

Behavioral and Social Science Research at the National Institutes of Health

January 19, 2005

“NIH is the steward of medical and behavioral research for the Nation. Its mission is science in pursuit of fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to extend healthy life and reduce the burdens of illness and disability.”

-Mission Statement, National Institutes of Health

Behavioral science boasts a body of work that provides compelling evidence for its rightful place next to medical research in the opening sentence of the NIH mission statement, and it clearly plays a major role in the prevention of illness and the promotion of good health. The basic knowledge and applications of behavioral science research are critical to the health of the nation. In this article, we review the current status of behavioral research at NIH and propose ways in which the extramural behavioral science community can contribute to advancing behavioral science at NIH.

The Role of Behavior in Health

McGinnis and Foege (1) documented that modifiable behavioral risk factors contributed to substantial mortality in the United States in 1990. Among the leading contributors to mortality were tobacco use (accounting for 19 percent of total deaths), poor diet and physical inactivity (accounting for 14 percent of total deaths), and alcohol consumption (accounting for 5 percent of total deaths). Risky sexual behaviors and illicit use of drugs were also leading contributors to mortality. The authors concluded that roughly half of all deaths that occurred in 1990 could be attributed to a limited number of “largely preventable behaviors and exposures.” A decade later, Mokdad et al (2) again found that tobacco use, poor diet, physical inactivity, and alcohol consumption were among the leading causes of death; combined, the first three accounted for more than a third of all deaths in the United States. In addition to mortality, these unhealthy lifestyle behaviors impose significant burdens on society, such as disability, diminished quality of life, and increased health care costs.

Other recent studies support the critical importance of behavioral research in combating disease. Tuomilehto et al. (3) reported that lifestyle changes by high-risk individuals could prevent Type 2 diabetes. In fact, lifestyle intervention may be more effective than metformin, an established antihyperglycemic agent, in reducing the incidence of diabetes in persons at high risk (4). Other studies have found that changing daily behaviors, such as adopting diets high in fruits and vegetables, might reduce the risk of developing high blood pressure (5). On a population level, such reductions in blood pressure translate to a decrease in mortality of approximately 7 percent for coronary heart disease and 10 percent for stroke (6).

There is an established body of scientific literature that links morbidity and mortality to psychosocial

risk factors, such as social isolation and negative emotions (7). As one example, Dickens et al. (8) found that lack of a close confidant is predictive of further cardiac events after myocardial infarction, mediated perhaps by unhealthy behaviors and/or lack of compliance with medical recommendations. Researchers also have noted the key role that depression plays in the pathway towards morbidity and mortality (9). Other studies provide early evidence that IL-6 overproduction, via chronic stress, may prematurely age the immune system, accelerating the risk of a host of age-related diseases (10). Many studies relating to quality of life issues, psychological distress, and treatment side effects across diseases exist that directly speak to the importance of behavioral science research, but we will not address these in this article.

Findings such as those noted above demonstrate a compelling need for investments in behavioral science beyond a focus on medical management of disease processes. This is a stance also recently adopted by the Public Health Sciences Working Group in England (11). This group endorsed the notion that there is a need to place far greater emphasis on the prevention of illness and the promotion of good health rather than focusing predominantly on treating poor health.

Current Status of Behavioral Science Research at NIH

To assess the status of behavioral science research at NIH, we examined: 1) funding for behavioral research at NIH; 2) requests for applications, or RFAs, that include a behavioral science component; 3) representation of behavioral scientists among Institute/Center, or I/C, leadership; 4) behavioral scientist representation on the advisory boards of leading institutes; 5) inclusion of behavioral science research in the mission statements of individual institutes and centers; and 6) inclusion of behavioral science objectives in the recent NIH “Roadmap” initiative. We used very liberal definitions in order to be inclusive and not miss relevant RFAs, leadership positions, or mission statements that may indicate support for the behavioral sciences. We also should note that our measures were not standardized, and, while we attempted to be comprehensive, there may be other ways of assessing the role of behavioral and social sciences at NIH.

