



# **National Institute of Environmental Health Sciences (NIEHS) FY 2025-2029 Strategic Plan**

*Health at the Intersection of People and  
Their Environments*

## **Final Draft for Public Comment**

National Institute of Environmental Health Sciences (NIEHS),  
National Institutes of Health (NIH)

6-17-2024

# National Institute of Environmental Health Sciences (NIEHS) 2025-2029 Strategic Plan: Health at the Intersection of People and Their Environments

National Institute of Environmental Health Sciences, National Institutes of Health

## Director's Message

I am excited to share the new National Institute of Environmental Health Sciences (NIEHS) 2025–2029 Strategic Plan: Health at the Intersection of People and Their Environments. This plan is the result of a careful analysis of our prior accomplishments, ongoing efforts, and future aspirations. It was developed with extensive input from a diverse group of environmental and health scientists from across many disciplines, public health professionals, community and patient advocates, and the public. I want to personally thank each person who took the time to share their insights, expertise, and opinions with us to produce this plan.

Environmental health sciences and translation of its outcomes to the benefit of human health are global endeavors. Environmental agents and processes such as air pollution, microplastics, disasters, and climate change, among many others, transcend geopolitical boundaries and impact the health of people around the world. Global movement of people and goods, cultural and political conflicts, and diffusion of non-scientific information into the basic understanding and beliefs of society further complicate efforts to prevent or mitigate these impacts. As the COVID-19 pandemic so vividly demonstrated, global environmental health threats require collaborative, coordinated, and credible responses that include addressing immediate health needs, both domestically and abroad, and providing ongoing and focused attention to complex scientific problems. In addition to generating new knowledge, we must identify and acknowledge what drives the uptake and acceptance of scientific findings and explore the most effective pathways for translating the knowledge resulting from these findings into decisions that will protect human health. NIEHS, with our deep history of international scientific engagement and broad expertise in environmental health sciences and related fields, is well-positioned to provide critical global leadership for the scientific endeavors envisioned in this strategic plan.

The themes and goals of our strategic plan reflect NIEHS's strong commitment to adhering to a specific set of guiding values in our work to advance environmental health and fully integrate it into the broader field of health research. These values include:

**Collaboration**—Searching out opportunities for cooperative teamwork and partnerships to drive synergistic engagement towards a common mission.

**Communication**—Safeguarding the intentional and transparent exchange of information built on mutual respect and trust.

**Distributive Leadership**—Inspiring and empowering the workforce, at all levels, to utilize their talents, strengths, and expertise to assume leadership responsibilities and accountability.

**Innovation**—Fostering and rewarding forward-thinking and cutting-edge ideas for solving current and emerging challenges.

**Workforce Diversity**—Cultivating an inclusive and well-skilled staff of professionals whose unique perspectives are respected and valued.

Leveraging the full value of NIEHS resources for research and translation depends on building and sustaining effective collaborative relationships between NIEHS and critical partners. First and foremost, we value engagement with our sister institutes of the National Institutes of Health (NIH). Environmental exposures interact with all the organ systems, diseases and health conditions, and populations being evaluated across the NIH to enhance health, lengthen life, and reduce illness and disability. We believe that better integrating environmental health science considerations into the relevant research and priority setting of all NIH institutes, as well as the centers and offices across NIH that coordinate research, will advance human health by ensuring that biomedical research is inclusive and effective. Our success in promoting health also relies on engagement and collaboration with diverse partners beyond NIH including federal, state, local, and tribal public health and environmental agencies; patient groups and advocates for environmentally related disease research; advocates and leaders from affected communities; and environmental health research scientists around the world. Through these relationships, we can extend our research investments and increase the value of the resources entrusted to us by the American people.

I believe that this strategic plan, implemented with our guiding values, will provide an important roadmap to integrating the knowledge we gain through environmental health research into the fabric of research on the origins of disease at NIH and across the biomedical enterprise. As we work to identify and understand the multitude of environmental factors that influence human biology over the lifespan, our hope is that the results of our efforts will continue to inform disease prevention and interventions and promote healthier lives for all people. The task before us is immense but the pursuit is worthy. I hope you will join us.

Rick Woychik, Ph.D.

