

Hearing and Speech Research at the NIDCD

Debara L. Tucci

Introduction

From my position as director of the National Institute on Deafness and Other Communication Disorders (NIDCD) at the National Institutes of Health (NIH; Bethesda, MD), I am proud to lead an outstanding group of scientists and administrators who share my passion for scientific discovery and advancing public health in three program areas: hearing and balance; taste and smell; and voice, speech, and language. Our broad research portfolio of basic, translational, clinical, and public health research focuses on human communication and associated disorders.

At least 46 million people in the United States have a hearing or other communication disorder. I have dedicated my career to understanding the causes and impact of hearing loss and to developing treatments to restore hearing. Over my many years of clinical practice as an otolaryngologist surgeon-scientist, including more than 25 years at Duke University Medical Center (Durham, NC) where I cofounded the Duke Hearing Center and directed the medical center's cochlear implant program, I was privileged to care for and help many individuals with ear, hearing, and balance problems. I was also frustrated that our scientific understanding was insufficient to successfully treat every patient I encountered. As NIDCD director, it is gratifying to me to now guide the institute's exceptional biomedical workforce. I truly believe the research funded by our institute will continue to improve many lives in meaningful ways.

NIDCD: Three Decades of Discovery and Advancement

Over its 32-year history (available at bit.ly/3nGuuq3), NIDCD-supported researchers have made seminal advances in understanding the basic biology of sensory systems and disease mechanisms leading to increasingly effective, evidence-based treatments. Extraordinary research opportunities have led to scientific breakthroughs in the study of genes, proteins, cellular and molecular processes, neural circuits, and sensory and motor systems that directly affect our understanding

of communication disorders. Current NIDCD-funded research promises to advance science in ways that directly impact patient care. Some examples include

- developing improved treatments for otitis media (middle ear infections);
- identifying and characterizing genes responsible for hereditary hearing impairment;
- studying genes associated with tumors affecting human communication;
- investigating gene therapy for treating hearing loss and dizziness;
- exploring the genetic bases of child language disorders as well as characterizing the linguistic and cognitive deficits in children and adults with language disorders;
- identifying biomedical and behavioral issues associated with communication impairment and disorders;
- researching improvements to assistive device technology that benefits those with hearing loss; and
- engineering a “thoughts into speech” algorithm for assistive communication devices to help people with amyotrophic lateral sclerosis, stroke, or neurodegenerative disease regain their ability to communicate.

NIDCD research has informed a practice that many now recognize as routine, universal newborn hearing screenings, and has supported research that helps us better understand the role taste and smell play in nutrition and health. Our national education campaign, “It’s A Noisy Planet. Protect Their Hearing.”[®] (available at noisyplanet.nidcd.nih.gov), has educated millions of teens, parents, and teachers about noise-induced hearing loss and how to prevent it. And our commitment to research that improves access to affordable hearing health care will help many Americans with hearing loss who could benefit from assistive hearing devices, such as hearing aids, but currently can’t afford them.

NIDCD Budget and Spending Overview

For fiscal year (FY) 2020, Congress appropriated approximately \$491 million to the NIDCD. This appropriation represents about 1.2% of NIH’s total budget

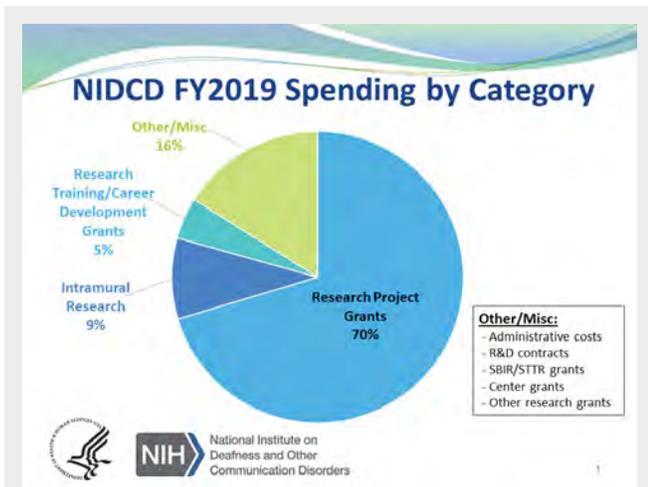


Figure 1. This chart shows National Institute on Deafness and Other Communication Disorders (NIDCD) fiscal year (FY) 2019 spending by category: 70% research project grants; 16% other/miscellaneous, including administrative costs, research and development (R&D) contracts, Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) contracts, Center grants, and other research grants; 9% intramural research; and 5% research training/career development grants.