Funding for Behavioral Science Research

We obtained NIH budget information from the Consortium of Social Science Associations, or COSSA (12), which provides budget data contributed independently by each of the 25 NIH institutes that provide extramural funding for the scientific community. Each institute defines “behavioral science research” according to its unique interpretation of the NIH Office of Behavioral and Social Sciences Research, or OBSSR, definition,¹ and reports funding data to OBSSR based on this information. Because data collection was not standardized across institutes, these data constitute, at best, a rough estimate of the amount of funding allocated to behavioral science research.

Because the COSSA data for years 2000-2003 do not differ significantly by percent of total funding for research with a behavioral component (although the total dollars increase annually), we report data on 2003 only (see Table 1). Spending for behavioral science research ranged from \$1 million (NIBIB)² to \$441 million (NIMH). Institutes with the largest proportions of their FY2003 appropriations allocated to behavioral science funding were NINR (81 percent), NIAAA (47 percent), and NIDA (43 percent). Of the total NIH appropriation, only 9.7 percent was devoted to behavioral and social science research.

RFAs That Include a Behavioral Science Research Component

RFAs provide a useful index to gauge an institute's interest and investment in a scientific area because, unlike program announcements, they include set-aside funds. RFAs listed in the NIH Guide to Grants and Contracts from 2000 through 2003 were reviewed by the second author for behavioral science content. All RFAs that were not clear in terms of relevance to behavioral scientists received a second review by the first author, and the RFA was then categorized as one including or not including behavioral science. The inclusion criteria were quite liberal; the RFA did not have to focus on behavioral science. If the RFA included behavioral science as one component of the proposal's aims, or if one of the "bullets" listed as an example of the type of research of interest for the initiative was behavioral in content, it was counted as a "yes." Clearly, if we restricted counts to those with a focus on behavioral science, the numbers would be appreciably lower.

The percentage of RFAs with a behavioral component ranged from a low of 9.7 percent in 2000 to a high of 22.4 percent in 2002 (see Table 2). Approximately 25 percent of these RFAs involved initiatives that focused on tobacco or drug abuse. The largest numbers of RFAs with a behavioral science component for the period 2000-2003 were issued by NIDA, NIMH, NICHD, NIAAA, and NCI, respectively.

Representation of Behavioral Scientists Among Institute Leadership

To assess the representation of behavioral scientists among the leaders of the institutes, the scientific background of each director and deputy director was reviewed. Four of the 50 (8 percent) current directors and deputy directors have a background in behavioral science (broadly defined to include anthropology, demography, cognitive or affective neuroscience, psychiatry, psychology, and sociology). These institute leaders are at NIDA, NIMH (two), and NCCAM. In addition to these four, Raynard Kington, deputy director of NIH and former director of OBSSR, does not have a degree in a behavioral science discipline but does have social science research experience in the area of health care policy and the role of social factors as determinants of health.

Representation of Behavioral Scientists on Advisory Boards

Each institute has an advisory board or council of external scientists that is responsible for advising the secretary of the Department of Health and Human Services, the director of NIH, and the institute director on the scientific mission of the institute. These advisory groups review and recommend applications for funding and advise institute directors on policies and activities relating to the conduct of the institute's mission. As such, these advisory groups play a critical role in directing scientific program priorities and activities.

We reviewed the memberships of the advisory boards and councils for the five institutes that allocated the largest amount of money to behavioral science research in FY2003 (NIMH, NIDA, NCI, NICHD, and NIA). We assumed that these institutes would have the largest percentage of behavioral scientists on their councils or boards. If a board or council member had an appointment in a behavioral science department or had conducted behavioral science research, he or she was considered to have a behavioral science background. Thirty-three of the 87 board/council members (38 percent) met this criterion. Fourteen of the 18 members of the NIMH council had a behavioral science background. If we exclude the NIMH council, this reduces the number across the other four institutes to 19 of 69 (28 percent).

