Perspective: Late-Stage (T4) Translation Research and Implementation Science: The National Heart, Lung, and Blood Institute Strategic Vision

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In August 2016, the National Heart, Lung, and Blood Institute (NHLBI) released its Strategic Vision for charting a course for research over the next decade. This vision was the culmination of an unprecedented process that engaged diverse stakeholders from across the United States and around the globe. The process resulted in four mission-oriented goals and eight strategic objectives that provide an overall framework for advancing research in heart, lung, and blood diseases and sleep disorders. In this perspective, we address opportunities that NHLBI has identified to advance late-stage (T4) translation research, implementation science, health inequities research, global health research, and related research workforce development. Additionally, we highlight the importance of continued active engagement of the clinical and public health research community and the strategic, transdisciplinary, cross-sector partnerships necessary for advancing research priorities to maximize the population-level outcomes and health impact of scientific discoveries. *Ethn Dis*. 2017;27(4):367-370; doi:10.18865/ed.27.4.367.

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The NHLBI Strategic Vision

The National Heart, Lung, and Blood Institute (NHLBI) has provided global leadership for scientific research advances that have fueled remarkable health gains for nearly 70 years. To build on this legacy and chart a course for future research over the next decade, NHLBI initiated an unprecedented strategic visioning process that engaged diverse stakeholders from across the United States and around the globe.[1] The resulting Strategic Vision has four mission-oriented goals that guide research opportunities and eight strategic objectives.[2]

As shown in Figure 1, the four goals include: 1) the molecular, cellular, and physiological mechanisms governing normal function in heart, lung, blood, and sleep (HLBS) health; 2) the pathobiological basis of HLBS diseases and disorders; 3) research translation across the entire research spectrum from fundamental basic discoveries to population health impact; and 4) the development of a diverse biomedical workforce. Figure 1 also shows the eight strategic objectives that reflect one or more of the four mission-oriented strategic goals and generally explore both biological and non-biological contributors to health and disease.[2]

The NHLBI Center for Translation Research and Implementation Science

The Center for Translation Research and Implementation Science (CTRIS) at NHLBI serves as a strategic focal point for advancing late-stage (T4) translation research, which focuses on population-level outcomes,[3] and implementation science in alignment with the NHLBI Strategic Vision. Additionally, CTRIS addresses health inequities research, global health research, and workforce development in HLBS diseases and disorders. This perspective highlights related aspects of the Strategic Vision within the core mission areas of CTRIS that may be of particular interest to clinical and public health researchers.

Increasingly, it has become recognized that the remarkable successes demonstrated in fundamental discovery science and early-stage translational research stand in sharp contrast to the limited findings from late-stage translational research, especially the T4 phase.[4] One contributing barrier creating this limitation is the lack

of consistent terminology and clear operational definitions used in late-stage translational research. NHLBI is committed to advancing work on the terminology, frameworks, metrics, and outcomes needed in T4 research in clinical and public health settings. The Strategic Vision emphasizes the importance of research to generate new knowledge, including new practice-based evidence for successful and sustained implementation of proven-effective interventions. Similarly, research to advance de-implementation of practices that provide little or no added value and the timely progression from discovery to implementation, scale-up, and spread of effective interventions aligns strongly with the NHLBI Strategic Vision and objectives.[2]

The Strategic Vision emphasizes the importance of research to generate new knowledge, including new practice-based evidence for successful and sustained implementation of proven-effective interventions.

The Strategic Vision also underscores the importance of team science that advances synergy among diverse professionals from biomedical, behavioral, and social science research as well as experts from engineering, bioinformatics, behavioral economics, and the emerging field of big data science. Strategies that leverage stakeholders at the convergence of implementation science, precision medicine, and the learning health care system will be invaluable.[5] Opportunities that facilitate the rigorous design, execution, and evaluation of large, relatively inexpensive pragmatic trials in the adoption, scale-up, and spread of proven-effective interventions hold great promise.

Although rigorous systematic evidence reviews and trustworthy clinical guidelines exist, adherence from patient and provider perspectives remains suboptimal. In addition, few studies have used validated implementation frameworks and outcomes to assess strategies for improving guideline adherence, scale-up, and sustainment for the prevention and treatment of HLBS disorders, or for de-implementation of ineffective, unproven, or outdated practices. The Strategic Vision recognizes these challenges as priorities for clinical and public health research and focuses its vision on four areas: health inequities research; global health research; research and training of a diverse scientific workforce; and maximizing population health impact, as we describe below.