## Table of Contents

|   |    |
|---|----|
| Director’s Message .....  | 1  |
| Table of Contents.....  | 3  |
| Overview .....  | 4  |
| Research Areas of Emphasis .....  | 6  |
| Area 1: Exposomics .....  | 6  |
| Area 2: Precision Environmental Health .....  | 7  |
| Area 3: Mechanistic Biology and Toxicology.....   | 8  |
| Area 4: Data Science and Computational Biology .....                                    | 9  |
| Area 5: Environmental Health Disparities, Environmental Justice, and Health Equity..... | 10 |
| Area 6: Climate Change Impacts on Human Health.....                                     | 11 |
| Crosscutting Themes.....  | 12 |
| Diversity, Equity, Inclusion, Accessibility, and Civility.....                          | 12 |
| Solutions-Focused Research and Translation .....  | 12 |
| Capacity and Infrastructure .....   | 13 |
| Scientific Workforce Development.....   | 13 |
| Data Infrastructure and Management.....   | 13 |
| Human Studies and Community-based Research.....   | 14 |
| Exposure Measurement.....   | 14 |
| Communication and Dissemination Capacity and Infrastructure.....                        | 14 |
| Scientific Management and Stewardship .....   | 15 |
| Public Trust in Science .....   | 15 |
| Sustainability.....   | 15 |
| Review, Evaluation, and Assessment Capabilities .....                                   | 16 |
| Leadership Core Values.....   | 16 |

## **Overview**

### **Mission**

The mission of the NIEHS is to research how the environment affects biological systems across the lifespan and to translate this knowledge to reduce disease and promote human health.

### **Vision**

The vision of the NIEHS is to provide global leadership for innovative research that improves the health of people and communities.

### **Strategic Plan Framework**

- Research Areas of Emphasis
- Crosscutting Themes
- Capacity and Infrastructure
- Scientific Management and Stewardship

### **Relevant Mandates and NIEHS Statutory Authority**

NIEHS is charged in its foundational statutory responsibility, per amendments to the Public Health Service Act in 1966, with the task of conducting and supporting research, training, health information dissemination, and other programs with respect to factors in the environment that affect human health, directly or indirectly. NIEHS research covers all organ systems, diseases, and conditions that could be caused or affected by environmental impacts, which are defined broadly.

### **NIEHS Organization**

The NIEHS campus is in Research Triangle Park, North Carolina. Components of the NIEHS Office of the Director and the Clinical Program (the Environmental Autoimmunity Group) are located on the NIH campus in Bethesda, Maryland.

### **Priority Setting Approach**

NIEHS takes an inclusive approach to priority setting. NIEHS values transparency and engagement in setting research priorities and supports collaborative community involvement in all aspects of the Institute's strategic planning work. Input from external parties is extremely important and is obtained in multiple ways, including workshops, engagement at national meetings and other gatherings, legislative input and directives, community forums, collaboration with other NIH institutes, and from various informal and formal advisory boards including the National Advisory Environmental Health Sciences Council (NAEHSC) and the Board of Scientific Counselors (BSC).

Some of the main factors considered and questions asked by NIEHS leadership when setting priorities include:

- Public health needs: What increasing or emerging exposures are of concern that can adversely impact human health? Are there environmental exposures that can impact human health in a positive way? Can we assess how different individuals respond differently to environmental exposures? Will this research move us towards addressing such needs?

- Scientific opportunities: How is the field of environmental health sciences poised to address environmental health issues of concern? What new approaches are suggested by technological advances or areas of new understanding in related fields?
- Portfolio balance: How can NIEHS ensure that the research we support and conduct is focused on addressing the most needed areas of environmental health science and those areas that will enable society to respond to new opportunities or challenges?

### **Strategic Planning Process**

The strategic planning process for FY2025-2029 comprised three main phases: Input, Analysis, and Plan Development.

The Input phase was initiated with an online Request for Information (RFI) soliciting comments from January 31–April 20, 2023. NIEHS asked respondents to comment on the themes of the current 2018-2023 Strategic Plan: Advancing Environmental Health Sciences (EHS), Data to Knowledge to Action, and Enhancing EHS through Stewardship and Support and their associated goals. The Institute received 169 unique responses (both individual and group) to the RFI.

Comment on strategic priorities in environmental health sciences was also solicited through discussion with the Institute’s advisory boards and councils, including the BSC, and at the February 2023 open session of the NAEHSC. NIEHS policy and planning staff also reviewed reports and proceedings from workshops hosted or supported by NIEHS between 2018 and 2022 to identify relevant recommendations for environmental health sciences research priorities.