Inclusion of Behavioral and/or Social Sciences in Mission Statements

Each institute has a mission statement that summarizes its scientific goals. The mission statements of 24 institutes and centers and the Office of the NIH Director were reviewed for any reference to behavioral or social science research. If a mission statement included any of the following terms, it was considered to have a behavioral or social science research focus: behavior, behavioral, social science, quality of life, well-being, social implications, or rehabilitation. (Excluded from consideration were CIT, CSR, and CC, because they do not fund extramural research.) Fourteen of the 25 mission statements (56 percent) specifically mentioned behavioral or social science research, using the terms noted above. Seven (28 percent) of the mission statements were very broadly stated, with content that could include both biomedical and behavioral research. Finally, four institutes (16 percent) specifically mentioned basic, medical, or biomedical research as goals without noting behavioral and social sciences as a scientific goal.

Representation of Behavioral Science in the NIH Roadmap Initiative

The NIH Roadmap is a major FY2004 initiative³ that provides a framework for the biomedical research priorities that NIH as a whole must address in order to optimize its entire research portfolio. The goal of the initiative is to accelerate the pace of discovery in the designated scientific areas and the translation of work from bench to bedside.

None of the designated "themes" focus on the behavioral and social sciences, and none have a significant behavioral research component. Within these themes, behavioral science has a limited role. The theme titled "Research Teams of the Future" includes behavioral scientists along with biological, quantitative, engineering, and computer scientists. The "Meetings and Networks for Methodological Development in Interdisciplinary Research" initiative is intended to engage behavioral scientists, engineers, and investigators in the biomedical, mathematical, and physical sciences to develop methodologies to facilitate health research. With few exceptions, opportunities for the behavioral and social sciences are centered on interdisciplinary training and funding for sponsoring meetings.

The Roadmap thus provides a framework of the "biomedical research priorities" at NIH. It is

disappointing that there is no equivalent initiative for behavioral and social science research priorities that might accelerate the pace of discovery and translational studies to help fulfill the NIH mission.

Basic Behavioral Science Research at NIH

NIMH, which historically has been a strong supporter and funder of basic behavioral science, has recently undergone a reorganization that may threaten the future of such research at this institute.* The reorganization has given rise to concerns that previously funded research areas – for example, personality, social psychology, language, perception, and animal behavior – may not be supported in the future.

The decision to reorganize reflects the conflict between the goals of basic and applied research and the tension that has been woven into the dominant paradigm of science, neither of which is limited to the behavioral science domain. The defining property of basic research is the contribution it seeks to make to the general, explanatory body of knowledge within an area of science. It seeks to widen the understanding of phenomena within a given scientific field, whereas applied research is directed towards individual or group or societal use. Historically, the conflict has been conceptualized as a single arrow running from basic to applied research and then on to development and dissemination. Clearly, this linear model greatly oversimplifies the complicated process of give and take between basic and applied research. Consider a sports analogy: compare the oversimplified view of a relay race, with the baton passed from one runner to the next, with the more apt analogy of a rugby game, in which the outcome depends on a team that attempts to score as a unit by passing the ball back and forth (13). The direction of such passes is not always known far in advance (and not each pass is terribly accurate). Breakthroughs achieved by applied research can lead to further basic research, just as breakthroughs in basic research might lead to further applied work.

NIMH director Thomas Insel has asserted that the new reorganization reflects a movement to new translational divisions to accelerate advancements in clinical care. However, NIMH also would like to redirect basic behavioral science to the “mission” institutes that deal with child development, aging, or specific health conditions. Such a redirection may be appropriate, but at this writing there is not a strategy in place to ensure that other institutes will “pick up the slack.” In addition, the absence of any basic behavioral research at the NIGMS (see Table 1) has also been troubling to the external community and has even attracted significant Congressional attention. NIGMS, known informally as “the basic research institute,” has a statutory mandate to support behavioral research, but this mandate has not been fulfilled, perhaps in part because of the historical role of NIMH. With diminishing support from NIMH, now is an especially critical time for NIGMS to establish a behavioral science infrastructure and help ensure that basic behavioral science is a priority in advancing science and the health of the nation.

One encouraging sign is that under the auspices of the NIH Office of the Director, an NIH-wide working group on basic behavioral science is assessing the status of basic research programs in the behavioral and social sciences at NIH. The goal of this group is to identify new areas of opportunity and investigate barriers to the submission of grant applications, in order to improve the basic behavioral and social science portfolio at NIH. This working group consists of distinguished scientists from leading institutions, with Linda Waite, University of Chicago, serving as chair. The final report is expected in the winter of 2004-05.

