

The Contributions of Behavioral and Social Sciences Research to Improving the Health of the Nation: A Prospectus for the Future



Healthier Lives Through Behavioral and Social Sciences

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institutes of Health
Office of Behavioral and Social Sciences Research

ACRONYMS

ACD	Advisory Council to the Director of NIH
AHRQ	Agency for Healthcare Research and Quality
CDC	Centers for Disease Control and Prevention
FIC	Fogarty International Center
HHS	Department of Health and Human Services
IC	Institutes and Centers
IOM	Institute of Medicine
NCCAM	National Center for Complementary and Alternative Medicine
NCI	National Cancer Institute
NCMHD	National Center on Minority Health and Health Disparities
NEI	National Eye Institute
NHGRI	National Human Genome Research Institute
NHLBI	National Heart, Lung, and Blood 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
NIDA	National Institute on Drug Abuse
NIDCD	National Institute of Deafness and Other Communication Disorders
NIDCR	National Institute of Dental and Craniofacial Research
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases
NIEHS	National Institute of Environmental Health Science
NIGMS	National Institute of General Medical Sciences
NIH	National Institutes of Health
NIMH	National Institute of Mental Health
NINDS	National Institute of Neurological Disorders and Stroke
NINR	National Institute of Nursing Research
NRC	National Research Council
NSF	National Science Foundation
OAR	Office of AIDS Research
OBSSR	Office of Behavioral and Social Sciences Research
ODP	Office of Disease Prevention
ORWH	Office of Research on Women's Health

PREFACE



The Office of Behavioral and Social Sciences Research (OBSSR) is pleased to present its strategic prospectus. The document was developed over a year of consensus building and deliberation. The prospectus addresses strategic recommendations for future research priorities in the behavioral and social sciences. If addressed, these priorities can make a substantial and critical contribution to the mission of the National Institutes of Health (NIH) to improve the Nation's health and well being.

Exciting trends and daunting challenges provided the impetus for developing this prospectus at the present time. Among the issues are a rapidly changing world of science, technology, societal needs, and financial constraints at NIH. The altered landscape requires a serious look at the accomplishments, current status, and future role for the behavioral and social sciences.

In examining past accomplishments and what we know today, it becomes clear how behavior—both individual and collective—bridges biology and society. Robust findings are mounting with evidence of how biology, behavior, and the social and physical environments are dynamically intertwined in the ways that they promote health or produce disease, disability, and death. The emerging view is that differences in patterns of health and disease represent the embodiment of a dynamic interaction of genes and environment over time. Two previously separate, often competing world views about health and illness may finally be converging: (1) the biomedical view of causation, and (2) the socio-behavioral-ecological view of causation. The biological “causes” and the socio-behavioral-ecological “causes of the causes” are two sides of the same coin. Historically powerful scientific models of linear causality and reductionism are giving way to the ideas of multiple causal pathways and “causal loops” within complex adaptive systems.

The most pressing, persistent, and emergent population health challenges also necessitate strong partnerships among the biological, social, behavioral, economic, and public health sciences. The solutions to some of our biggest health challenges may depend on whether scientists from different disciplines are able to learn each other's languages, listen across the gulfs that separate their sciences, and forge a new conceptual synthesis across their disciplinary boundaries.

Although this prospectus focuses on the work of OBSSR at NIH, it is important to acknowledge that the behavioral and social sciences have been contributing to health research for a long time, well before the establishment of OBSSR. Behavioral and social sciences research at NIH is supported by many of its 27 Institutes and Centers (ICs). As a result, major discoveries and advances have been made in virtually every aspect of health and disease. Indeed, the world we know today would be a very different place without the contributions of the behavioral and social sciences. This prospectus provides a welcome opportunity to express our gratitude to the leadership and staff of NIH who nurture and value behavioral and social sciences research.

The entire process that culminated in this prospectus would not have been possible without the generous contributions of time and ideas from many individuals and groups. We deeply appreciate everyone's contributions. We hope that we can continue in partnerships that will make a meaningful impact on improving the health of individuals, families, communities, and the entire population. The behavioral and social sciences have the potential to make unprecedented strides in improving our Nation's health and well being.

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I. INTRODUCTION

This prospectus provides a research agenda for the behavioral and social sciences at NIH. The behavioral and social sciences can make a substantial contribution to NIH's mission to improve the Nation's health. The prospectus briefly reviews the mandate establishing OBSSR, as well as selected achievements and the current status of behavioral and social sciences research. This is followed by the broad strategic recommendations that emerged from a year-long process of consultation, deliberation, and consensus building as well as a review of several documents. The emphasis is on areas that are likely to be transformative and integrative rather than a repetition of existing programmatic foci.

