



National Institute of
General Medical Sciences

Basic Discoveries for Better Health

National Institute of General Medical Sciences 5-Year Strategic Plan

March 2015

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Message from the NIGMS Director



I am pleased to present the 2015—2020 National Institute of General Medical Sciences (NIGMS) strategic plan. This document reflects the Institute’s priorities and activities in pursuit of its mission. It lays out the goals, objectives and implementation strategies that the Institute—in partnership with the scientific community at universities, professional societies and other federal agencies—will engage in over the next 5 years. It also provides snapshots of specific priorities and achievements.

NIGMS supports more than 3,000 investigators and 4,500 research grants, or about 10.5 percent of the grants funded by the National Institutes of Health (NIH) as a whole. NIGMS-funded scientists investigate how living systems work at a range of levels, from molecules and cells to tissues, whole organisms and populations. Investments in such diverse and fundamental areas of biomedical research serve as the foundation for subsequent categorical or disease-specific discoveries and advances. Our ability to effectively treat, diagnose, manage and ultimately cure diseases increases significantly with an understanding of their underlying mechanisms and biology.

NIGMS was established in 1962 with a \$124.6 million budget. In Fiscal Year 2014, the Institute’s budget was \$2.366 billion. The vast majority of this money goes into local economies through grants to individual investigators at universities, medical schools, hospitals and other research institutions throughout the country. NIGMS has always taken its role as a steward of taxpayer dollars very seriously and has thus attempted to invest its resources in a manner that reflects its commitment to scientific impact and productivity, diversity, balance, efficiency and accountability.

As indicated in this strategic plan, the Institute places great emphasis on supporting investigator-initiated research grants that unleash the creativity and energy of investigators across the country to solve important biomedical problems. In addition, the Institute

provides funding to a limited number of research centers that support critical research resources used by the scientific community or that build research capacities in states that historically have received low levels of NIH funding. In all its investments, and in line with agency-wide efforts, NIGMS stresses the critical importance of rigor, reproducibility and transparency in all biomedical pursuits.

NIGMS research training programs are built upon recognition of the interdisciplinary nature of biomedical research, and thus they emphasize experiences that cut across fields of inquiry. NIH recognizes a compelling need to promote diversity in the biomedical research workforce. NIGMS is committed to galvanizing efforts to diversify the workforce by recruiting talented researchers from all groups and supporting quality educational and training environments in a wide variety of scientific areas. Certain NIGMS training programs address areas in which there are particularly critical needs. One of these, the Medical Scientist Training Program, produces investigators who hold both M.D. and Ph.D. degrees and are thus well trained in basic and clinical science. Other programs aim to promote diversity within the biomedical research workforce in order to strengthen the research process by engaging people with different experiences, interests and backgrounds.

As NIGMS continues its work over the next 5 years, it does so with an ongoing commitment to public service, the careful stewardship of taxpayer funds and a focus on achieving outcomes such as those documented in this strategic plan. Recognizing that the achievement of such outcomes cannot occur in isolation, NIGMS maintains its commitment to open and reciprocal communication with its partners in the scientific community. Notably, increasing portfolio evaluation, exploring new mechanisms of research funding that highlight the impact of individual scientists rather than specific projects and ensuring a broader distribution of funding are themes mentioned not only in this strategic plan, but also elsewhere.¹ This reinforces the Institute's plan to continue to pursue its mission in an atmosphere of open dialogue, collaboration and shared responsibility with the scientific community.

Jon R. Lorsch, Ph.D.
Director
National Institute of General Medical Sciences
National Institutes of Health
U.S. Department of Health and Human Services

¹ Sustaining Discovery in Biological and Medical Sciences: A Framework for Discussion. Federation of American Societies for Experimental Biology. January 8, 2015.

NIGMS Profile

| | |
|---|-----------------|
| Year Established | 1962 |
| FY 2014 Budget | \$2.366 billion |
| FY 2014 Supported Investigators | ~ 3,300 |
| FY 2014 Funded Research Grants | 4,550 |
| FY 2014 National Research Service Award-Supported Trainees | 4,114 |
| Number of Grantees Who Have Won Nobel Prizes Since 1962 | 81 |

Divisions

Biomedical Technology, Bioinformatics, and Computational Biology
Cell Biology and Biophysics
Extramural Activities
Genetics and Developmental Biology
Pharmacology, Physiology, and Biological Chemistry
Training, Workforce Development, and Diversity

Introduction

The National Institute of General Medical Sciences (NIGMS) is a component of the National Institutes of Health (NIH) in the U.S. Department of Health and Human Services. NIGMS supports basic biomedical research, which is the wellspring that feeds advances in medicine and technology. By defining the mechanisms of disease and providing targets for drug development, basic research is a critical driver of the U.S. economy. Keeping the basic research pipeline healthy and flowing requires a broad research portfolio in terms of subject areas and research environments, as well as a diverse and well-trained scientific workforce.

NIGMS uses three major means to advance its mission:

- Grants that support scientific research at colleges, universities, medical schools, research institutes and small businesses that support NIGMS mission-related needs.
- Training and education awards that support the development of a diverse biomedical research workforce.
- Programs that support the development of, and widespread access to, high-quality research resources and technologies and that build capacity in under-resourced institutions and states.

Through these activities, NIGMS plays a major role in advancing fundamental biomedical research and maintaining a healthy research enterprise in every state in the nation as well as in U.S. territories.

The NIGMS 2015—2020 strategic plan is a tool to guide the Institute as it seeks to make the most efficient and effective use of taxpayer funds to extend fundamental scientific knowledge and meet the challenges of a rapidly evolving biomedical research landscape.

Mission Statement

NIGMS supports basic research that increases understanding of biological processes and lays the foundation for advances in disease diagnosis, treatment and prevention. NIGMS-funded scientists investigate how living systems work at a range of levels, from molecules and cells to tissues, whole organisms and populations. The Institute also supports research in certain clinical areas, primarily those that affect multiple organ systems. To assure the vitality and continued productivity of the research enterprise, NIGMS provides leadership in training the next generation of scientists, in enhancing the diversity of the scientific workforce and in developing research capacities throughout the country.

Organizational Structure

NIGMS is organized into divisions that support research and research training in a range of scientific fields. Major areas in which these units fund research are highlighted below.