NIEHS hosted a virtual community workshop in April of 2023, in which more than 100 invited experts provided input to discussions of environmental health science topics for priority consideration under the new Strategic Plan. Attendees included senior and early-stage investigators from environmental health and biomedical sciences; members of patient advocacy groups; and staff of NIH institutes, centers, and offices (ICOs), as well as other federal agencies. Workshop participants introduced and discussed 43 major topics of interest, and generated summary reports and recommendations for each. At the end of the workshop, a poll of participants was used to identify the top 10 areas of interest. Work products of the workshop were retained to inform implementation efforts of the Strategic Plan.

In the Analysis phase, NIEHS staff combined and curated all input using the NIH RFI Analysis Tool and a vocabulary of key words that was created from the corpus of comments and recommendations. Themes were identified by grouping related comments around topics including research areas, translation and communication, capacity and infrastructure, and stewardship. Results of this curation were presented to NIEHS Senior Leadership to inform their discussions of priorities and goals.

Plan Development comprised a series of focused retreats in which Senior Leadership determined areas of emphasis, refined concepts, and created an initial plan outline, followed by writing of the current draft by NIEHS planning staff, with consultation and review of NIEHS subject matter experts and Senior Leadership.

### **Strategic Plan Implementation**

NIEHS Senior Leadership will identify opportunities for coordination and collaboration across all divisions of the Institute. NIEHS will also proactively pursue opportunities for collaboration and shared leadership

of environmental health research relevant to the missions of other NIH ICOs. NIEHS will expand on existing tracking systems and metrics, as well as explore novel ones where needed, to monitor our progress and to provide regular updates on the Strategic Plan to NIH, Congress, and the public we serve.

## **Research Areas of Emphasis**

NIEHS will conduct high quality, innovative environmental health sciences research. Research on the effects of the environment on biological systems and processes is central to the NIEHS mission to understand how the environment affects human health. State-of-the-art biomedical tools help produce new understanding of the effects of specific exposures up to and including the full “exposome,” which represents the totality of exposures over the lifespan. The exposome will help to establish the knowledge base of environmental effects on biology and health from the subcellular level to the whole individual. NIEHS’ Research Areas of Emphasis include group and population studies in environmental epidemiology, as well as clinical studies aimed at understanding risk and beneficial factors for a wide variety of environmentally mediated diseases and conditions. Efforts are focused on understanding effects on processes and mechanisms across the lifespan, in different individuals and in different sexes, including collaboration on activities with the NIH Office of Research on Women’s Health. NIEHS will maintain a focus on mechanisms during windows of susceptibility through multiple developmental stages. Another priority is to continue to move towards a deeper understanding of individual variability in response to the environment that arise from multiple factors (genetic, epigenetic, underlying health status, among others). NIEHS will continue to develop, validate, and support new tools and methods necessary for advancing the research described in this plan.

NIEHS research will continue to focus on environmental exposures of special interest and concern for public health, ranging from widespread chemical exposures; non-chemical stressors including social determinants of health; and exposures related to climate change and human activities that impact the environment. Additionally, there will be a focus on better understanding how specific environmental factors can positively impact human health and contribute to the totality of influences that shape human health. The Research Areas of Emphasis represent research approaches that are used to understand the effects of these and other exposures on health. As new data and research bring to light emerging environmental exposures, NIEHS will consider this new information and its readiness to be addressed through NIEHS-supported research.

### **Area 1: Exposomics**

The exposome is the totality of environmental exposures that an individual encounters from conception to death. Defined broadly to include chemicals and pollutants, physical agents, diet, 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. The growth of this field has led to a paradigm shift in environmental health research. Considerable efforts will be focused on developing an operational framework for collecting and integrating exposomic data including multi-scale integration of data on exposures and biological responses across time points. This, in turn, will enable data-driven discovery and hypothesis generation to identify which environmental stressors have the most potential to impact health. Understanding the interactions of the full exposome will yield more effective approaches to health promotion and disease prevention.

### Translational Goal

Develop the ability to understand interactions across the exposome for the purpose of generating, and sharing, a more complete picture of positive and negative environmental effects on health, including disease risk, progression, severity, and management.