Current Initiatives at NIH

A number of current behavioral science activities and initiatives at NIH have the potential to advance the behavioral science knowledge base. For example:

Within NCI, a new focus on patient and provider decision-making across the cancer continuum is being championed by the Division of Cancer Control and Population Sciences, along with initiatives being developed in the areas of physical activity and obesity. In addition to NCI, NINR and NIDDK continue to support initiatives in the area of obesity. The recent Institute of Medicine, or IOM, report, *Preventing Childhood Obesity: Health in the Balance* (14), notes the need to make this a national priority and underscores the lack of knowledge about the factors that determine obesity and effective individual and societal interventions. This area, in need of both basic research and more effective intervention strategies, is indeed receiving attention from behavioral scientists within the NIH.

Also at NCI, more basic and biobehavioral areas are being targeted with an ongoing Health Cognitions and Theory Development Working Group and a developing BiMPED, or Biological Mechanisms of Psychosocial Effects on Disease, initiative.

NHLBI is helping to advance the adoption of the Consolidated Standards of Reporting Trials, or CONSORT guidelines (15) for the reporting of behavioral clinical trials, along with more general promotion of evidence-based behavioral medicine.

NICHHD, one of the leading funders of behavioral science at NIH, has several ongoing projects that extend beyond the traditional grant-funding mechanism. In the late 1990s, scientists from this institute, working with extramural scientists, added a study of fatherhood to the evaluation of Early Head Start programs, addressing the role of biological and social factors in children's early development. In 2002, the Child Development and Behavior Branch of NICHHD organized the "Children Exposed to Violence" workshop, working with NIDA, NIMH, the Fogarty International Center, the OBSSR within NIH, the Centers for Disease Control, the Substance Abuse and Mental Health Services Administration, and others outside of the NIH. This workshop, with the goal of assessing the state of this science and the research needs among children exposed to violence, resulted in a program announcement and two special issues of a peer-reviewed journal (*Clinical Child and Family Psychology*, 2003).

NIA has sponsored the Longitudinal Data in Aging Working Group, with the goal of increasing knowledge regarding determinants of aging and health across the life span. This is an initiative clearly relevant for basic behavioral researchers.

The National Human Genome Research Institute now has a Social and Behavioral Research Branch that promises to investigate social and behavioral factors that facilitate translation of genomic discoveries to promote health and disease prevention.

OBSSR has sponsored several initiatives in the area of Mind-Body Medicine, along with the publication of an IOM report to integrate behavioral science education into the medical school curriculum ("Improving Medical Education: Enhancing the Behavioral and Social Science Content of Medical School Curricula") (16). While the position of OBSSR director has been vacant far too long, an appointment to this post may occur by the time this article goes to press. It is critical that a recognized scientific leader assumes this role. The selection of the director of OBSSR will speak volumes about the future of behavioral and social sciences at NIH.

Advancing Behavioral Science Research at NIH

There are a number of steps that the scientific community can take to elevate the status of behavioral science research at NIH, and in so doing help NIH leadership appreciate the contributions that behavioral science can make to the health of the nation:

1. *Share your grant-related publications with your NIH program directors.* Not only does this enable your program director to stay current with your area of science, but your work may be used to catalyze scientific initiatives such as RFAs or program announcements. Publications are an important way to communicate the importance of behavioral science research to institute directors and advisory boards.
2. *Engage in interdisciplinary research.* The movement towards interdisciplinary research is a trend that is likely to have some staying power, and the Roadmap provides one pathway to initiate such activity. The goal is not only to advance particular areas of science and specific scientific projects, but also to create new areas of science. Psychoneuroimmunology is one such example; researchers in the seemingly disparate scientific fields of psychology and psychiatry, neurology, and immunology work together to contribute significantly to what we know about the basic biological processes related to mood, emotions, behavior, and health. Be proactive in involving scientists in disciplines outside of the behavioral sciences to strengthen your research applications and the breadth of your contributions to science.
3. *Stay current with behavioral science research funding and training opportunities at NIH.* The NIH guide to grants and contracts (<http://grants1.nih.gov/grants/guide/index.html>) and the OBSSR Web site (<http://obssr.od.nih.gov/Publications/BSSR-Guide/index.htm>) provide up-to-date information on behavioral and social science initiatives and training opportunities.
4. *Voice your opinions about behavioral science research at NIH to the leaders of your professional organizations.* Scientific staff from several behavioral and social science organizations, including the American Psychological Society, the American Psychological Association, COSSA, and the Federation of Behavioral, Psychological and Cognitive Sciences frequently attend and participate in OBSSR meetings at NIH. Scientific staff members representing most NIH institutes attend these meetings. Your feedback to organizational leaders may lead to an exchange of ideas that will prove fruitful for behavioral science research.
5. *Attend and provide feedback at NIH-sponsored roundtables and meetings at conferences hosted by professional organizations.* NCI and several other institutes at NIH regularly sponsor such gatherings at major national conferences (e.g., “The NCI Listens”) attended by behavioral scientists, including APS, the Society of Behavioral Medicine, the American Psychosomatic Society, and others. Attend these meetings and express your thoughts, comments, and concerns. NCI and other institutes value such input from the extramural scientific community, and this is an important opportunity to make sure program staff are aware of the concerns of their behavioral science constituency.
6. *Publish in high-impact interdisciplinary journals.* Clearly, this is not always possible and may not be relevant based on the scientific scope of the work to be published and the intended audience. However, journals such as the *Proceedings of the National Academy of Sciences* or the *Journal of the National Cancer Institute* help to inform readers outside of the behavioral science field about the relevance of behavioral work and the potential for interdisciplinary research.
7. *Continue to develop interdisciplinary curricula and practicum experiences for behavioral science students.* The IOM report sponsored by OBSSR, “Improving Medical Education: Enhancing the Behavioral and Social Science Content of Medical School Curricula” (16), is an

important step in this direction. As behavioral scientists, we need to develop interdisciplinary teaching strategies and curricula to enhance expertise in the integration of biomedical, behavioral, and social sciences at the pre-doctoral and post-doctoral level. Progress needs to move in both directions, informing those involved in medical training about the contributions of behavioral science, while ensuring that behavioral science students learn enough about biomedicine to make research integration a much more viable goal.

8. *Serve on NIH study sections when requested.* Study sections are groups of outside scientists that review grant proposals at NIH. By serving as a reviewer, you can have a role in promoting fair peer review and quality behavioral research. If called, please serve. You can also help by forwarding names of colleagues you believe would be excellent reviewers to your program directors or to the Scientific Review Administrators of behavioral study sections. To learn more, please visit the home page of NIH's Center for Science Review at www.csr.nih.gov.
9. *Make explicit the link between your research and its relevance to health promotion or management of disease processes.* There has been and probably always will be a tension between basic and applied research and between the need to emphasize treatment of disease versus prevention or promotion of health. In order to promote the value of behavioral science, you need to make the connection between your research aims and health, even if the link is not direct. Depending on your area of research, there may be a few leaps between findings and direct application to health, and the links and leaps need to be explicitly delineated for those not intimately versed in behavioral science. We must demonstrate the relevance of the breadth of behavioral science research to the overall health of the nation.
10. *Design and report randomized clinical trials in a systematic, "transparent" fashion.* There is a growing movement towards Evidence Based Behavioral Medicine. The CONSORT guidelines, adopted by a number of medical journals less than a decade ago, are now being actively promoted for use in health and behavioral medicine journals (15). The acceptance of such guidelines is critical to demonstrating to those outside the behavioral and social sciences world that we are serious about our science. Use of the guidelines should help with reporting data from prospective, randomized clinical trials (and a variety of other research designs) and also may help improve the design and conduct of research. By incorporating rigorous standards into the reporting of efficacy trials, we can potentially hasten the transition of tested interventions to effectiveness trials, and the clinical impact and public health benefit of behavioral science interventions.