This document is a prospectus rather than a plan. A prospectus reflects the need to have an evolving and dynamic approach to planning and leadership in a rapidly changing landscape. The prospectus provides a vision and guiding principles rather than more concrete objectives and action steps. The prospectus provides guidance for action plans that will be developed in an implementation process that will remain flexible and fluid as circumstances change.

Establishment of the Office

OBSSR opened in 1995. Established by the U.S. Congress as part of the Office of the Director, NIH, its mission is to stimulate behavioral and social sciences research throughout NIH, and to integrate it more fully into the NIH research enterprise. Under the leadership of its first director, Norman B. Anderson, Ph.D., OBSSR established three main goals set forth in its initial 1997 strategic plan:

1. Enhance behavioral and social sciences research and training;
2. Integrate a biobehavioral interdisciplinary perspective into all NIH research areas; and
3. Improve communication among behavioral and social scientists and with the public.

Selected Accomplishments in the Behavioral and Social Sciences

Major advances in understanding the role of behavior in health, and the complex interactions among behavioral, social, economic, and biological determinants of health have been achieved (Bachrach and Abeles, 2004). Robust and intriguing results from a wide range of empirical investigations show that social and behavioral factors are associated with essentially every aspect of health and illness (National Research Council, 2001). Space does not permit a comprehensive list of the valuable contributions to our Nation's health made by behavioral and social sciences research supported by OBSSR and other agencies within the Department of Health and Human Services (HHS). Selected examples are described below:

- ◆ The biggest public health success story of the 20th century may very well be the reduction in tobacco use and related diseases. In 2000, overall cancer death rates dropped for the first time in a century, driven largely by the dramatic reduction in male smoking from 47% in the 1960s to less than 23% today (Thun et al., 2006). This success has been a trans-HHS victory, with significant investments over the last 60 years made by NCI, NHLBI, NIDA, CDC, and AHRQ. Without these investments, 40 million Americans might still be smoking today with about 12 million additional premature deaths and billions of dollars in excess cost to health care.
- ◆ To accelerate our understanding of mind/body interactions, such as the relationship of stress to heart disease, decreased immune system functioning, and premature aging, OBSSR led the establishment of five Mind-Body Research Centers. Initial findings from these Centers as well as NCI- and NCCAM-supported research include evidence of the links between stress, social involvement, and cancer progression (Antoni et al., 2006).
- ◆ OBSSR led two funding initiatives to address the initiation and maintenance of health behavior change. These initiatives have produced behavior change interventions for diet modification, physical activity, tobacco, and drug use. Most recently, OBSSR established a Health Maintenance Consortium Resource Center (HMCRC, 2006) to build research and practice capacity among health behavior intervention researchers.
- ◆ Through basic and clinical research supported by NIDA, NIAAA, NIMH, and NCI, our understanding of the bio-behavioral mechanisms and treatment of mental health and substance abuse has advanced

dramatically. Effective and cost-effective behavioral and combined behavioral and pharmacological treatments are now available for treatment of depression, anxiety disorders, and the abuse of nicotine, alcohol, and other drugs.

Reducing the Burden of Disease from Macrosocioeconomic Causes

The gross inequality we see in the world, both within (a spread of 20 years in life expectancy) and between countries (a spread of 48 years), is not inevitable, but malleable and can be changed. Social factors are at the root of much of these inequalities ... Health status should be the concern of policy makers in every sector, not solely those involved in health.

~ Marmot, 2005

The PROGRESA study (Programa Nacional de Educacion, Salud, y Alimentacion) is an anti-poverty program begun in 1997 that provides aid to 2.6 million poor Mexican families. The intervention and evaluation efforts are comprised of an impressive collaboration across disciplines including biomedicine, social/behavioral sciences, economics, epidemiology, demography, and public health. Children and pregnant and lactating women in participating households received fortified nutrition supplements, and the families received nutrition education, health care, and cash transfers.

The results have been dramatic, showing that health outcomes associated with poverty may be altered within a generation. The PROGRESA intervention was associated with better growth and lower rates of anemia in low-income, rural infants and children in Mexico. This large-scale, real-world study has demonstrated that anti-poverty programs that employ sound principles from behavioral and social sciences and that combine education, health, and nutrition interventions in one package can improve the capacity of families to pull themselves out of poverty and its adverse health effects (Rivera et al., 2004).