### Priority Approaches

- a. Continue development of new methods for multiple exposure measurement. For example, increase capacity for geospatial and wearable exposure assessment, as well as integration of measures of external exposures with analysis of biological samples
- b. Enhance the rigor and reproducibility of exposomics through the development of data standards, harmonization of analytical methods, and integration of disparate data types at multiple levels
- c. Develop retrospective measures for life course studies, such as validated biomarkers, including epigenetic modifications, that can be used to quantify exposures over an individual's lifespan
- d. Continue development and dissemination of approaches in model systems to enable efficient interpretation and validation of findings from exposomics studies
- e. Explore the feasibility of designing a human exposome atlas as a reference for understanding the variability and correlation patterns in the human exposome, including signals of disease

## **Area 2: Precision Environmental Health**

Precision environmental health (PEH) is focused on understanding the basis of interindividual differences in disease susceptibility, progression, and severity, in a way that takes account of environmental exposures throughout life. PEH aims to provide the tools and understanding needed to better understand how environmental exposures affect individual health and disease susceptibility to ensure more equitable health status for all. A precision environmental health approach requires integrating genome/epigenome profiles, measuring exposures at critical stages of life using the exposomics framework, and incorporating powerful data science tools to create connections and understanding across many different types of data. Next generation PEH research occurs at the intersection of genomics, genomic modifications that do not change genomic sequences (epigenomics), and environmental exposures and is informed by other “-omics” data. The goal of PEH is to better understand individual environmental risk and susceptibility to help create and deliver personalized interventions for promoting health and for the prevention and treatment of disease.

### Translational Goal

Advance PEH science to obtain a level of knowledge that will permit individuals and healthcare providers to better understand and manage environmental risks, in both general and clinical settings, based on individual susceptibilities.

### Priority Approaches

- a. Focus on understanding factors and markers of risk, resilience, and susceptibility at the individual level
- b. Develop methods of measuring multiple exposures at the individual level so that exposures over time and from different sources can be better understood



- c. Incorporate multiple “-omics” approaches for individual measurements from different tissues and at different timepoints across diverse populations of individuals
- d. Conduct human studies to generate observations related to health effects, using community-based research approaches when possible
- e. Develop human biology-based testing methods that will provide insights into specific biological processes or disease states and represent population diversity
- f. Develop innovative approaches in data science, analytics, and artificial intelligence/machine learning (AI/ML), and improve computational methods for integration of complex data sets
- g. Establish partnerships for sharing and integrating exposomics and genomics into environmental health studies to generate more holistic results
- h. Advance research on communicating exposure and disease risk using the framework of precision prevention

### **Area 3: Mechanistic Biology and Toxicology**

A deeper understanding of the mechanisms through which environmental exposures affect biological processes leading to disease is critical to understanding susceptibility, as well as preventing and treating adverse health outcomes. NIEHS studies in cell-, tissue-, and organ-based systems, as well as in animal models and new approach methodologies (NAMs), will provide a roadmap for understanding the totality of environmental exposure effects.

NIEHS works to develop and apply improved test methods and models of genetic, epigenetic, and cellular effects that can be used to predict health outcomes resulting from environmental exposures. Challenges include developing approaches to assess the hazards of complex, real-world mixtures of chemicals, modeling non-chemical stressors that contribute to health disparities in under-resourced communities, creating approaches to better evaluate broad classes of environmental agents, identifying and evaluating environmental exposures related to climate change, and searching for early biomarkers of adverse health effects, especially in at-risk populations. Additionally, experimental approaches will need to be developed to accurately assess the molecular mechanisms associated with environmental exposures that promote health and that can potentially mitigate adverse environmental exposures.

Key approaches to mechanistic biology include research to identify the mechanisms by which environmental factors influence cells, tissues, organ systems, physiology, and behavior; increase understanding of how exposures impact vulnerability and disease risk over the life course; and integrate data from different domains to solve environmental health problems. Key approaches to mechanistic toxicology include research to understand how an agent provokes or prevents damage in the body, generation of mechanistic data that is highly translatable to human biology, integration of innovative approaches to studying environmental exposures, and emphasizing the predictive value of toxicology for promoting human health.

Along with dissemination among the scientific and biomedical communities, it is critical to translate the research insights to inform public health practices and policies including risk assessment and regulatory decision making. Research translation is done in partnership with regulatory scientists, federal and state agencies, advocacy organizations, and other public groups. Areas where innovation is needed to promote research translation include creating efficiencies in leveraging existing data and knowledge and taking advantage of AI/ML-based approaches to derive insights from mechanistic and toxicological studies that are targeted at novel questions or uses.

### Translational Goal

Define the impacts of known classes of environmental agents by developing and implementing novel diagnostic, therapeutic, and prevention strategies that will have a positive impact on human health.