Health Inequities Research

Despite notable improvements in the overall health of the United States during the past half-century, health inequities have persisted.[6] There is a critical need to advance health inequities research in HLBS diseases and disorders such as hypertension, asthma, chronic lung disease, and sickle cell disease. At the same time, a growing interest has emerged to tackle the rising burden of HLBS diseases and disorders as comorbidities of HIV infection. Community-engaged research, aligned with community needs and priorities, facilitates the adoption and translation of research findings to maximize health impact. Importantly, implementation and scale-up of evidence-based strategies and approaches also have the potential to reduce disparities in health outcomes in populations in the United States and across the globe.

Global Health Research

Compelling evidence suggests that, in aggregate, health is improving across the globe with dramatic declines in mortality and morbidity in high-income countries but not in many low- and middle-income countries (LMICs).[7] The NHLBI seeks to support innovative research that has the potential to reduce the burden of HLBS diseases in LMICs.[8] T4 translation research conducted in LMICs offers unique opportunities to understand key barriers in the adoption, scale-up and sustainment of evidence-based interventions valuable in LMICs as well as in low-resource settings in high-income countries. Research that galvanizes patients, non-governmental organizations, academia and ministries of health and finance together has the potential to find sustainable solutions tailored to context. Similarly, research partnerships with key national and international organizations, such as the World Health Organization (WHO), expand the knowledge base for adoption, adaptation, dissemination, and scale-up of best practices and attract valuable investments in global health programming.[9]