References:

- Marmot, M. (2005). Dreaming a different epidemiological future. *European Journal of Epidemiology*, 20, 3-4.
- Rivera, J.A., Sotres-Alvarez, D., Habicht, J.P., Shamah, T., Villalpando, S. (2004). Impact of the Mexican program for education, health, and nutrition (Progresa) on rates of growth and anemia in infants and young children: A randomized effectiveness study. *JAMA*, 291(21), 2563-70.

- ◆ Research supported by NHLBI, NINR, and others on behavioral risk factors, education, and adherence has contributed to dramatic reductions in cardiovascular disease and improved management

of chronic illness. Funded by NIDDK and other partners, the Diabetes Prevention Program demonstrated that lifestyle interventions—modest weight loss and regular physical activity—can reduce the risk of developing type 2 diabetes in high-risk adults by 58%, compared to a 31% reduction with diabetes medication. These findings led to “Small Steps, Big Rewards”, the first national diabetes prevention campaign (NDEP, 2006).

- ◆ Research at NIA, NIMH, and other Institutes has led to dramatic advances in knowledge of the psychosocial determinants of premature aging and effective interventions to slow degeneration and improve cognitive fitness and memory as we age.
- ◆ Mass media campaigns draw heavily on research on communication, diffusion, and behavior change. For example, the NICHD-sponsored “*Back to Sleep Campaign*” aims to reduce mortality from sudden infant death syndrome (SIDS) by promoting infant back sleeping (NICHD, 2006). Since the campaign was launched in 1994, back sleeping increased from 26.9% to 72.8% and SIDS declined by more than 50%.
- ◆ International studies supported by FIC, NCMHD, The World Bank, and others have added to our understanding of the role of poverty, social position, culture, and socioeconomic status in the prevention, treatment, and management of diseases. Many preventable diseases that create enormous emotional and financial hardship have their origins in socioeconomic adversity. Discoveries in the behavioral and social sciences can inform life-saving family, environmental and policy changes (see sidebar).
- ◆ Studies supported by numerous NIH Institutes have demonstrated associations between

psychosocial risk factors such as hostility, depression, and social isolation, and physical health conditions such as cardiovascular disease, infectious disease, and cancer.

- ◆ In the United States, research supported by NICHD, NIAID, OAR, NIMH, FIC, and others has made major contributions to slowing the spread of HIV/AIDS and treating those with the disease. Although still devastating, HIV/AIDS is no longer the epidemic it once was in the United States thanks to research breakthroughs in decisionmaking, drug abuse, and sexual behavior. As people changed risky behaviors, new AIDS cases in the United States were cut almost in half from a peak of over 80,000/year in 1993 to 42,000/year in 2005. Previously 1,800 babies were born infected with HIV each year but today that number is less than 50. At its core, prevention and management of AIDS is recognized as a behavioral and socio-cultural problem.
- ◆ Historically, injury prevention initiatives have distinguished between “passive” (structural) strategies focused on improving product safety and “active” (behavioral) strategies where individuals take actions to protect themselves. Research supported by CDC, NIH, and others has established the importance of integrating these approaches at an individual and community level. For example, NIAAA-supported research has shown that multilevel, community-based approaches can reduce alcohol-related injuries resulting from motor vehicle crashes and assaults (Holder et al., 2000). Alcohol-related policies (e.g., raising the minimum drinking age to 21, enforcing stricter drinking-and-driving penalties) have made a significant impact on traffic fatalities, child abuse, and a range of other public health outcomes.

- ◆ In 1900, average life expectancy in the United States was a mere 47 years. Today, average life expectancy is over 77 years—an astounding increase of 30 years in the span of a century. Much of this improvement, especially during the first 50 years, has come from changes in lifestyle and living conditions. Advances in biomedical and socio-behavioral science have increasingly contributed to life expectancy. In the last 30 years, almost 6 years of life expectancy gains have come from improvements in management of cardiovascular diseases (CVDs), spearheaded by research at NHLBI. At least 50% of improvements have been attributed to socio-behavioral factors.
- ◆ We now know that about 70% of the quality of our health and health care comes from malleable behavioral, socio-cultural, and environmental determinants. These determinants include individual factors (e.g., smoking, poor diet, stress, inactivity, hypertension, violence, accidents, alcohol and substance abuse, and mental illness) as well as societal and health care system factors (e.g., medical errors, gender bias and cultural insensitivity, low health literacy, poverty, lack of insurance or access to quality health care, and excessive delays in putting what we know into practice and policy) (Pastor et al., 2002).
- ◆ Research conducted by NINDS, NIDCD, and others, on deafness, communication disorders, and language have contributed significantly to improved detection of these disorders and early interventions that enhance health and education outcomes. Research within NIDCR has not only improved the understanding, prevention, and treatment of dental diseases, but also has extended the scope of related research, such as on the perceptual mechanisms and the clinical management of pain from a BioPsychoSocial perspective. NIDCR also has shown how dental research can interface with much larger socio-ecological and environmental issues of health disparities, inequality, poor self-care, poor health literacy, adverse living conditions, and inadequate access to care.