The Division of Biomedical Technology, Bioinformatics, and Computational Biology (BBCB) supports research and research training that leverages data and technologies to answer fundamental biological questions underlying health and disease, to develop a more robust computing infrastructure for the biomedical research community and to promote and facilitate the development and use of new computational and experimental technologies in biomedical research.

Biomedical Technology Branch

This BBCB branch supports research to discover, create and develop innovative technologies for biomedical research. Technology development often requires multidisciplinary and team-oriented approaches and can lead to new or improved instrument development that has broad application to medical research. Areas of emphasis include computational infrastructure, molecular imaging and dynamics, and technologies to elucidate structural and functional biology. The branch provides support through biomedical technology research resources, instrument development for biomedical applications and investigator-initiated research grants.

Bioinformatics and Computational Biology Branch

This BBCB branch supports bioinformatics and computational approaches that join biology with the computer sciences, engineering, mathematics, biostatistics and physics, as well as general approaches that have the potential for broad applicability and usage by investigators funded by NIH and other agencies. In addition, the branch leads the NIH Biomedical Information Science and Technology Initiative and collaborates with other NIH components on the Big Data to Knowledge initiative as well as with the National Science Foundation to support programs in mathematical biology. The branch also supports a network for modeling infectious disease agents and programs in systems biology, mathematical biology, investigator-initiated research grants and behavioral and social modeling.

The Division of Cell Biology and Biophysics (CBB) supports research and research training to gain greater understanding of the structure and function of cells, cellular components and the biological macromolecules that make up these components. CBB research support ranges from studies of cellular processes and single molecules to high-resolution structural determination of biological molecules.

Biophysics Branch

This CBB branch supports studies in biophysics, a discipline that uses techniques derived from the physical sciences to examine the structures and properties of biological molecules. A major area of emphasis is structural biology—the determination of protein and nucleic acid structures through X-ray crystallography, nuclear magnetic resonance, electron microscopy, optical microscopy, mass spectroscopy and other physical methods. This branch also supports studies of the physical features that determine macromolecular conformation, analysis of macromolecular interactions and of ligand-macromolecular interactions, bioinformatics as it relates to protein and nucleic acid structure and function, and development and use of theoretical methods to investigate biological systems. In addition, the branch supports the development and refinement of physical methodologies needed to conduct research in the areas described above.

Cell Biology Branch

This CBB branch supports general studies on the molecular and biochemical activities of cells and subcellular components as well as on the role of cellular dysfunction in disease. This research applies to a range of cell types, model systems or disease states that do not fall within the disease-oriented mission of one of the other NIH institutes or centers. Representative studies include those on plasma and intracellular membranes, receptors and signal transduction mechanisms; cytoskeletal structure and function; cell motility; regulation of protein and membrane synthesis and the activation of cell growth; subcellular organelles; cell division; and lipid biochemistry.

Structural Genomics and Proteomics Technology Branch

This CBB branch supports studies that take a genomics or computational approach to determining protein structures and functions. Such research includes the development of high-throughput methods for protein structure determination, bioinformatics as it relates to the analysis of protein structures *en masse*, and the development of mass spectroscopy and other tools for the rapid analysis of biological molecules.

The Division of Genetics and Developmental Biology (GDB) supports research and research training to increase knowledge about the cellular and molecular mechanisms that underlie inheritance and development. Many supported projects make use of model organisms. The division also supports the NIGMS Human Genetic Cell Repository, a collection of more than 11,300 cell lines and 5,700 DNA samples from individuals with genetic disorders or individuals from different population groups.

Genetic Mechanisms Branch

This GDB branch supports studies on DNA and on the flow of information from genetic material (DNA or RNA) to protein. The branch supports studies on the mechanisms and regulation of basic cellular processes including DNA and RNA replication, DNA recombination and repair, transcription and function of coding and noncoding RNA, RNA processing and protein synthesis. Studies that investigate interactions among these processes are also supported. Consistent with its focus on DNA, the branch supports studies of population genetics, evolution and the genetic basis of human biology. The emphasis is on the general principles governing these processes rather than on the expression of specific genes in relation to organismal phenotypes or disease.

Developmental and Cellular Processes Branch

This GDB branch supports studies on the genetic and biochemical pathways that cells utilize in development and in normal physiological processes. The research supported by the branch spans the spectrum from the genetic basis of development and cell function to biochemical signaling pathways that underlie normal cell physiology. The branch supports studies of cell cycle control; mechanisms of cell death; regulation of cell growth, differentiation and homeostasis; adaptive responses to stress and nutrients; stem cell biology; microbial symbiotic relationships and community ecology; developmental genetics; neurogenetics and the genetics of behavior; and chromosome structure and epigenetic regulation of gene expression.

The Division of Pharmacology, Physiology, and Biological Chemistry (PPBC) supports research and research training that takes a multifaceted approach to solving problems in pharmacology, physiology, biochemistry and biorelated chemistry that are either very basic in nature or that have implications for more than one disease area.

Pharmacological and Physiological Sciences Branch

This PPBC branch supports research in pharmacology, anesthesiology and the physiological sciences. Studies range from the molecular to the organismal level and can be clinical in nature. Research examines the effects of drugs on the body and the body's effects on drugs, as well as pharmacogenetics/genomics, or how these effects vary among individuals. Studies also investigate the absorption, transport, distribution, metabolism, biotransformation and excretion of drugs as well as drug delivery strategies, determinants of bioavailability, drug-receptor interactions and signal transduction mechanisms. The branch also funds basic and clinical investigations on the total body response to injury, including biochemical and physiological changes induced by trauma, as well as basic molecular immunobiology research that studies fundamental cellular and molecular mechanisms.

Biochemistry and Biorelated Chemistry Branch

This PPBC branch supports basic research in areas of biochemistry, such as enzyme catalysis and regulation, bioenergetics, redox biochemistry and glycoconjugates. It also supports research in areas of biorelated chemistry, such as organic synthesis and methodology, as well as bioinorganic and medicinal chemistry. In addition, the branch supports studies in biotechnology that focus on the development of biological catalysts (including living organisms) for the production of useful chemical compounds, medicinal or diagnostic agents, or probes of biological phenomena.