### Priority Approaches

- a. Elucidate the mechanisms and systems underlying tissue, cell, and genetic abnormalities that occur in the face of known and emerging environmental exposures, and develop approaches to better understand the molecular mechanisms through which some environmental exposures can promote health and potentially mitigate adverse physical/chemical exposures
- b. Conduct systematic reviews of the science on emerging chemicals of concern to advance our understanding of human health impacts
- c. Utilize single-cell technologies through -omics approaches, including epigenomics and transcriptomics, as well as proteomic and metabolomic technologies, to study complex biological processes
- d. Develop and implement state-of-the-art, high-resolution imaging techniques
- e. Conduct computational and epidemiological studies to inform laboratory-based mechanistic investigations
- f. Improve capacity of computational models to include more complex data, including data on human biology and mechanisms of susceptibility, as well as AI/ML-based approaches, to ensure research findings are relevant and actionable
- g. Develop and validate innovative research approaches that increase efficiencies and decrease costs for toxicology testing, while better predicting human responses to environmental exposures
- h. Develop mechanistically driven approaches to understanding the toxicology of emerging contaminants to provide more timely knowledge that can help avoid adverse health impacts

## **Area 4: Data Science and Computational Biology**

Data science and computational biology are increasingly foundational to conducting environmental health and biomedical research for the purpose of enhancing clinical care and public health outcomes. The development of innovative data science and data-driven approaches, such as integration of increasingly large and diverse data types and data sources, holds enormous potential for advancing key research needs across the environmental health sciences. Promoting the expanded integration, harmonization, and use of available data through data science frameworks and Findable, Accessible, Interoperable, Reusable, and Computable (FAIR+) principles will facilitate such advances. AI is poised to expand the generation, use, and dissemination of environmental health knowledge in ways that will advance science while limiting misuse in order to increase public trust. NIEHS will continue to coordinate and partner with diverse groups and experts across the data science and computational biology communities. This will be done for the purpose of identifying activities to further NIH-wide priorities described in the NIH Strategic Plan for Data Science to capitalize on new discoveries and evolving data resources and approaches.

### Translational Goal

Fully harness the increasing availability of diverse environmental health-relevant data and advances in data science methods, tools, and management to enable more precise identification and understanding of

the complex casual relationships between environmental exposures and health impacts and translation of scientific discovery into actionable knowledge.

#### Priority Approaches

- a. Advance the integration and harmonization of large, complex data types from diverse sources and across distinct U.S. and global data ecosystems, including meteorological, geospatial, and health data
- b. Advance the use and development of AI/ML and computational methods to construct and use cross-system (*in vivo* and *in vitro*), multi-scale, and interoperable models and knowledge platforms
- c. Build AI/ML tools, training, and capacity to improve identification, use, and analysis of environmental health science, other biomedical, and sociobehavioral data
- d. Develop, refine, and apply uniform data standards, common data elements, and standard curation methods to support FAIR+ principles and improve the validity and comparability of health studies and outcomes

### **Area 5: Environmental Health Disparities, Environmental Justice, and Health Equity**

Understanding the underlying causes of environmental health disparities and reducing the environmental impacts on the health of the communities who are most affected is fundamental to NIEHS's goal of enhancing environmental justice and health equity for all people.

Health disparities are differences in health status in individuals and communities that arise from a combination of factors related to social, economic, and environmental disadvantages. Exposure of communities to multiple environmental stressors over time increases the risks for environmental health disparities. Environmental justice is the fair treatment and meaningful involvement of all people in environmental laws and policies regardless of race, nationality, or income. Health equity is the state in which everyone has a fair and just opportunity to attain their highest level of health. Concepts of health disparities, environmental justice, and health equity must be understood in the full context of the exposome framework, including social and other determinants of health such as housing, diet, sleep, and exercise. NIEHS emphasizes a community-engaged research approach as part of its efforts to ensure that research findings are useful and actionable in improving the lives of people in communities affected by environmental disadvantages. NIEHS seeks opportunities to work toward understanding the biological and non-biological factors that drive disparities in environmental health impacts and enable the most effective and applicable research investments. NIEHS will harness both the approaches outlined in other research areas of emphasis and those listed below to advance this area of environmental health science and public health.

#### Translational Goal

Prioritize research to understand and address environmental health disparities and enable full application of the knowledge gained to achieving environmental justice and health equity.

