POLICY

NIH's transformative opportunities for the behavioral and social sciences

Emerging scientific and technological opportunities, such as new sensor tools that better characterize neurological, behavioral, and social processes, have the potential to produce a scientific paradigm shift in the behavioral and social sciences. This shift from a fragmented data-poor science to an integrated data-rich science facilitates greater translation from basic to applied research and from applied research to clinical practice. In November 2016, the U.S. National Institutes of Health (NIH) Office of Behavioral and Social Sciences Research (OBSSR) released its strategic plan for fiscal years 2017 through 2021, which seeks to take advantage of these scientific and technological developments (1). Here, we outline four key developments that influenced the scientific priorities of the OBSSR strategic plan, each of which offers the potential for accelerating research and translation in the behavioral and social sciences.

INTEGRATING NEUROSCIENCE INTO BEHAVIORAL AND SOCIAL SCIENCES

Advances in neuroscience experimental approaches and technologies provide an ability to observe brain function and activity in real time and with increasing levels of granularity (2), but these brain functions and activities do not occur in isolation; they are influenced by an organism's environment and are expressed as behaviors that, in turn, have the potential to influence the environment. To understand these complex dynamic interactions, the brain must be studied in the context of environmental and social systems. The behavioral and cognitive neurosciences have already invested in this integration, but more progress and expanded attention are needed to further integrate brain functions with higher-level processes (for example, social and cultural neuroscience and neuroeconomics). New transdisciplinary efforts that merge these areas of research hold promise for a more comprehensive research effort that explores the mechanisms of behavior and social phenomena that reside both within and beyond the dura.

TRANSFORMATIONAL ADVANCES IN MEASUREMENT SCIENCE

Advances in measurement science and technology are converging to provide the basis for increasingly accurate measurement that will accelerate new discoveries. The precision and efficiency of self-reported measurement

approaches have been improved greatly by the application of (i) modern psychometric theory (for example, item response theory) and (ii) smartphone technologies to obtain prospective, real-time assessments throughout the course of a day (for example, ecological momentary assessment). Digital footprints from routine interactions of people with technology provide new methods of capturing thought and behavior, and the rapid emergence of sensor technologies has provided an efficient and objective means for assessing physiology, behavior, and social and environmental contexts. The application of these scientific and technological advances to the measurement of behavioral and social processes provides a level of granularity and precision that has the potential to transform the behavioral and social sciences into a much more data-rich science (3).

DIGITAL INTERVENTION PLATFORMS

Advances in technology also hold the potential to transform the means by which behavioral and social science interventions are delivered. These interventions are often resource- and labor-intensive, which results in limited reach, scalability, and duration. The limited duration of these interventions negatively affects the ability to maintain behavioral change. The operationalization of these interventions into code ensures treatment fidelity from research to clinical practice settings and may extend their reach to anyone in any place at any time. Efficient delivery of behavioral and social change strategies via smartphones and other digital technologies provides the potential to extend treatment duration and thus improves behavioral maintenance. Technology-based delivery of behavioral and social interventions also holds promise for improving the precision of these interventions, not only by personalizing or tailoring treatment at initiation but also by adapting the intervention over the course of treatment on the basis of context, timing, and prior responses (4).

LARGE-SCALE POPULATION COHORTS AND DATA INTEGRATION

The behavioral and social sciences are benefiting from the expansion of large-scale surveys and longitudinal cohort projects that take advantage of digital technologies to provide extensive databases for studying the role of behavioral and social factors on health (5). Long-standing survey projects (for example, the National Health Interview Survey) continue to provide new and important data, and

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these projects will soon be complemented with two large NIH-supported efforts, the Precision Medicine Initiative Cohort Program (PMI-CP) and the Environmental influences on Child Health Outcomes (ECHO) Program. These efforts will include much larger and more diverse cohorts than previously available, as well as new approaches for obtaining considerable data on cohort participants. These projects also provide a platform from which behavioral and social science researchers can evaluate the effects of population-level interventions and layer additional studies that target specific subpopulations in greater depth. Combined with advances in big data analytics and data integration techniques, an open data-sharing approach for behavioral and social science research will allow those in the field to extend the use of research data.

The OBSSR strategic plan addresses these four as well as other emerging opportunities and challenges that have the potential to transform the behavioral and social sciences. Scientific priorities include (i) improvement in the flow of basic to applied science through the research-product pipeline, (ii) advances in measurement and methodological approaches, and (iii) improvements in the dissemination and implementation of social and behavioral interventions. These scientific priorities are supported through the OBSSR foundational processes of communication, coordination, training, and evaluation. Achieving the objectives of this strategic plan and leveraging the emerging opportunities to transform the field of behavioral and social sci-

ences will require a coordinated effort, not only among the NIH institutes and centers but also with our sister government agencies, private research and funding entities, and the larger social, behavioral, and biomedical research communities. These current and emerging opportunities are aligning to transform the behavioral and social sciences and thus to enhance their contribution to the health of the nation.

–Francis S. Collins and William T. Riley

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