In the decade since its founding, OBSSR has contributed to the behavioral and social sciences at NIH in important ways. OBSSR provides program development for funded research projects; expertise and funding to programs initiated by its NIH partners; and leadership in training, continuing education, and dissemination of research findings to the broader scientific community and the general public. Support for behavioral and social science projects in areas supported by OBSSR has grown substantially over the decade ending in 2002. Perhaps more importantly, behavioral and social scientists are funded at a success rate comparable to applicants from other disciplines (OBSSR Report, 2005). These trends all indicate that OBSSR is fulfilling its mission at NIH and serving the public in a world that increasingly recognizes the contributions of the behavioral and social sciences to individual and population health.

The Challenges and Opportunities Ahead



Rapid advances in science and technology have provided dramatic progress in understanding health and disease, as well as new tools, especially in imaging, informatics, communications, cyberinfrastructure, and knowledge and data management. But how will these scientific advances help address the grand challenge? From longstanding issues like health disparities and tobacco addiction, to emerging threats of obesity, diabetes, pandemic flu, and bioterrorism, the 21st century presents a multitude of complex and urgent problems. Racial and ethnic minorities and those who live in poverty continue to suffer a heavier burden of illness,

disability, and premature death. The infrastructure of our health care system is threatened by a “perfect storm” of rising demand for health care, an aging and increasingly economically disparate population, and unsustainable costs. A number of health-related epidemics have social and behavioral roots, including HIV/AIDS infection; indeed, approximately half of premature deaths could be prevented through lifestyle behavior and environmental changes (Mokdad et al., 2005). Another 20-30% of premature deaths involve behavioral factors in the health care delivery system such as provider-patient relationships, decisionmaking, bias due to stigma or stereotyping, medical errors, and organizational dynamics.

To address these health challenges effectively and efficiently requires leveraging the full potential of our scientific knowledge. As shown in Figure 1, health across the lifespan is a function of many interwoven influences, from the genetic and molecular levels to economic and geopolitical levels. This growing awareness presents new challenges in understanding the roots of health and human behavior, as well as new opportunities to answer some of the most pressing questions facing behavioral and social scientists:

- ◆ What links exist among in utero and early childhood exposures to trauma, stress, adversity, alcohol, tobacco and other pathogens, and later lifespan aspects of quality of social relationships, gene expression, neurobehavioral and immune function, and chronic disease and disability?
- ◆ How do positive aspects of health such as an optimistic outlook or strong family ties translate into disease resistance? Conversely, how does negative affect or social isolation decrease resistance to disease?
- ◆ What is the basis of mental illness and addictions and how can biomedical, behavioral, and social scientists work together to improve early detection, prevention, and treatment?
- ◆ How do differences in educational and economic opportunity, access to medical care, cultural mores, and discrimination influence health outcomes?
- ◆ How can we better understand motivation, risk perceptions, and decisionmaking and relate these mechanisms to health communications, sustained maintenance of behavior change, and new technology like Internet-based self-change and health literacy interventions?
- ◆ What are the cultural strengths and health-enhancing resources of various racial and ethnic groups? How do these factors account for resilience to social and resource inequities?
- ◆ What behavioral or social interventions could improve the prevention of injury and violence?
- ◆ How can we strengthen the science of dissemination and the dissemination of the science of behavior change?

Rigorous research in the behavioral and social sciences and productive interdisciplinary collaborations offer exciting prospects for answering these questions and many others. The success of OBSSR to date and its strong and growing base of partnerships provide a promising foundation for OBSSR to stimulate the kind of research necessary to understand and solve complex health issues.