The Division of Training, Workforce Development, and Diversity (TWD) supports programs that foster research training and the development of a strong and diverse biomedical research workforce. The division funds research training, career development, diversity, and capacity-building activities through a variety of programs at the undergraduate, graduate, postdoctoral, faculty and institutional levels.

Undergraduate and Predoctoral Training Branch

This TWD branch supports research training programs for undergraduate and predoctoral students, including those from populations that traditionally have been underrepresented in the biomedical research workforce.

Postdoctoral Training Branch

This TWD branch supports research training, fellowships and career development programs for postdoctoral scientists. It also supports studies on interventions that promote student interest in research careers, and it provides supplements to research grants that promote scientific workforce diversity by offering research experiences for students at all levels, from high school through the postdoctoral stage.

Capacity Building Branch

This TWD branch offers a number of programs aimed at increasing the research capabilities of institutions and the research competitiveness of faculty at institutions with substantial enrollments of students from underrepresented groups and those in states that historically have not received significant levels of research funding from NIH.

GOAL 1: MAXIMIZE INVESTMENTS IN INVESTIGATOR-INITIATED BIOMEDICAL RESEARCH TO DRIVE FUNDAMENTAL SCIENTIFIC DISCOVERIES THAT ADVANCE UNDERSTANDING OF HUMAN HEALTH AND DISEASE.

Introduction

NIGMS is widely known as NIH's "basic science Institute." The product of basic research is knowledge that creates a strong foundation for the entire scientific enterprise. This foundation includes research in a variety of biomedically relevant scientific disciplines. NIGMS-funded researchers employ diverse experimental models and approaches as they strive to understand how biological systems work at all levels, from molecules and cells to organs, organisms and populations. NIGMS investments in basic research not only advance fundamental knowledge of biological systems, they also underlie many important advances in medicine. Furthermore, NIGMS fosters public health through supporting research in selected clinical areas and through programs that support collaborations between basic and clinical scientists.

Objective 1-1: Invest in and sustain a broad and diverse portfolio of highly meritorious research.

It is impossible to know in advance where and when the next breakthroughs in biomedical research will occur. Fundamental research can have unexpected outcomes and novel applications. For example, basic studies in bacteria spawned the multi-billion-dollar biotechnology industry and continue to provide new tools and approaches for both basic and translational research. To maximize the opportunities for important advances, NIGMS supports diverse studies in a wide array of scientific areas that encompass its broad mission, from fundamental chemistry and biology to selected aspects of clinical and behavioral research. The Institute will focus on supporting investigator-initiated research, in which the curiosity and creativity of individual scientists drives the identification of the most important questions and development of the strategies needed to answer them. NIGMS will also strive to support a research portfolio that is diverse in the broadest sense: in scientific questions and research approaches, in career stages of investigators, in institution types and regions, and in investigators and trainees with a range of individual backgrounds.

Implementation Strategies

1. Support highly meritorious, investigator-initiated research in NIGMS mission areas.
2. Use data-driven analyses to regularly assess the diversity and breadth of the Institute's portfolio.
3. Use funding mechanisms that optimize the scientific return on taxpayers' investments in fundamental biomedical research.
4. Utilize opportunities to collaborate with other NIH institutes, government agencies, external organizations and industry to maximize the impact of NIGMS' investments.

5. Identify appropriate situations and mechanisms to support research cooperation and collaboration among groups of investigators.
6. Support new and early stage scientists to develop the next generation of investigators and ensure the continued vitality of the scientific enterprise.
7. Support opportunities for investigators with diverse backgrounds to pursue biomedical research.

Objective 1-2: Promote the ability of investigators to pursue new research directions, novel scientific insights and innovative ideas.

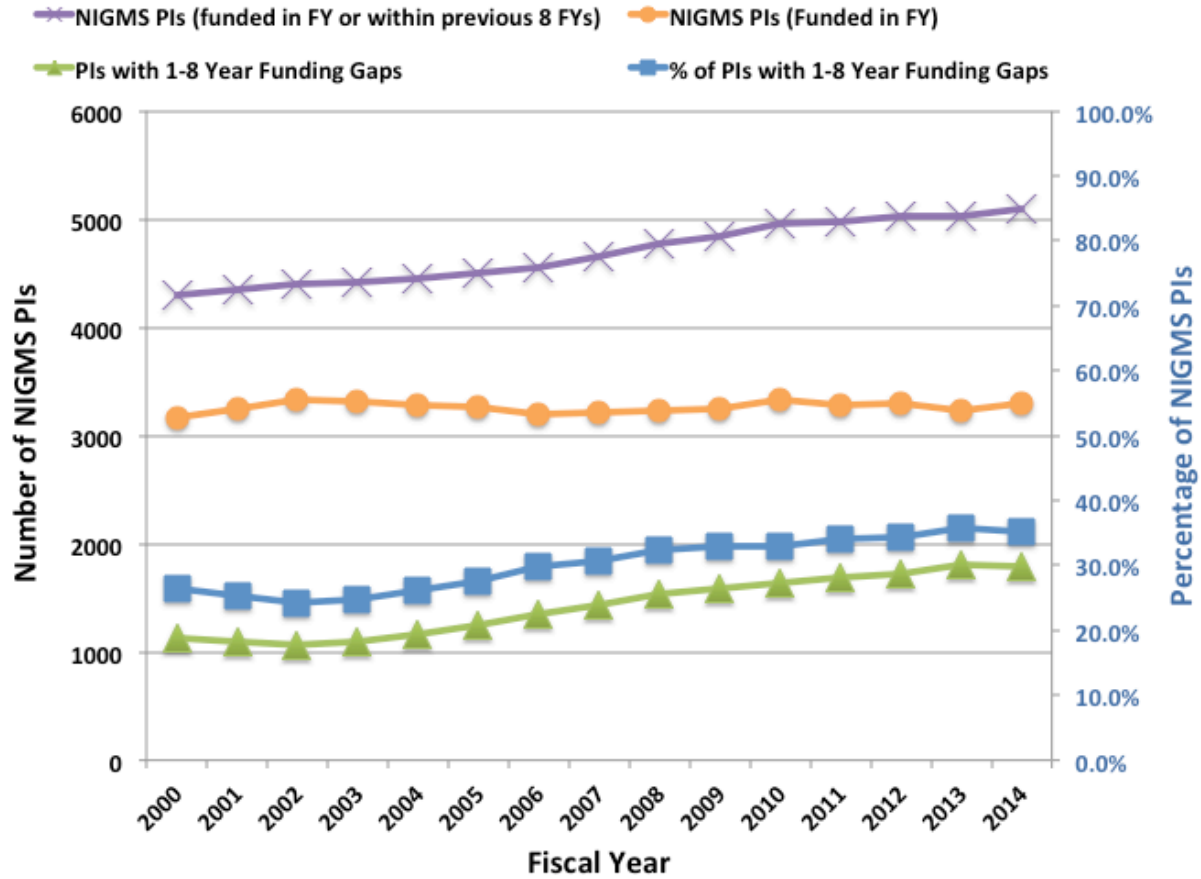
Biomedical research is a dynamic enterprise that creates opportunities to explore new ideas and paradigms while questioning established ones. Providing investigators with the flexibility and support needed to pursue new research directions and novel scientific insights can facilitate important advances. NIGMS will support investigators in the pursuit of novel, creative and flexible lines of work that have the potential to yield important new insights into biological processes and systems.