(\$41.7 billion). NIDCD FY2020 appropriations are a 3.4% increase over the FY2019 budget.

Figure 1 shows an overview of FY2019 spending (the latest available) by category/funding mechanisms for intramural and extramural research programs. *Intramural* research is research conducted by scientists at NIH. *Extramural* research is research conducted by scientists at US and international research centers, universities, and medical centers.

Figure 2 notes the percentage of FY2019 intramural and extramural research spending for each of our seven mission areas.

A Broad Focus for NIDCD Funding Opportunities

The NIDCD distributes its resources among many diverse programs and mechanisms. The institute is committed to funding the largest number of meritorious projects possible while allowing the flexibility needed to support selected program priorities and respond to emerging scientific opportunities. Our funding applicants and grantees represent diverse professional and academic programs, from biology and medicine to engineering,

physics, and mathematics — that address research questions relevant to the NIDCD’s multidisciplinary mission.

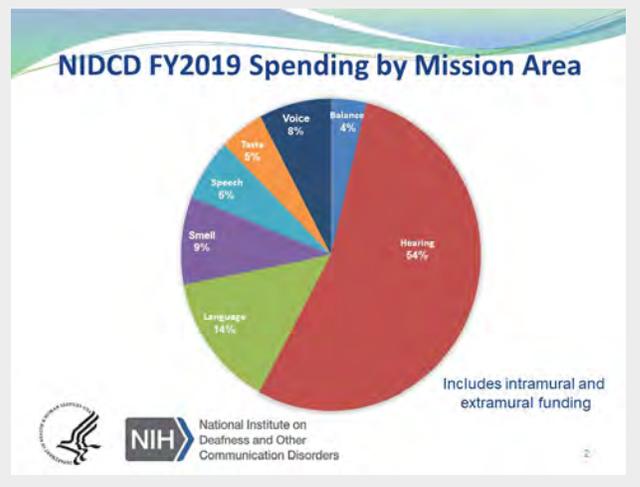
Examples of NIDCD support that may interest applicants from traditional and nontraditional biomedical fields include the NIDCD Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. These funding mechanisms aim to stimulate technology and research innovation with a potential for product commercialization. VocaliD is a personalized-voice product designed by NIDCD voice scientists and is now available to people with severely impaired speech. The device blends the speech of two individuals, a donor and a recipient, to recreate the recipient’s natural voice.

The NIDCD establishes general guidelines for funding based on scientific merit, responsiveness to the institute’s priorities, and availability of funds. I encourage individuals from nontraditional and traditional biomedical areas connected to our program areas to consider NIDCD as a source for research support. Please see our guidelines for more information about our funding opportunities (available at www.nidcd.nih.gov/funding).

Training the Next Generation for Success

We continue the NIDCD’s long commitment to a research environment that supports scientists in a variety of related disciplines and at all stages of their professional

Figure 2. This chart represents the percentage of FY2019 funding across the 7 mission areas of the NIDCD: 54% for hearing, 4% for balance, 5% for taste, 9% for smell, 8% for voice, 6% for speech, and 14% for language.



careers. My hope is that trainees funded by the NIDCD will subsequently submit successful career development applications and continue a trajectory to productive and fulfilling research careers. As an otolaryngologist surgeon-scientist, I am committed to training the next generation of otolaryngologist researchers (available at bit.ly/NIDCD_OSSP) who can leverage their unique clinical experience and research skills to address important questions in human disease and disorders.

The NIDCD supports a variety of grant mechanisms that are tailored to support different stages of professional career development. Support for investigators who have received their terminal education degrees within the past 10 years (early-stage investigators; ESIs) is reflective of our commitment to early career development. The institute has a long history of supporting ESIs through special programs, including the Early Career Research Award (ECR R21), and an expedited review of predoctoral and postdoctoral fellowship applications. Our training programs are designed to support the next generation of scientists and other professionals who will address tomorrow's expanding health care needs. I encourage you to peruse our extensive research training and career development opportunities at the NIDCD website (available at www.nidcd.nih.gov/training).