Summary

What can we conclude from our survey of behavioral science research at NIH? As noted earlier, we were as inclusive as possible in our assessment. Despite this, we believe it is fair to say that there is inconsistent representation of behavioral research across the institutes and centers of NIH. This is reflected in the considerable variation in the amount of funding of behavioral and social sciences research across institutes. Even with such variation, less than 10 percent of the 2003 NIH appropriation was allocated to behavioral and social sciences research. There is relatively poor representation of behavioral science expertise among the leaders of institutes and centers. The lack of mention of behavioral science in the mission statements of many of the institutes makes one wonder about their expressed resolve to steward behavioral and social sciences research, the NIH mission statement notwithstanding. It is disappointing that the NIH Roadmap initiative, one of the largest initiatives in recent years, has precious few opportunities for behavioral scientists, or that there is no "partner" initiative focusing on the behavioral and social sciences. The money for this initiative, drawn in part

from the budgets of each institute, and the opportunity for behavioral science to contribute to biomedicine, is largely lost to behavioral scientists.

Clearly, there is not an absence of behavioral science at NIH. However, it is interesting to speculate what behavioral science might contribute to the health of our nation if the budgets across institutes were reversed. That is, what would we have learned about health behavior and behavior change related to disease prevention and health maintenance if 93.8 percent (versus 6.2 percent) of the NCI budget or 95.7 percent (versus 4.3 percent) of the NHLBI funding was dedicated to behavioral and social sciences research? We are not arguing for the creation of such a disparity or even budget parity, given the very significant contributions of biomedical research. However, there is sufficient evidence to argue for a more equitable distribution than currently exists. This would be a powerful way to recognize the contributions of behavioral and social sciences research to the nation's health.

There is room for optimism, presented in the variety of promising developments noted in this article. However, for behavioral scientists within and outside the walls of NIH, and those who appreciate the contributions of behavioral science to the health of the nation, there is clearly work to be done.

The views expressed in this article are those of the authors. They are not intended to represent any of the institutes or centers of the National Institutes of Health or any federal agency. The authors' point of reference is the National Cancer Institute and therefore many examples and illustrations focus on NCI. Readers should be aware that there are many exciting developments in behavioral science throughout NIH, and we encourage you to explore the behavioral science funding opportunities of all NIH institutes.

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¹Behavioral and social science research is defined as “research that has a major and explicit focus on the understanding of behavioral or social processes (basic), or on the use of the processes to predict or influence health outcomes or health risk factors (clinical). ‘Behavioral’ refers to overt actions, to underlying psychological processes such as cognition, emotion, temperament and motivation, and to biobehavioral interactions. ‘Social’ refers to sociocultural, socioeconomic, and sociodemographic status, to biosocial interactions, and to the various levels of social context, from small groups to complex cultural systems and societal influences.”

²Institute/Center Abbreviations (listed in alphabetical order)

CC: Warren Grant Magnuson Clinical Center; CIT: Center for Information Technology; CSR: Center for Scientific Review; FIC: John E. Fogarty International Center; NCCAM: National Center for Complementary and Alternative Medicine; NCI: National Cancer Institute; NCMHD: National Center on Minority Health and Health Disparities; NCRR: National Center for Research Resources; NEI: National Eye Institute; NHLBI: National Heart, Lung, and Blood Institute; NHGRI: National Human Research Genome Institute; NIA: National Institute on Aging; NIAAA: National Institute on Alcohol Abuse and Alcoholism; NIAID: National Institute of Allergy and Infectious Diseases; NIAMS: National Institute of Arthritis and Musculoskeletal and Skin Diseases; NIBIB: National Institute of Biomedical Imaging and Bioengineering; NICHD: National Institute of Child Health and Human Development; NIDCD: National Institute on Deafness and Other Communication Disorders; NIDCR: National Institute of Dental and Craniofacial Research; NIDDK: National Ins titute of Diabetes & Digestive & Kidney Disorders; NIDA: National Institute on Drug Abuse; NIEHS: National Institute of Environmental Health Services; NIGMS: National Institute of General Medical Sciences; NIMH: National Institute of Mental Health; NINDS: National Institute of Neurological Disorders and Stroke; NINR: National Institute of Nursing Research; NLM: National Library of Medicine; OBSSR: Office of Behavioral and Social

Science Research; OD: Office of the Director, NIH

³For more information visit www.nihroadmap.gov.