#### Priority Approaches

- a. Emphasize recruitment of diverse study populations in diverse community settings
- b. Employ community-engaged and community-based participatory research approaches

- c. Conduct research and disseminate findings to inform the creation and implementation of effective, evidence-based health promotion and disease prevention strategies
- d. Expand post-disaster research to assist communities in understanding and addressing exposures from natural and human-caused disasters
- e. Utilize social sciences research including health behavior, public policy, law, and economics to support translation of environmental health science into interventions

## **Area 6: Climate Change Impacts on Human Health**

As the reality of a changing climate unfolds across the globe in record-breaking heat, extreme storms and wildfires, droughts, floods, and the spread of vector-borne diseases, the need to understand the effects of these changes on human health is increasingly urgent. NIEHS brings to this challenge decades of research on the impacts of factors in the environment on human health. Such research is being leveraged to uncover the myriad ways in which climate change is fundamentally altering the systems humans rely on for air, water, food, shelter, and other essentials and the resulting outcomes for health and life. NIEHS has continued to expand its efforts in this area through leadership of the NIH Climate Change and Health Initiative and the NIH Disaster Research Response Program, as well as new engagements in research, translation, capacity, and training efforts across federal and global spheres. Topics include impacts of heat on health, oceans and human health, climate-related disasters, children's health and climate change, and many others. Such research will utilize new approaches for using and integrating climate and health data to inform the identification of trends, prediction of risks, and adoption of actions to prevent or respond to negative health outcomes. This area of emphasis recognizes the disparate health impacts of climate change on diverse and under-resourced communities and prioritizes efforts to understand these impacts and empower communities to adapt and build resilience against climate change threats.

### Translational Goal

Catalyze research and translation of climate change effects on human health to reduce related health threats and impacts, especially among those most at-risk, and build health resilience to climate change impacts among individuals, communities, and nations around the world.

### Priority Approaches

- a. Provide leadership, guidance, technical assistance, coordination, and other resources to spur environmental health research and support the NIH Climate Change and Health Initiative
- b. Conduct and support collaborative research with other NIH institutes, centers, and offices that use a climate change framework to fill gaps in our understanding of human health and causes of diseases and health conditions
- c. Build partnerships that facilitate the translation of research across many sectors to provide the evidence base for health-protective policy and decision making on climate change and health
- d. Develop and sustain research, communication, resources, decision support tools, and knowledge bases to support global action on climate change and health, disaster research response, and related areas

## Crosscutting Themes

### Diversity, Equity, Inclusion, Accessibility, and Civility

NIEHS is committed to a diverse workplace environment where the talents of all individuals are valued and their viewpoints acknowledged, empowering them to successfully contribute to the critical work of the NIEHS. The NIH-Wide Strategic Plan for Diversity, Equity, Inclusion, and Accessibility, Fiscal Years 2023-2027 states that “principles of diversity, equity, inclusion, and accessibility (DEIA) are intrinsic to the achievement of better health for all.” NIEHS embraces these values and prioritizes them in the full range of the institute’s goals and activities. A tradition of working toward achieving environmental justice has positioned NIEHS as a leader among NIH institutes in efforts to understand and reduce health disparities. DEIA values are integral to the success of this work, and thus are already strongly rooted in the NIEHS mission and workplace ethos. In fact, NIEHS has expanded on the four core values of DEIA to add a fifth value of “Civility” (DEIAC), to emphasize our commitment to the respectful treatment of all.

Activities that support this crosscutting theme across NIEHS’ research areas of emphasis, capacity and infrastructure, and scientific management and stewardship, in fulfillment of the NIEHS mission, include:

- Recruit and staff an office led by a Scientific Diversity Officer to help advance DEIAC issues within NIEHS and the broader environmental health sciences community
- Address barriers to training for underserved populations, and promote a more diverse research workforce
- Promote inclusion of diverse viewpoints, especially those of affected communities and populations, in research design

### Solutions-Focused Research and Translation

NIEHS’s mission incorporates not just research and the generation of scientific knowledge, but the translation and dissemination of such knowledge for health promotion, disease prevention and evidence-based intervention. The value of NIEHS research investments is determined from its use by the public, health providers, regulators, and policymakers to inform their decisions and actions to protect health and improve people’s lives.