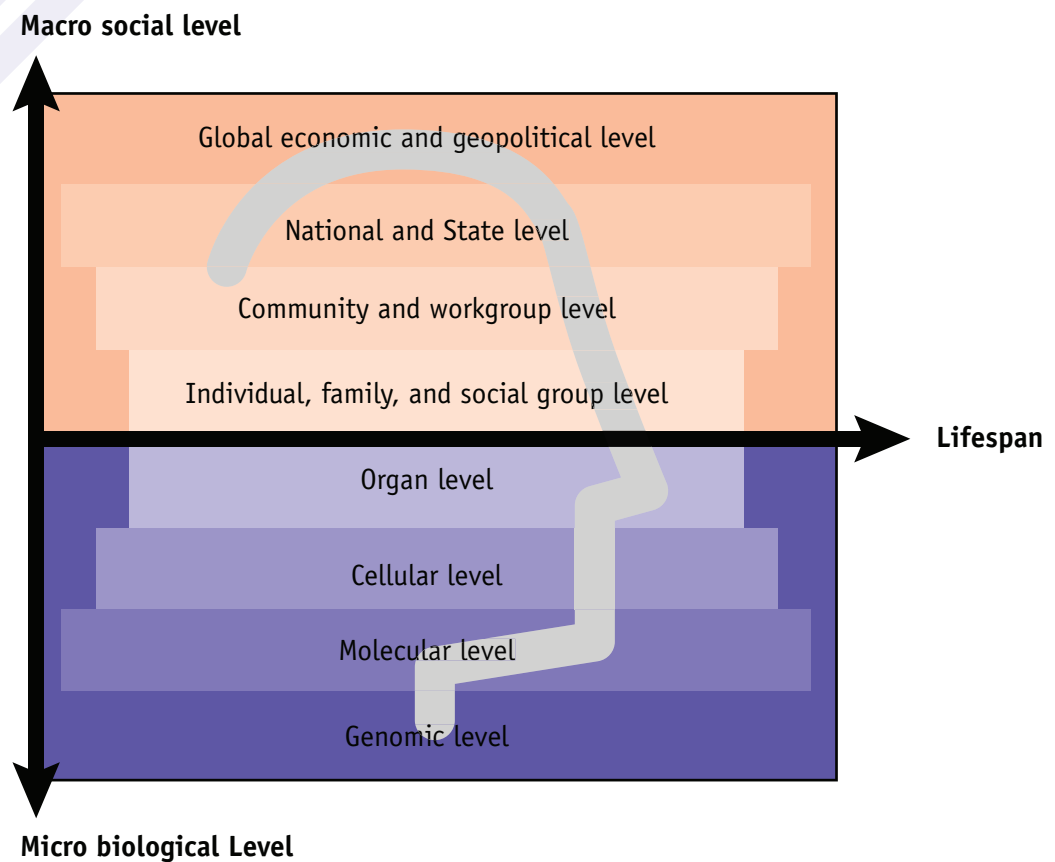


Figure 1. Health as a continuum between biological and social factors across the lifespan. (Adapted from Glass & McAtee, 2006).



II. INFORMING THE PROSPECTUS

OBSSR is building on its original mission and strategic priorities to meet the challenges of the 21st century. This process of reflection and planning takes place at a time of substantial shifts in the financial and organizational contexts of NIH where two key trends have emerged:

- 1. Funding challenges.** After a period of annual funding increases, budgets have leveled off. Given that funding has not kept pace with the biomedical inflation index, in effect the purchasing power of support has decreased across NIH, necessitating re-evaluation of current and future priorities.
- 2. Broader partnerships.** OBSSR's original mandate to coordinate behavioral and social sciences research across all of the NIH ICs must evolve within an NIH environment that now supports several major trans-NIH initiatives. These initiatives include the NIH Roadmap for Medical Research, the NIH Blueprint for Neuroscience Research, and the Office of Portfolio Analysis and Strategic Initiatives (OPASI).

In developing this prospectus, OBSSR sought input from its key partners and stakeholders within and outside NIH regarding specific actions OBSSR should take to maximize the contributions of the behavioral and social sciences to the NIH mission. This process is described in more detail in Appendix A. The two trends described above and six trigger questions (see sidebar on p 8) were emphasized to ensure that stakeholder input was relevant to the financial and organizational contexts in which OBSSR operates. More than 400 individuals participated in this process, including leaders in the behavioral and social sciences, representatives from NIH ICs, and other external key stakeholders representing the breadth of scientific disciplines with which OBSSR works (see Appendix B).