Research Training and Development of a Diverse Scientific Workforce

The Strategic Vision recognizes that basic, clinical, and translational research

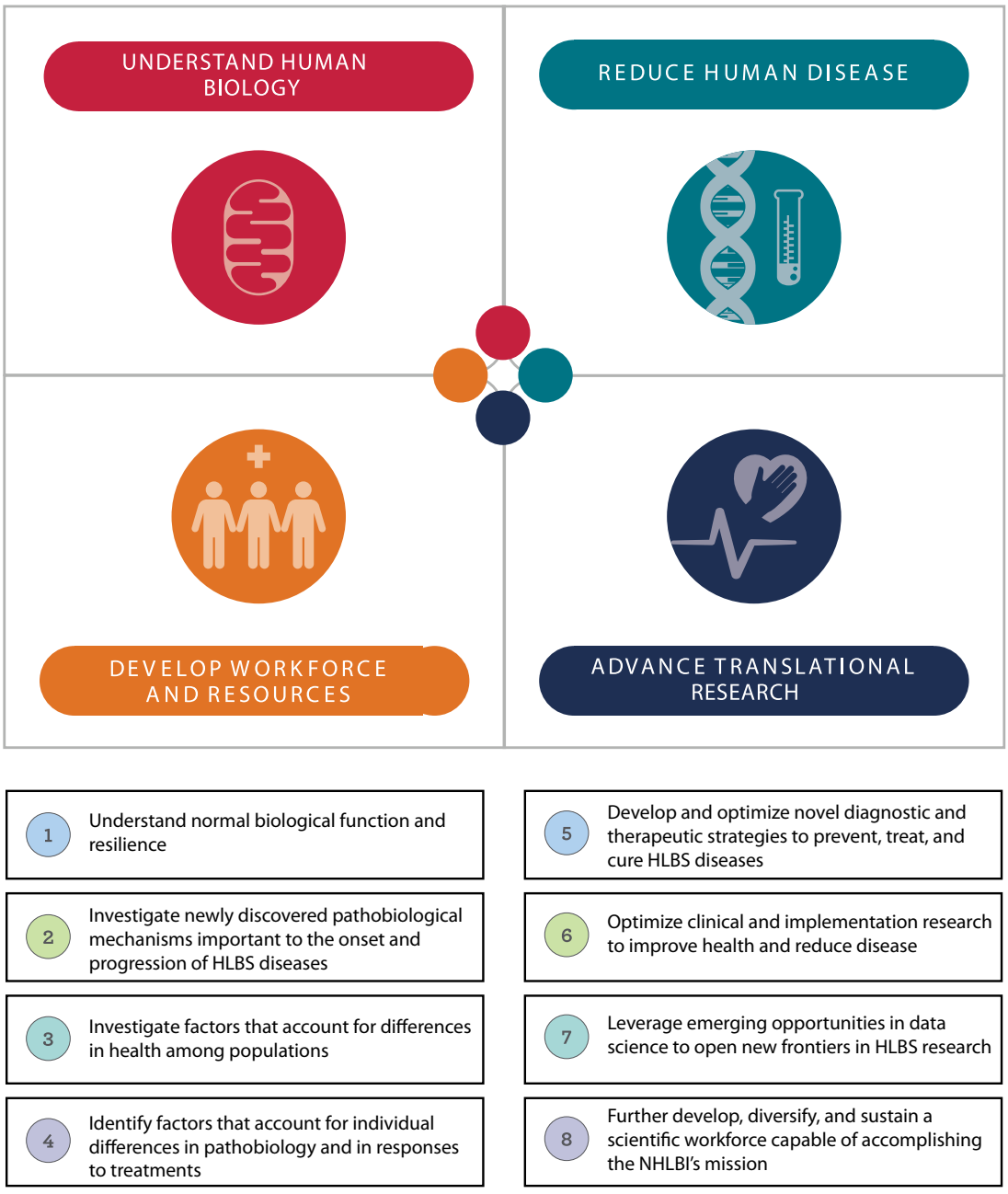

Figure 1. The National Heart, Lung, and Blood Institute Strategic Vision
The four goals and eight strategic objectives provide a framework for moving heart, lung, blood, and sleep (HLBS) science forward. Strategic Objective #3 addresses health equity while objectives #6, #7, and #8 represent the part of the framework where implementation science expertise is particularly needed to advance HLBS science in late-stage T4 translation research. Reproduced from The National Heart, Lung, and Blood Institute, 2016. *NHLBI Strategic Vision: Charting the Future Together*. https://www.nhlbi.nih.gov/about/documents/strategic-vision.

training efforts are still often performed in isolation or within silos based on specific diseases or disciplines, lacking collaboration or a productive team science approach. Emerging implementation research competencies using state-of-the-art frameworks in cultural contexts will be important to address both domestic and global health research workforce needs. Developing a cadre of T4 translation researchers will require transdisciplinary mentoring approaches that

promote cross-training with traditional and non-traditional expert mentors in real-world settings. In global health research, bi-directional mentoring and learning between United States and global settings have demonstrated great value. Research career development programs across NIH, other agencies, and public-private partnerships need to include training in methods for late-stage T4 translation research and team science including engagement with communities and stakeholder organizations. The identification of academic and non-academic partners, mentors, and implementers with diverse skill sets across disciplines, departments and organizations (eg, business/economics, informatics, public health, medicine, engineering, education, and nursing) are among the hallmarks of implementation team science and an innovative T4 translation research training program.

Maximizing Population Health Impact

We are poised to maximize the population-level impact of turning research discoveries into improved health outcomes. Maximizing population health impact of these research discoveries is highly feasible through the strategic priorities described here for implementation science, health inequities research, global research, and research training. The NHLBI looks forward to active engagement of clinical, public health, and the entire scientific research community as we chart the future for late-stage (T4) translation research and implementation science to maximize population health impact on HLBS diseases, disorders, and related disparities in the United States and abroad.

Conclusions

The four mission-driven goals and eight strategic objectives of the NHLBI Strategic Vision set the research agenda and provide a framework for advancing research in HLBS diseases and disorders through 2025. The strategic vision also provides an opportunity to advance an evidence-based elimination of health inequities in HLBS diseases and disorders. As the strategic focal point at NHLBI to accelerate the process of turning discovery science into health impact, CTRIS stands ready and committed to work with biomedical, behavioral, and social science research investigators as well as dissemination and implementation researchers to help execute the NHLBI Strategic Vision. We look forward to working with the full spectrum of basic, clinical, translational, and population science investigators as well as strategic partners in the public health research community as we chart our future together over the next decade.

Disclaimer

The views expressed in this article are those of the authors and do not necessarily represent the views of the National Institutes of Health or the United States Department of Health and Human Services.

Conflict of Interest

No conflicts of interest to report.

Author Contributions

Research concept and design: Boyce, Price, Engelgau, Mensah; Acquisition of data: Price, Mishoe, Engelgau; Data analysis and interpretation: Mishoe, Engelgau, Mensah; Manuscript draft: Mensah, Boyce, Price, Mishoe, Engelgau; Administrative: Mensah, Boyce, Price, Mishoe, Engelgau; Supervision: Mensah

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