Commitment of the NIDCD to a Diverse Biomedical Workforce

The NIDCD has diligently worked to increase the diversity of the research pipeline across our mission areas. When scientists and trainees from different backgrounds work together, their unique perspectives and experiences stimulate creativity and innovation, yielding higher quality research than less diverse teams (available at bit.ly/3nJ4zhC). Importantly, diverse research teams are more likely to ensure that members of underserved populations will support and participate in research and that the research we invest in addresses questions that are meaningful to these communities. Increasing scientists' understanding of disparate groups benefits us all and is at the core of the NIH mission: *to uncover new knowledge that will lead to better health for everyone*. Deafness and other communication disorders, after all, cross all cultural, racial, and gender boundaries. Despite these efforts, however, the proportion of investigators receiving funding in our mission areas who are members of underrepresented minority groups remains small.

To affirm the NIDCD's commitment to inclusive excellence and our resolve to both embrace and enable the contributions of a diverse scientific workforce, I initiated several steps to ensure that our commitment has an impact. Together with our scientific advisory council and other stakeholders, the NIDCD is exploring how we can most effectively engage underrepresented minority scientists throughout their careers and support training, mentoring, and leadership development programs to ensure a robust and diverse workforce. Furthermore, we are looking at how best to increase participation of underrepresented minority populations in research studies in our mission areas.

Supporting Research Toward Affordable, Accessible Hearing Health Care and Improving Global Hearing Health

Approximately 15% of US adults report some degree of hearing loss. Untreated hearing loss is a significant public health issue. Higher total health care costs, a higher risk of dementia and cognitive decline, falls, depression, and a lower quality of life have been associated with untreated hearing loss in older adults (Deal et al., 2019). As the lead federal agency supporting research to prevent, detect, and treat hearing loss, the NIDCD supports initiatives to improve access to affordable hearing health care (available at bit.ly/330QIeE). One example is NIDCD's contributions to and major support for the National Academies of Sciences, Engineering, and Medicine consensus study, "Hearing Health Care for Adults: Priorities for Improving Access and Affordability" (2016). Cosponsored by the NIH through the NIDCD and the National Institute on Aging, as well as four other federal agencies and a non-profit patient advocacy group, the study concluded that the diverse needs of adults with hearing loss were not being met. As a result, one of the independent panel's 12 recommendations for improving adult hearing health care was for the Food and Drug Administration (FDA) to create and regulate a new category of over-the-counter (OTC) hearing devices for adults with mild-to-moderate hearing loss. These products are expected to come to market soon, pending release by the FDA of the final regulations for guidelines and quality standards. Additionally, a small-business research grant from the NIDCD led to the first self-fitting hearing aid approved by the FDA in 2018. The NIDCD remains committed to improving the landscape of adult hearing health care and encourages continued research to fill remaining gaps.

HEARING AND SPEECH RESEARCH

Global hearing health care is another NIDCD priority and one that also embraces multidisciplinary approaches. I cochair The Lancet Commission on Hearing Loss (available at globalhearinglosscommission.com), which pursues innovative ideas that challenge the accepted thinking on identification and treatment of hearing loss worldwide. The commission seeks to develop creative approaches focused on policy solutions and the use of new technologies and programs to enable those with hearing loss worldwide to be fully integrated into society. We will share our findings in spring 2022. I encourage you to learn more about the NIDCD's commitment to global health (available at bit.ly/3kMEhZL).

NIDCD's Strategic Plan for 2022–2026

One current focus is the development of the institute's strategic plan for 2022–2026. Throughout this process, we are formulating ambitious yet achievable goals for research in our mission areas, goals that will further our scientific understanding of basic biological systems, human disease mechanisms, and promising treatments. We will continue to prioritize accessibility of care and research dissemination as core components of our mission. We are committed to making treatments accessible to all, using a full range of innovative technologies and approaches to help all populations, inclusive of gender, race, ethnicity, socioeconomic status, geographic location, and communication method. We also value our work with the many individuals and groups outside of the NIH who represent those affected by deafness and other communication disorders.

Looking to the Future

I am optimistic that in the coming years we will make tremendous progress in addressing the scientific and clinical challenges related to the mission areas of the NIDCD. I am especially proud of how our workforce successfully navigated pandemic-imposed challenges with dedication and spirit during my first year as NIDCD director. I am excited about continuing this work and commitment with my colleagues in the months and years ahead to apply this energy across our mission areas. Together, we will continue to see the quality of life improved by our research.

References

Deal, J. A., Reed, N. S., Kravetz, A. D., Weinreich, H., Yeh, C., Lin, F. R., and Altan, A. (2019). Incident hearing loss and comorbidity: A longitudinal administrative claims study. *JAMA Otolaryngology-Head & Neck Surgery* 145(1), 36-43. Available at <https://bit.ly/3325NfZ>.

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