Key components of this process included:

- ◆ **Concept mapping:** Ideas were gathered from 239 participants through organized brainstorming in response to a specific prompt (see sidebar). Multidimensional scaling and cluster analyses were used to yield a visual map whose “clusters” serve as meta-themes for the aggregate stakeholder vision.
- ◆ **Expert Panel interviews:** Eighteen individuals internal and external to NIH were interviewed (see sidebar) and participated in work sessions at an Expert Panel meeting.
- ◆ **IC Director interviews:** Selected IC directors were interviewed to obtain their views of OBSSR’s role within NIH.
- ◆ **Issues Summit:** Information gathered through each of the methods above was integrated, presented, and discussed with over 50 participants representing the key disciplines, thought leaders, and stakeholders in the behavioral and social sciences.
- ◆ **Town Hall Meeting:** Participants reviewed the draft prospectus and provided comments at the Town Hall Meeting held at the conclusion of OBSSR’s 10th Anniversary Celebration in June 2006 and/or through a web-based survey.

In addition to stakeholder input, OBSSR’s strategic planning process leveraged prior reports (e.g., NRC, 2001; Kessel et al., 2003; IOM, 2006). Each of these sources has informed the strategic prospectus.

Concept Mapping Prompt:

What specific actions should OBSSR undertake to maximize the contributions of the behavioral and social sciences to the overall NIH mission?

Expert Panel Interview Questions:

1. How can OBSSR best contribute to the stated mission of NIH over the next decade?
2. What is the present status and future potential for each of the core areas of behavioral and social science to contribute to furthering NIH’s mission? By core areas, we mean basic behavioral and social sciences research; applied clinical research; applied research on dissemination; and applied policy research.
3. How might the rapid and increasingly numerous advances in science and technology relate to or impact behavioral and social sciences research over the next decade?
4. What do you believe is the current state of the profession in terms of recruitment and development of behavioral and social scientists? What do you think OBSSR’s role should be in training and educating behavioral and social scientists?
5. What should OBSSR be doing to ensure that discoveries are ready for dissemination, and how can it facilitate the dissemination of findings?
6. How might OBSSR communicate effectively with each of its partners to enable more effective dissemination of results and discoveries from behavioral and social sciences research?

Reference:
Kane, M. and Trochim, W.M.K. (2006). *Concept Mapping for Planning and Evaluation*, Vol. 50, L. Bickman and D.J. Rog, eds. Thousand Oaks, CA: Sage.

III. DEFINING OBSSR'S VISION

The vision of OBSSR is to bring together the biomedical, behavioral, social, and public health science research communities to work more collaboratively to solve the most pressing population health challenges faced by our society. Together we can change the landscape of health and disease by investing in more basic, applied, and policy research in the behavioral and social sciences, partnering with the biomedical sciences, and implementing the discoveries of the behavioral and social sciences. By working as a partner within the broader scientific community, OBSSR will help NIH achieve its mission.

There are four core elements of OBSSR's vision:

- 1. "Next-generation" basic science:** OBSSR will support and facilitate the next generation of basic behavioral and social science research informed by breakthroughs in complementary areas such as genetics, informatics, computer sciences, measurement, methods, and multilevel analyses.
- 2. Interdisciplinary research:** OBSSR will facilitate collaborative research across the full range of disciplines and stakeholders necessary to fully elucidate the complex determinants of health and health systems challenges. Such collaborations will yield new conceptual frameworks, methods, measures, and technologies that will speed the improvement of population health.
- 3. Systems-thinking approaches to health:** OBSSR will stimulate systems thinking and modeling approaches to research that integrates multiple levels of analysis—from cells to society—required to understand the ways in which individual, contextual, and organizational factors interact over time to determine health status.
- 4. Population impact:** OBSSR will work with its NIH partners to identify key problems in population health where scientists, practitioners, and decisionmakers can work together to accelerate the translation, implementation, dissemination, and adoption of behavioral and social sciences research findings.

The NIH Mission:

... 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.

Each of these elements serves a critical role in improving the health of our Nation. Basic research provides the foundation for understanding the mechanisms that link behavioral and social factors with health, as well as their complex interrelationships with biomedical factors in disease and wellness. Interdisciplinary research encompasses the full range of disciplines related to health, and emphasizes the vertical integration of the disparate methods and technologies of various disciplines to understand the complex determinants of health. Systems-thinking approaches consider the various levels of analysis from the cellular to the geopolitical, taking into account the system as a whole,

as well as feedback loops and the relationships among its component parts. And finally, an emphasis on population impact focuses each of these efforts on demonstrable and tangible benefits of the scientific enterprise to the health of our Nation.

