of the Director.

The NIH HEW Program was formed to tackle the research gaps and priorities at the intersection of health and extreme weather. An Executive Committee provides leadership and oversight of the program. The Executive Committee is comprised of the directors of 12 NIH ICs:

- Fogarty International Center (FIC)
- National Center for Complementary and Integrative Health (NCCIH)
- National Cancer Institute (NCI)
- National Institute of Environmental Health Sciences (NIEHS)
- National Heart, Lung, and Blood Institute (NHLBI)
- National Institute on Aging (NIA)
- National Institute of Allergy and Infectious Diseases (NIAID)
- National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)
- *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD)
- National Institute on Minority Health and Health Disparities (NIMHD)
- National Institute of Mental Health (NIMH)
- National Institute of Nursing Research (NINR)

Efforts to build strong collaboration across all NIH institutes, centers, and offices (ICOs) are yielding new and expanded participation, as well as expertise. Each participating IC is also represented by one to two staff members on the HEW Program Steering Committee, which carries out the planning, organization, and activities needed to achieve the mission and goals of the Program.

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Scope of the HEW Program

This list is not exhaustive:

- Air pollution influenced by weather or disaster
- Changing incidence of water-borne, vector-borne, and other weather-driven infectious diseases
- Drought
- Extreme precipitation and floods
- Extreme temperatures
- Harmful algal blooms
- Humidity
- Hurricanes and other storms
- Snowpack loss
- Wildfires

Over 200 members from across 30 ICOs participate in the HEW Program's Working Group, which fosters knowledge transfer, idea sharing, interdisciplinary research, and a space for NIH leaders to thoughtfully envision the future of health and extreme weather research. Collectively, the HEW Program has topical expertise represented across the following ICOs, including those listed below:

- Center for Scientific Review (CSR)
- National Center for Advancing Translational Sciences (NCATS)
- National Eye Institute (NEI)
- National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)
- National Institute of General Medical Sciences (NIGMS)
- National Institute of Neurological Disorders and Stroke (NINDS)
- National Institute on Alcohol Abuse and Alcoholism (NIAAA)
- National Institute on Drug Abuse (NIDA)
- National Library of Medicine (NLM)
- Office of Behavioral and Social Sciences Research (OBSSR)
- Office of Dietary Supplements (ODS)
- Office of Disease Prevention (ODP)
- Office of Evaluation, Performance, and Reporting (OEPR)
- Office of Laboratory Animal Welfare (OLAW)
- Office of Nutrition Research (ONR)
- Office of Research Facilities (ORF)
- Office of Research on Women's Health (ORWH)
- Office of Science Policy (OSP)

The HEW Program also leverages NIH's intramural research programs, extramural grants, a community of practice, and other investigator networks to support initiatives and projects that achieve the program's mission, goals, and objectives. NIH ICOs will work through existing, coordinated processes to develop, review, and support activities that align with both their individual missions and the goals of the program. Thoughtful coordination and effective collaboration enable consistent communication across the agency, researchers, community members, and other federal and non-federal partners.

Transparency

The NIH HEW Program ensures research findings are credible, accessible, unbiased, and reproducible.

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Partnerships

NIH is a well-trusted and desired partner in research, development, and scientific translation around the world. NIH actively works to coordinate with federal and global partners to ensure consistency, data and resource sharing, and collective understanding related to health and extreme weather. Through a whole-of-government approach, comprehensive solutions to the multidisciplinary challenges posed by extreme weather can be achieved — with expertise from public health, meteorology, environmental protection, economics, and other scientific and public policy fields. Partnerships that extend to geoscience- and environmental-oriented agencies are a priority for the HEW Program. For example, NIH has an agreement with the National Science Foundation to support two Natural Hazards Centers, the University of Colorado Boulder Natural Hazards Center[69] and the University of Washington Natural Hazards Reconnaissance (RAPID) Facility,[70] that provide rapid funding for timely collection of perishable data for health research in the immediate aftermath of natural disasters. Collaboration with non-health focused scientists is recognized as essential to NIH's efforts to address the health effects of extreme weather.