Effective support for investigator-initiated research must include an examination of current funding approaches and paradigms. To maximize efficiency, effectiveness and return on investment, NIGMS will conduct ongoing evaluations of its research programs, funding mechanisms and overall research portfolio. The results of these analyses will guide the Institute as it adjusts its programs and funding strategies to focus on supporting individual investigators rather than individual projects in response to a constantly evolving scientific landscape.

Implementation Strategies

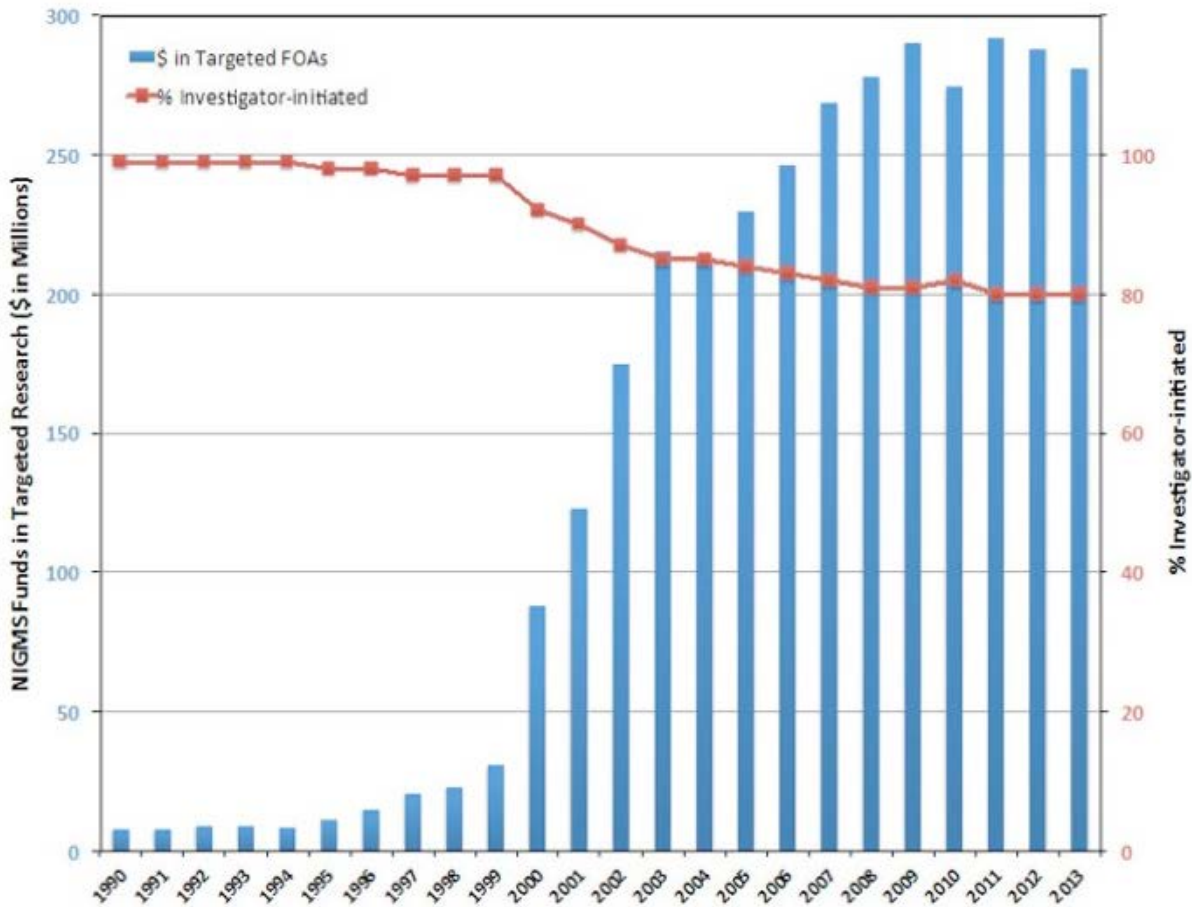
1. Align funding decisions with the need to create a broad and diverse research portfolio that maximizes the scientific return on taxpayers' investments.
2. Support investigators working in underexplored areas of science that are relevant to the NIGMS mission.
3. Conduct regular analyses of NIGMS' scientific investments to assess their efficacy, distribution and impact, and use this information to help guide programmatic and funding decisions.
4. Pilot and assess alternative mechanisms of funding that emphasize individual investigators, rather than individual projects, to better meet NIGMS goals and objectives.
5. Increase the Institute's ability to conduct in-depth portfolio analyses and evaluation activities.

Focusing on Investigators Rather Than Projects



The number of NIGMS principal investigators (PIs) without NIH R01 funding has increased over time. All NIGMS PIs are shown by the purple Xs (left axis). NIGMS PIs who were funded in each fiscal year are represented by the orange circles (left axis). This line is flatter than the top line with purple Xs due to increased turnover. PIs who had no NIH funding in a given fiscal year but had funding from NIGMS within the previous 8 years and were still actively applying for funding within the previous 4 years are shown by the green triangles (left axis); these unfunded PIs have made up an increasingly large percentage of all NIGMS PIs over the past decade (blue squares; right axis).