The biomedical research enterprise often describes a translational research pipeline where basic research is built upon to advance toward preclinical and clinical stages. NIEHS has expanded this approach to adopt a multidimensional framework that describes how environmental health sciences translates to clinical practice, public health policy, and environmental regulation for the improvement of people’s lives. NIEHS is expanding its commitment to community engagement to empower communities and individuals that experience disparate environmental burdens to learn about and protect themselves from environmental harms to achieve real-world health impacts. A focus of these efforts is the report back to study participants of results of environmental health research. Because of barriers to implementing this type of communication — including lack of established approaches, institutional approval, funding, and expertise — report back of personal results is not widely done across studies even though it is increasingly recognized as a beneficial and ethical practice. NIEHS will continue to pursue research on best practices for report back of results in environmental health studies.

The ultimate use of NIEHS-funded research is the promotion of health and the prevention of disease. The research funded in this strategic plan’s Research Areas of Emphasis will yield findings that will be

translated into solutions for improving individual and public health. NIEHS will continue to fund research for translational purposes, including efforts to develop, test, and validate evidence-based prevention and intervention strategies to prevent disease and promote health.

Activities that support this crosscutting theme across NIEHS' research areas of emphasis, capacity and infrastructure, and scientific management and stewardship, in fulfillment of the NIEHS mission, include:

- Develop and evaluate strategies to communicate environmental public health messages to diverse audiences in culturally appropriate ways
- Foster cooperation and collaboration among researchers of various disciplines, communities, public health professionals, and others to identify and bridge evidence gaps
- Engage with clinicians, medical societies, and organizations such as the U.S. Preventive Services Task Force and the Community Preventive Services Task Force to ensure that environmental research sciences are integrated into medical and health care standards of practice

## **Capacity and Infrastructure**

All NIEHS research activities depend on robust investments in capacity and infrastructure to ensure readiness for their success. This section focuses on NIEHS priorities and approaches for building and maintaining scientific capacity in environmental health sciences including workforce, resources, and infrastructure.

### **Scientific Workforce Development**

NIEHS aims to promote a diverse, inclusive culture in the environmental health sciences enterprise, where all members of the workforce across the biomedical spectrum are empowered to do their most collaborative, productive, and best work in a civil, respectful atmosphere.

- Recruit and train the next generation of environmental health sciences leaders and researchers
- Develop innovative approaches to training, development, and recruitment
- Focus on increasing access and reducing barriers to training for underrepresented groups, to promote development of a diverse research workforce
- Train across the full range of disciplines important to environmental health sciences, as well as interdisciplinary and cross-disciplinary training
- Promote team science and collaborations across the global biomedical research enterprise
- Educate and engage students beginning with K-12 to generate knowledge and enthusiasm for environmental health sciences and create a pipeline for the professional workforce, as well as an EHS-informed public
- Provide opportunities for researchers across the biomedical community to incorporate environmental exposures into their research strategies for studying the etiology of human disease

### **Data Infrastructure and Management**

The progress we expect to make in our Research Areas of Emphasis is highly dependent on data-driven discovery. The rate of discovery will, in turn, be determined by the resolution of complex problems related to data integration, harmonization, accessibility, storage, and security. Our efforts must be to ensure the research community can readily adopt and integrate technical advances in data science

methodologies and technologies into environmental health sciences that are that are accurate, high resolution, and of high utility to researchers.

- Implement policy, incentive, and funding systems that promote FAIR+ data practices
- Ensure data repositories, data standards, common data elements, and curation methods are used to support FAIR+ data sharing practices, to lower barriers to effective data sharing and interoperability
- Advance training in FAIR+ data science and management, as well as policies for their equitable use in environmental health research contexts
- Develop partnerships to enable the inclusion of environmental health data in current and future repositories and facilitate processes for sharing such data for effective team science and collaborations across the biomedical enterprise

### **Human Studies and Community-based Research**

Human studies represent a major ongoing investment for NIEHS. Specific attention will be given to our ability to manage the valuable information collected through past and current studies and to ascertain and address the barriers preventing robust development of specialized new studies.

- Expand support for maintaining cohorts and specimen repositories that can be leveraged for future research projects
- Bring environmental exposure analyses into existing human studies that currently are not collecting this type of data
- Ensure research promotes health across the lifespan and for all people, including consideration of women's health and sex as a biological variable, where scientifically applicable
- Facilitate data sharing and access to biospecimens
- Provide infrastructure for assisting community-based research
- Provide support for initiation of specialized human and community-engaged studies

### **Exposure Measurement**

Advancing NIEHS's primary goal of integrating environment more fully into the biomedical research enterprise requires investment in improved methods and technology for measurement of a wide variety of environmental agents and factors utilizing the exposome framework, as well as the ability to derive actionable meaning from research results.