Definitions

Emerging Weather-Related Harms: The harms that stem from alterations in course or condition of the weather as exhibited by temperature, wind velocity, and precipitation. The HEW Program focuses on emerging weather-related harms due to changing incidence of water-borne, vector-borne, and other weather-driven infectious diseases, harmful algal blooms, air quality and pollution, ocean temperature and acidification, snowpack alterations, etc.

Extreme Weather: Unexpected, unusual, unpredictable, severe, or unseasonal weather; typically defined as occurring in the highest and lowest 5% of the historical distribution of similar weather parameters. The HEW Program focuses on extremes in temperature, precipitation, humidity, wind velocity, etc.

Weather-Related Natural Disasters: Weather-related natural disasters are large-scale meteorological events that have the potential to cause loss of life or property. The HEW Program addresses the following types of natural disasters: wildfires, hurricanes, drought, flood, extreme heat, and extreme storms.

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Conclusion

Individuals and communities across the globe are affected by extreme weather and weather-related natural disasters. There is clear, unquestionable evidence that extreme weather and weather-related natural disasters have direct and indirect human health impacts, in the U.S. and beyond. The health risks from wildfires, hurricanes, floods, drought, and extreme temperatures are tangible and can be severe. As humans endure these weather events and conditions, NIH has a duty to address weather-related threats to human health with strong scientific premises, innovative research, tested interventions, and transparency to enhance health, lengthen life, and reduce illness and disability. As we better understand how to ameliorate the health effects of these extreme weather events and conditions, human health and well-being will be better protected and enhanced all over the world. Each year there are more studies uncovering new, effective interventions that reduce harm from these risks, boosting resilience and improving health. The HEW Program aims to catalyze research that reduces health threats from extreme weather, weather-related natural disasters, and emerging weather-related harms to promote the health and well-being of people all over the world.

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Appendix A

Adaptation: An alteration in the behavior of an organism or species in order to become better suited towards its environment.[1]

Behavioral and Social Science: Behavioral and social sciences research at the National Institutes of Health involves the systematic study of behavioral and social phenomena relevant to health. "Behavioral phenomena" refers to the observable actions of individuals or groups and to mental phenomena such as knowledge, attitudes, beliefs, motivations, perceptions, cognitions, and emotions. "Social phenomena" refers to the interactions between and among individuals, and to the characteristics, structures, and functions of social groups and institutions, such as families, communities, schools, and workplaces, as well as the physical, economic, cultural, and policy environments in which social and behavioral phenomena occur. "Health" refers to state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.[2]

Community-Engaged Research: The process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address uses affecting the well-being of those people. This process is done during conceptualization and the conduct of research. It is a powerful vehicle for bringing about environmental and behavioral changes that will improve the health of the community and its members.[3]

Data Integration: The technical process of aggregating data from a variety of sources and providing users with a unified view of them.[1]

Epidemiology: The scientific field of study used to determine the distribution and determinants of health-related outcomes and events in a specified population.[1]

Exposomics: The exposome is the integrated compilation of environmental influences across an individual's lifetime. Defined broadly to include chemicals and pollutants, physical agents, diet and nutrition, exercise, therapies, and social determinants of health, many in the environmental health sciences community consider exposomics, which is the study of the exposome, to be the environmental counterpart to genomics.[4]

Genomics: Genomics is the study of all of a person's genes (the genome), including interactions of those genes with each other and with the person's environment.[5]

Implementation Science: The study of methods to promote the adoption and integration of evidence-based practices and interventions into routine health care and public health settings to improve the impact on population health.[6]

Intervention Research: Scientific investigation that provides the evidence base for development and implementation of timely, effective strategies to prevent or minimize disease and disability and promote health.[1]

Longitudinal Research: A type of research study that follows large groups of people over a long time.[7]

Mechanistic Science: Research designed to understand a biological or behavioral process, the pathophysiology of a disease, or the mechanism of action of an intervention.[1]

Nutrition Research: This research focuses on understanding how nutrients and food components impact health and well-being throughout the lifespan. It also includes research studies to better understand the nutritional ecology and the effects of behavior, including eating and food choice, socioeconomic factors, and environmental exposures on an individual's nutritional status.[8]

Preparedness: The continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action in an effort to ensure effective coordination during incident response.[1]

Appendix A References

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