Reinvigorating a Commitment to Investigator-Initiated Research



As part of its commitment to the stewardship of public funds, NIGMS regularly analyzes the content and distribution of its research portfolio. During the NIH budget doubling period in Fiscal Years 1998-2003, the Institute’s investment in research supported through targeted funding opportunity announcements (FOAs) increased dramatically, then continued to increase at a slower rate during Fiscal Years 2004-2009. Since the budget doubling period ended, however, maintaining steady support for targeted research has made it challenging to maintain an equivalently steady rate of support for investigator-initiated research project grants. To rebalance its portfolio in order to renew and reinvigorate its commitment to investigator-initiated research, NIGMS will reduce its use of targeted FOAs, generally reserving them for cases in which they are likely to have a major impact on a large segment of the biomedical research enterprise. NIGMS will also continue to emphasize a distributed portfolio in which researchers investigate a wide range of scientific questions. By letting scientists “follow their noses”—which involves a combination of curiosity, expertise, creativity and serendipity—NIGMS hopes to create the most productive route to results and findings that will translate over time into medical and technological breakthroughs.

GOAL 2: SUPPORT THE DEVELOPMENT OF A HIGHLY SKILLED, CREATIVE AND DIVERSE BIOMEDICAL RESEARCH WORKFORCE.

Introduction

Training the next generation of biomedical researchers is a fundamental aspect of the NIGMS mission. The Institute uses a variety of mechanisms to support students and trainees during multiple career stages and at varied institutions and educational settings to prepare them for a range of research and research-related careers and to develop a workforce characterized by diversity and excellence. As evidence of its commitment to training, NIGMS supports nearly half of all NIH-sponsored predoctoral students in structured institutional training programs across the country, as well as significant numbers of undergraduates, predoctoral students and postdoctoral trainees on research grants. A key Institute principle is that research training and education programs must promote individual student development. In addition, NIGMS promotes training environments that are broadly inclusive. Students and trainees in such settings acquire important skills and perspectives that enable them to identify and solve problems of societal importance. To advance its goals in research training and education, NIGMS broadly engages its stakeholder communities, because research training is a shared endeavor requiring participation from NIH, academia, industry, mentors and the trainees themselves.

Objective 2-1: Assess Institute research training and education programs and policies to ensure that they achieve positive outcomes related to the NIGMS mission.

NIGMS uses required progress reports for all supported research training and education programs as a way to monitor their performance. The Institute will enhance its program evaluation efforts using regular, data-driven assessments to ensure that its programs and policies advance its mission related to training, diversity and workforce development. Such evaluations guide NIGMS in allocating its research training and education resources to support the most impactful programs at effective levels. Evaluations also enable iterative improvements in the Institute's training, diversity-building and workforce development portfolio. This approach increases responsiveness to changing needs in the biomedical research workforce, avoids duplication of effort and enhances efficiencies in recruitment, retention, diversity-building and mentorship.

Implementation Strategies

1. Develop retrospective and prospective methods to collect outcomes data from research training and education activities.
2. Develop improved analytic methods for use in assessing the efficacy of NIGMS research training and educational programs.
3. Analyze data on key trainee outcomes, including degrees awarded and career trajectories.

4. Use data to guide the development and optimization of research training and education programs.

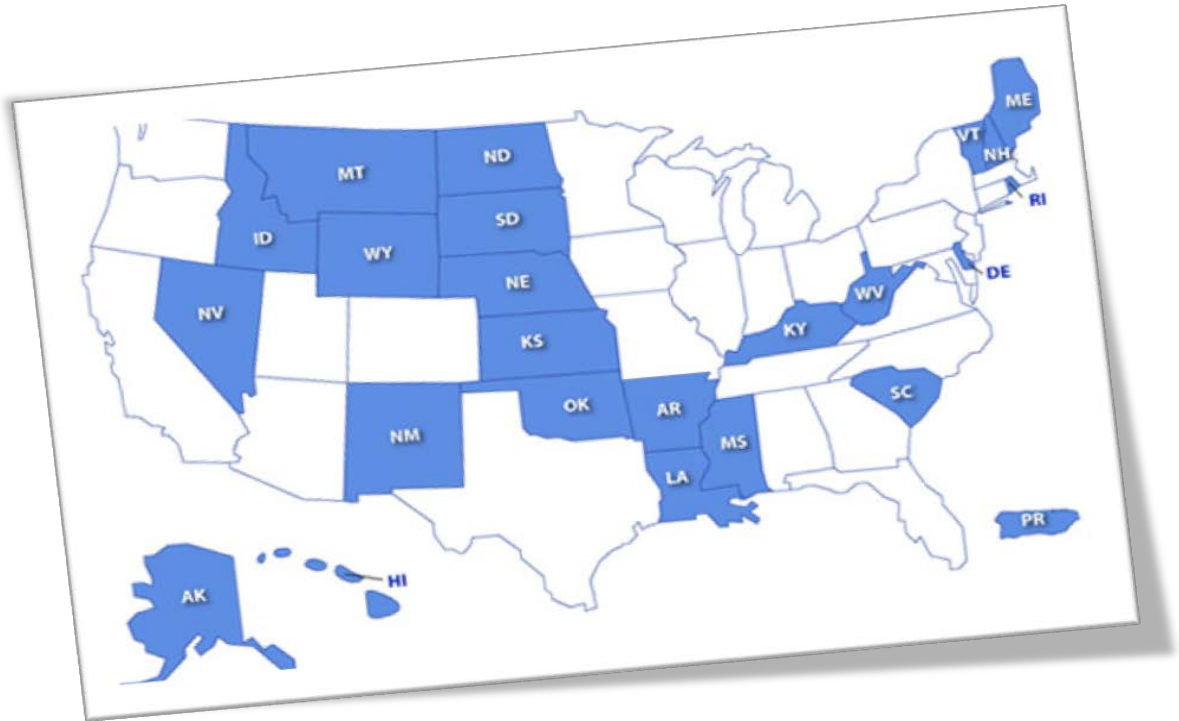
Objective 2-2: Promote the identification of best practices to continually improve the quality of research training activities.