- Increase environmental assessment capacity of non-NIEHS supported researchers
- Expand development of measurement tools and technologies to enable studies in support of the emerging operational exposomics framework
- Develop new risk assessment and other methodologies for setting standards and interpreting environmental data

### **Communication and Dissemination Capacity and Infrastructure**

Communication infrastructure and resources encompass a wide variety of activities. The purpose of communication across these activities includes dissemination of research across the scientific community, dissemination of health promotion information to general audiences, outreach and engagement with external groups and communities, and provision of scientific information to public audiences including Congress, advocacy groups and news media.

- Conduct robust outreach through NIEHS websites, podcasts, and newsletters

- Enhance the use of social media and other innovative communication tools to engage with public and scientific communities
- Support NIEHS’s editorially independent journals, *Environmental Health Perspectives* and *Journal of Health and Pollution*
- Engage with communities, patient advocacy groups, academic and professional societies, and the public through community forums and other forms of outreach

## Scientific Management and Stewardship

NIEHS stewardship efforts and policies for priority setting are consistent with the plans and values laid out in the [NIH-Wide Strategic Plan, Fiscal years 2021-2025](#). The NIH-Wide Strategic Plan “promotes policies and programs that foster and ensure a strong foundation and culture of good scientific stewardship.”

NIEHS prioritizes scientific stewardship and operational principles that align with the Institute’s commitment to advancing human health and understanding the environment’s impacts on human health.

NIEHS is committed to scientific management and stewardship in the following prioritized areas:

### Public Trust in Science

The NIH-Wide Strategic Plan emphasizes that NIH has a responsibility to uphold public trust and confidence in its work. NIEHS has a long history of community-engaged research and will continue to use many approaches to build transparency, engage with communities, and enhance public understanding of NIEHS-supported research and research programs.

An emerging need related to ensuring public trust in science is in the area of research data management and collection. NIEHS is committed to ensuring that our efforts to build data infrastructure for collecting and integrating environmental health data include capabilities to ensure research participant privacy and patient privacy, especially for individuals in disadvantaged and underserved groups.

NIEHS also affirms the NIH-wide commitment to upholding the highest quality science through efforts to enhance transparency, scientific rigor in experimental design and conduct, and reproducibility of scientific research findings.

### Sustainability

NIEHS has a long-standing commitment to sustainability in all its operations. Every two years, the institute publishes a report on sustainability activities at its North Carolina campus, guided by federal orders and global best practices on sustainability. Examples include on-site renewable energy, stewardship of natural resources, and maintaining LEED (Leadership in Energy and Environment Design) Platinum certification and ENERGY STAR-certified status for our net-zero energy warehouse. NIEHS will continue this commitment for the duration of the 2025-2029 NIEHS strategic plan. More information on how NIEHS fulfills its operational priorities related to sustainability can be found in NIEHS’ online sustainability reports.

NIEHS sustainability principles and actions further NIEHS’ scientific mission through effective and efficient management of utilities, supplies, and other resources that are critical to advancing innovative environmental health sciences research.



## **Review, Evaluation, and Assessment Capabilities**

NIEHS maintains capabilities for program evaluations and other assessment activities. NIEHS will establish measures for the goals of this Strategic Plan and track them to evaluate progress. NIEHS also participates in reviews and assessments of its programs and processes, further upholding the efficiency and integrity of NIEHS operations across a variety of programs.

## **Leadership Core Values**

NIEHS embraces a leadership and management strategy rooted in five core values, and will approach its operations, scientific management, and stewardship in a manner that upholds these values:

**Collaboration:** NIEHS will continue to identify opportunities where transparent and respectful partnerships can be developed to further NIEHS' mission.

**Communication:** NIEHS will continue to identify opportunities for intentional and transparent exchange of information that is built on mutual trust, respect, and inclusion.

**Distributive Leadership:** NIEHS will promote an environment where all people are empowered to use their talents, strengths and expertise for leadership and accountability.

**Innovation:** NIEHS aims to engage both external parties, as well as staff, in forward-thinking and cutting-edge ideas for solving current and emerging challenges in environmental health sciences.

**Workforce Diversity:** NIEHS maintains its commitment to an inclusive, diverse, and well-prepared workforce, where perspectives are respected and valued, and leadership and staff embrace diversity, equity, inclusion, accessibility, and civility (DEIAC) as a key part of a successful NIEHS work culture, as well as a key to fulfilling NIEHS' mission.