In this section, we elaborate on the four elements of OBSSR's vision. We then present recommendations regarding steps the OBSSR may take to stimulate basic research, facilitate interdisciplinary collaborations, and encourage the application of systems-thinking approaches to maximize the population impact of our knowledge.

“Next-Generation” Basic Science

Basic behavioral and social science research is critically important to NIH’s mission and is a core value of its scientific plan. Basic science spans the full range of scientific inquiry, from mechanisms and processes at the intra-individual level (“under the skin”) to mechanisms that explain inter-individual and systems behavior (“outside the skin”). Glass and McAtee (2006) provide a detailed argument for the need for a more integrative dynamic systems model, using concepts such as risk regulators and embodiment to reflect the intersection of biology with individual and population level exposures over time. Relatedly, Caspi et al. (2006) suggest that measured genetic variation and measured environmental and epigenetic exposures will play an increasingly important role, as will brain and behavior, in determining and refining the phenotypes, endophenotypes and intermediate phenotypes, for common disease and mental illness. Underlying this continuum is a need for basic inquiry into the complex interacting factors that affect health, health policy, and the delivery of health services. Basic research in the behavioral and social sciences provides the fundamental theoretical knowledge, methodology, and measures that are essential for understanding individual and collective systems of behavior and psychosocial functioning; for predicting, preventing, and controlling illness; for developing more personalized (tailored) interventions; for enhancing adherence to treatment and minimizing the collateral impact of disease; and for promoting optimal health and well-being across the lifespan and over generations. Basic science elucidates behavioral and social phenomena that are important in and of themselves, as well as in connection to health and disease.

Within this context there have been numerous exciting developments in basic behavioral and social sciences research (see sidebar):

- ◆ Research on learning theory and its application to psychopathology led to the development of empirically validated behavioral treatments for autism, anxiety, and depressive disorders now commonly used in clinical practice.
- ◆ Research on social networks and social relationships provided the basis for programs that enable families and groups to better assist individuals recovering from or coping with medical illness or addictions.
- ◆ Basic research on stereotypes, stereotyping, and cognitive processing has led to insights about how the medical care system delivers unequal treatment to women and ethnic or racial minorities.

Memory: Where Learning, Behavior, and Biology Intersect

Nobel laureate Eric Kandel’s work identified the molecular changes that underlie learning and memory. His book, *In Search of Memory: The Emergence of a New Science of Mind*, relates the story of how four distinct disciplines—behavioral psychology, cognitive psychology, neuroscience, and molecular biology—converged into a powerful new science of the mind. Through his profound insights into thought, perception, action, recollection, and mental illness, this new science is revolutionizing the understanding of learning and memory while simultaneously showing great promise for more effective healing. Dr. Kandel suggests that 21st-century neuroscience increasingly will focus on the brain circuits and systems that regulate cognition. Two major systems problems that he would want to study are

1. What factors regulate the unconscious processing of sensory information about our environment? How does conscious attention regulate the processes that then stabilize experiential memories? These are central issues in understanding consciousness and in the recall of memories from different places and times.
2. What is the relationship between the activity of an individual brain and the corporate activity of a group of brains? In other words, what is the sociology of cognition?

Dr. Kandel’s work may shed light on one of the key problems in understanding addiction, namely how repeated exposure to drugs “teaches” the brain to become addicted.

Reference:
Kandel, E. (2006). *In Search of Memory: The Emergence of a New Science of Mind*. New York: W.W. Norton & Company.

At the same time, remarkable advances in biomedical research have greatly improved our understanding of the biological mechanisms underlying the effects of social and behavioral factors on health. For instance, animal studies have demonstrated that particular patterns of maternal care cause epigenetic changes in specific brain regions and permanently alter brain structure and the expression of behavioral and endocrine stress responses in adult offspring. Genome-wide association studies, in combination with improved measures of the physical, behavioral, and social environments, will allow researchers to elucidate the links among environmental factors, behavior, gene expression, and physiological function across the lifespan. Understanding the gene-gene, gene-behavior, and gene-environment-behavior interactions that ultimately influence health and disease will require increasingly sophisticated and precise behavioral and social methods, measures, and constructs (Caspi et al., 2006). With such advancements, behavioral and social scientists may be able to address exciting new questions.