NIGMS recognizes that there is no “one-size-fits-all” approach to research training. Education research and the practices of successful training programs can provide insights into how to develop effective programs tailored to distinct educational levels and career stages. Evidence-based approaches can be used by programs to monitor and improve the recruitment and training of biomedical scientists at all levels. The Institute encourages those who conduct NIGMS-funded research training and education programs to develop and evaluate their practices, and the Institute provides online resources to help applicants develop effective evaluation plans. To ensure maximum return on its research training investment, NIGMS will encourage and assist programs in the dissemination of training practices that have proven to be effective.

Implementation Strategies

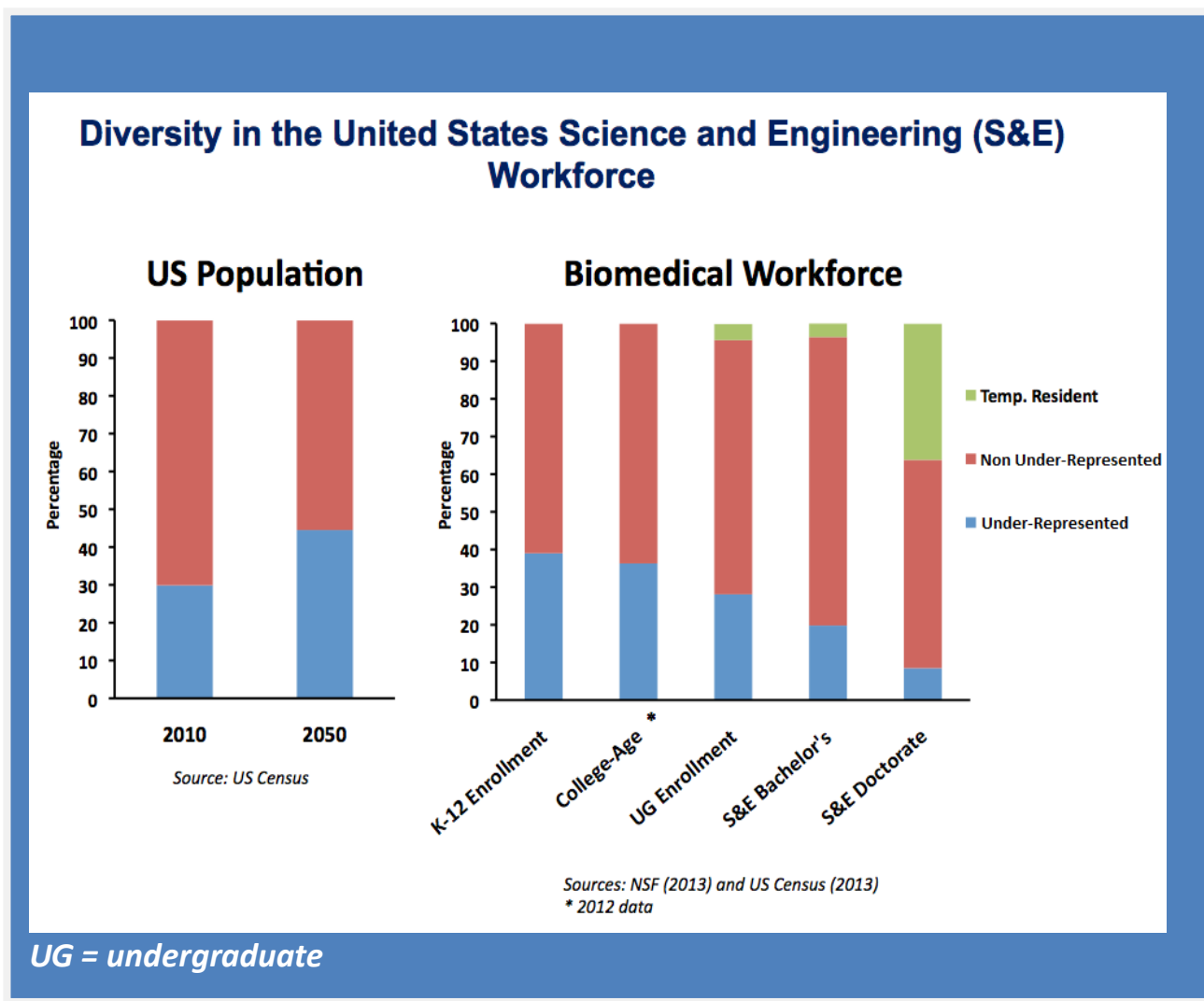
1. Facilitate interactions across the full range of the research training and education community via outreach activities and meetings.
2. Identify and address barriers to the creation of a highly skilled and diverse workforce.
3. Support research training and education programs that facilitate the increased exposure of trainees to the range of possible career options and opportunities and the skills needed to pursue them.
4. Enable the training community to pilot and evaluate new approaches aimed at building student skills and knowledge that will maximize the quality of research.
5. Explore approaches to decrease the overall time required for trainees to reach career goals.

Ensuring Balance and Geographic Diversity of Research Support



The Institutional Development Award (IDeA) program increases the geographic distribution of NIH funding for biomedical research. By supporting programs like IDeA, NIGMS not only enhances geographic diversity, but also stimulates research in states that traditionally have received lower rates of NIH funding. Through IDeA and other programs, NIGMS also increases its outreach to groups that have traditionally been underrepresented in biomedical research, which contributes to a more diverse, innovative and productive workforce.

NIGMS Interest in the Diversity of the Biomedical Workforce



Training the next generation of biomedical researchers is a fundamental aspect of the NIGMS mission, and achieving diversity and inclusion in the biomedical workforce is critical to meeting national research goals. Although the U.S. population continues to become more diverse, the biomedical research workforce has not kept pace. Because predicting the scientific areas rich for breakthroughs remains challenging, NIGMS aims to support a diversity of research and researchers likely to provide the foundation for future discovery, relying upon the creativity offered by a wide range of skill sets, backgrounds and viewpoints. For these reasons, NIGMS invests substantially in research training and education programs designed to develop talented individuals at multiple career levels, from underrepresented groups and at under-resourced institutions and states. Fostering diversity and inclusion in training will lead to a biomedical workforce that maximizes scientific innovation, enhances global competitiveness and contributes to robust learning environments.

Supporting a Full Spectrum of Training Programs

NIGMS supports a variety of programs that foster both research training and the development of a highly skilled and diverse biomedical workforce. A range of programs are needed to meet the needs of the varied institutions and communities NIGMS serves. The Institute funds research training, career development, diversity and capacity-building activities through programs at the undergraduate, graduate, postdoctoral and faculty levels. Information on all NIGMS-supported training programs can be found at <http://www.nigms.nih.gov/Training>.

| Educational Spectrum of NIGMS Training Programs | | | |
|--|-----------------|-----------------------|-----------------------|
| College | Graduate School | Postdoctoral Training | Professional Position |
| MARC U-STAR | NRSA T awards | NRSA T and F awards | SCORE |
| | NRSA F awards | IRACDA | |
| | PREP | | |
| BRIDGES | | K99/R00 | |
| RISE | | | |
| IMSD | | | |
| Diversity Supplement Program | | | |
| Institutional Development Awards (IDeA) | | | |

GOAL 3: SUPPORT THE DEVELOPMENT OF AND ACCESS TO ESSENTIAL RESEARCH TOOLS, RESOURCES AND CAPABILITIES FOR BIOMEDICAL RESEARCH.

Introduction

NIGMS seeks to advance the nation's capabilities for biomedical research and to enable the broadest possible community of scientists to create, expand and apply knowledge that leads to the improvement of human health. The Institute will continue to use a variety of approaches to advance the research capabilities of faculty and institutions and to ensure access to critical, shared research resources and technologies. One approach to achieving this goal is to support the development, maintenance and accessibility of high-quality technologies and research resources, including laboratory and computational tools and technologies as well as reagent, biological and database resources. Such new technologies enable scientific advances that, in turn, drive the development of additional technologies. Ensuring cost-effective, sustainable access to critical research resources is an NIGMS priority. The Institute, alone and in partnership with other NIH institutes and federal agencies, also fosters the establishment of standards to maximize resource usefulness and accessibility. Finally, NIGMS works to expand research capacities by targeted support for improvements in research infrastructure and environments that promote the success of faculty and institutions.

Objective 3-1: Support access to essential research resources and the development of new technologies that enable novel scientific advances.

NIGMS will continue to promote the development, maintenance and evaluation of the nation's biomedical research resource infrastructure. Scientists need powerful tools, methods and approaches to advance biomedical research, but a commercial market for these cutting-edge technologies does not always exist. NIGMS takes a leadership role in the development of a broadly based infrastructure of cutting-edge and productive research resource facilities. The Institute will continue to support technology research and development that benefits research within and across scientific domain areas. To ensure the efficient use of taxpayer funds, NIGMS will routinely evaluate current resource operations, carefully assess new technical opportunities and seek to create economies of scale by supporting shared regional and national resources.

Implementation Strategies

1. Assess existing NIGMS-supported resource operations to ensure that they are meeting the current and foreseeable needs of the scientific community.
2. Through interaction with the scientific community and review of the scientific literature, identify gaps in available research resources and technologies.
3. Collaborate with other NIH, federal and philanthropic entities in developing approaches for the sustainable support of valuable research resources, including databases.

4. Employ an appropriate range of funding mechanisms to optimally support technology development related to the NIGMS mission.

Objective 3-2: Continue the development of institutional research capacities and communities.

Developing the capacity for research involves providing a high-quality physical and technological infrastructure as well as fostering an environment that attracts and supports a scientific workforce that is highly skilled, collaborative and multidisciplinary. NIGMS will facilitate the development of the infrastructure needed to conduct basic, clinical and translational research, particularly at institutions with substantial enrollments of students from underrepresented groups and in states that historically have not received significant levels of NIH funding. Through these activities, NIGMS will aid institutions in providing strong research environments to address challenging biomedical questions and will promote a broad and diverse biomedical research enterprise.

Implementation Strategies

1. Provide support for institutional research infrastructure enhancement through the IDeA program in IDeA-eligible states.
2. Broaden the community of researchers and institutions that engage in highly meritorious biomedical research.
3. Enhance the research and training environment at institutions by supporting faculty development through NIGMS capacity-building programs.

GOAL 4: ADVANCE UNDERSTANDING OF FUNDAMENTAL BIOMEDICAL RESEARCH AND THE NIGMS ROLE IN SUPPORTING IT.

Objective 4-1: Use a broad range of approaches to inform the public about NIGMS goals, activities and results.

Using a variety of communication approaches, channels and partners, NIGMS will develop and distribute information about important scientific findings, the role of basic research and the excitement of careers in science. The Institute will work collaboratively with various organizations to amplify and reinforce these messages.

Implementation Strategies

1. Communicate with the public about NIGMS-supported research advances and their potential impact on human health.
2. Communicate with educator and student audiences about careers in science.

Objective 4-2: Continue to engage in an open dialogue with the scientific community and other stakeholders about NIGMS programs, processes and policies.

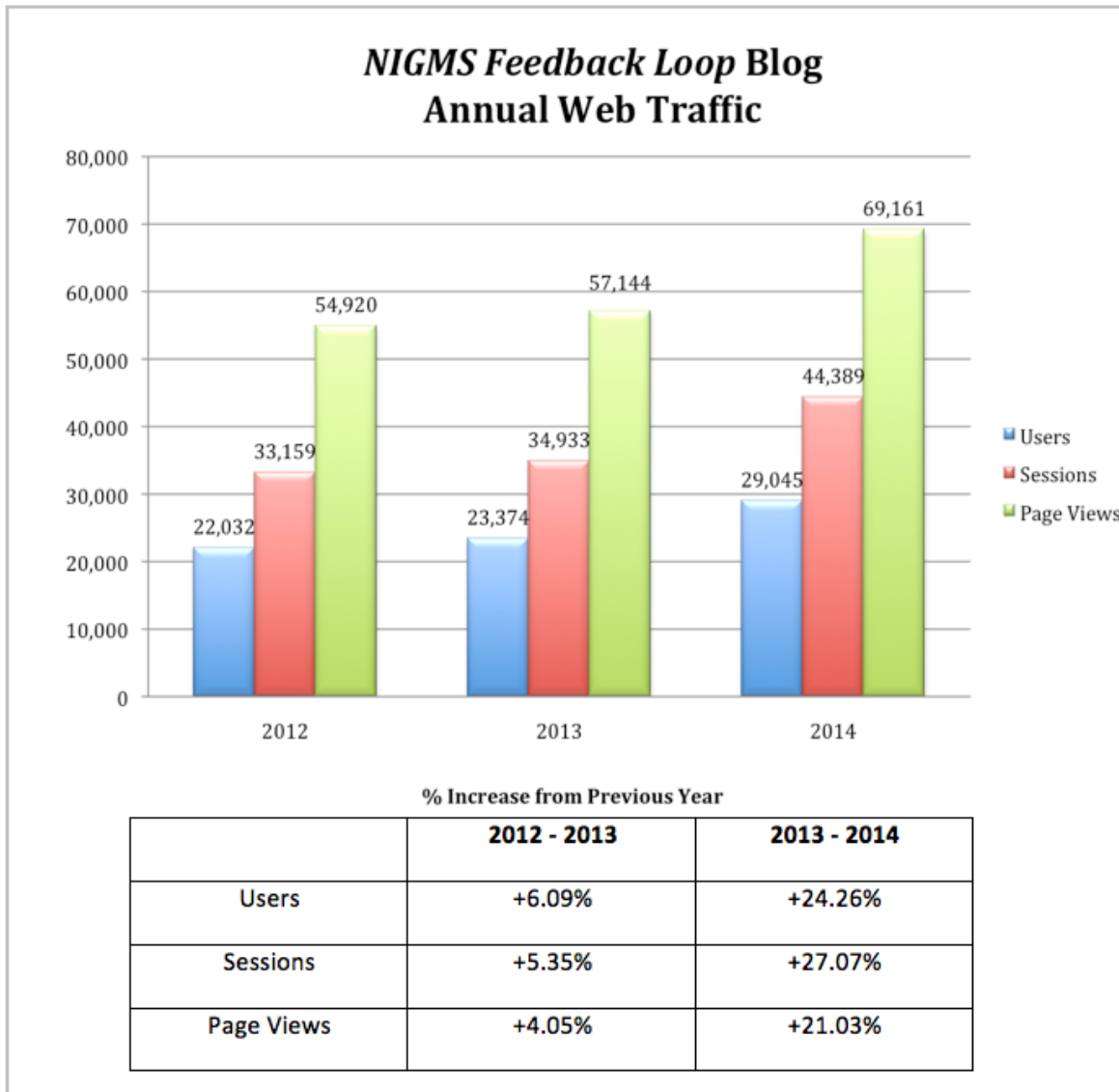
NIGMS seeks to communicate Institute programs and policies broadly and effectively and to invite and respond to feedback from its constituents. NIGMS will continue its bidirectional conversation with the scientific community and other stakeholders in a variety of ways. These range from program directors discussing ideas with individual scientists to online forums to meetings with professional societies.

Implementation Strategies

1. Communicate with the scientific community, including investigators and trainees at all levels, grantee organizations, scientific and professional societies and relevant industries, about NIGMS programs, processes and policies.
2. Encourage feedback from the scientific community and other stakeholders to ensure open dialogue.
3. Promote interactions of NIGMS staff with the scientific community in order to provide grant-related guidance and to seek input on NIGMS policies and practices.
4. Communicate NIGMS research training and education goals to potential applicants and peer reviewers.
5. Work closely with stakeholders to develop strategies for overcoming challenges and for ways to capitalize on opportunities.

Engaging the Scientific Community

Communication is a cornerstone of the scientific enterprise. NIGMS employs various means to engage and interact with the public, the scientific community and other stakeholders. The *NIGMS Feedback Loop* blog, for instance, is a popular forum for dialogue. It alerts researchers to NIGMS funding opportunities, trends and plans, and it encourages input and feedback on Institute activities.



The *NIGMS Feedback Loop* (<http://loop.nigms.nih.gov>) is distributed by e-mail to more than 23,000 NIGMS grantees, applicants and other stakeholders. The data presented above reflect traffic to the *NIGMS Feedback Loop* Web site over and above that baseline. Since its launch in 2009, the blog has had 453 posts contributed by 71 NIGMS staff members as well as more than 1,000 moderated comments on a range of topics, including NIGMS policies, programs, funding opportunities and trends, and resources.

GOAL 5: PROMOTE THE EFFICIENT USE OF HUMAN RESOURCES AND BUSINESS PRACTICES TO ADVANCE THE NIGMS MISSION.

Introduction

In a typical fiscal year, NIGMS awards and manages more than 4,500 grants and reviews nearly 1,000 grant applications (in addition to those reviewed by NIH's Center for Scientific Review), relying on the efforts of its dedicated staff to accomplish these core activities. NIGMS is committed to deepening the capabilities of its staff and embracing an inclusive and ever-changing workforce. The Institute will continue to support ongoing staff training, encourage participation in professional development activities and pursue organizational agility to ensure optimal work performance. Also, as federal regulations, NIH policies and NIGMS procedures change, the Institute will review business practices to ensure efficient operations.

Objective 5-1: Foster a proficient, diverse and collegial NIGMS workforce.

In order to build a knowledgeable, skilled and inclusive workforce that is aligned with the Institute's mission and the breadth of science that NIGMS supports, ongoing training of staff and organizational agility are necessary to ensure optimal work performance.

Implementation Strategies

1. Optimize staffing to meet the needs of the Institute.
2. Ensure continued professional development.

Objective 5-2: Maximize the efficiency of NIGMS operations by continuously assessing, identifying and applying the most effective business practices.

For NIGMS to function most effectively, the efficiency of its business practices must be optimized to provide staff with an open and collaborative environment, up-to-date information technology tools and services, flexible approaches to manage changing workloads, and robust data collection and analysis methods to guide data-driven decision making.

Implementation Strategies

1. Ensure up-to-date information technology infrastructure platforms that facilitate workflow.
2. Enhance internal operating procedures to maximize the efficiency of NIGMS business practices.

Objective 5-3: Develop and maintain cooperative and synergistic partnerships with other NIH institutes and centers, other federal agencies and other organizations.

Implementation Strategies

1. Identify areas of common interest in which partnering would increase the efficiency of funding and/or the accomplishment of the NIGMS mission.
2. Collaborate with other NIH and federal entities to continuously improve business processes.