In 2004, an advisory committee to the director of NIH was established to examine basic behavioral and social sciences research across NIH. This group reviewed the existing portfolio of basic behavioral and social sciences research to identify areas of opportunity, to examine barriers to the submission and review of applications in this area, and to make recommendations for improving NIH's program in basic behavioral and social sciences research. In its report (OBSSR, 2004), the committee concluded that basic behavioral and social sciences research and training are critical to the NIH mission, and that greater support for this work is needed throughout NIH. Priority areas in basic behavioral and social sciences research identified in the advisory committee report and by stakeholders in OBSSR's strategic planning process include:

- ◆ **Gene-environment interactions:** How are genetic traits and early life experiences linked to physical and emotional health later in life? What role does personality play in the expression of psychosocial risk factors under varying environmental conditions?
- ◆ **Intergenerational transmission of behavior:** How are epigenetics and gene expression related to inter- and trans-generational transmission of behavior and emotion? Conversely, what impact does the transmission of behavior patterns have on DNA?
- ◆ **Biopsychosocial stress markers:** What are the biological sequelae of stress, and how do they relate to long-term cognitive and affective reactions? How can these findings be used to understand group behavior in the context of trauma such as natural or man-made disasters and in phenomena such as premature chronic disease, neurodegeneration with aging, and how poverty and adverse living conditions interact with variation in DNA in disease etiology and progression?
- ◆ **Technology, measurement and methodology, and cyberinfrastructure:** How can we apply advances in computer sciences, communications, imaging, and biomarker data collection and other technologies to measure behavior in real time (e.g., ecological momentary assessment, personal sensors, geospatial coding methods) to decipher multilevel pathways linking biology, behavior, environment, and society? What informatics grids, networking, and database infrastructures are needed to support these activities?
- ◆ **Spirituality and health:** How do individual belief systems or social religious norms affect health?
- ◆ **Work-related stresses:** What are the effects of conflicts between work and family associated with women entering the workforce on social stress and health?
- ◆ **Social integration and social capital:** How have advances in technology and mobility affected neighborhood social networks and mechanisms such as resilience and connectedness? What is the impact of these advances on health behaviors and health outcomes?

- ◆ **Inequality and health outcomes:** How do large-scale societal structures (e.g., racial segregation, immigration and acculturation patterns, socioeconomic status) impact health?
- ◆ **Complex adaptive systems:** How can our growing understanding of complex adaptive systems be used to better understand the process of decisionmaking in health at the personal and systems levels?

- ◆ **Social movements and policy change:** How do social movements related to health take shape and permit things like tobacco taxes and school lunch program changes to occur? How and why must public opinion change before legislative, regulatory, or other legal action is possible? What science will enable researchers to coach legislators to frame messages in ways that maximize chances for motivating and sustaining positive health-related change?

Strategic Recommendations

OBSSR will help to build consensus and stronger partnerships within NIH regarding the most important research areas that will affect the Nation's most pressing public health problems. OBSSR also will explore the potential to link behavioral and social scientists within NIH to leverage their knowledge and resources. OBSSR will facilitate a common research language and terminology among behavioral and social scientists and with the broader scientific community. It also will encourage the development of new theoretical models, methodologies, and tools necessary to answer the many questions facing our fields. Other recommendations from participants in the planning process include

- ◆ Work with partners and stakeholders to identify and reach consensus on priority research areas in basic behavioral and social sciences.
- ◆ Promote the value of basic behavioral and social sciences research throughout the NIH community.
- ◆ Encourage research that bridges basic and applied behavioral and social sciences.
- ◆ Develop better research infrastructure by encouraging the identification of human and animal populations, birth cohorts, and community populations for future longitudinal studies.

Interdisciplinary Research

We are not students of some subject matter, but students of problems. And problems may cut right across the borders of any subject matter or discipline.

~ Karl Popper, 1963

Solving our most pressing health problems will require a greater understanding of the full range of factors that determine health—biological, medical, behavioral, social, and environmental—and of their complex interrelationships. In many instances, a single research discipline is best suited to tackle specific health problems. However, increasingly it is recognized that the most urgent public health challenges facing our Nation cannot be adequately addressed within a single discipline, and instead require a more comprehensive approach. New discoveries and innovative solutions may become possible when researchers in different disciplines meet at the interfaces and frontiers of those disciplines to pool their diverse knowledge.

Various terms have been used to describe these collaborations (Rosenfield, 1992), including transdisciplinary, multidisciplinary, and interdisciplinary. For the purpose of this prospectus, we have chosen to use interdisciplinary research to refer to scientific endeavors in which a variety of disciplines work together closely from the outset to address a problem (Rosenfield, 1992). Interdisciplinary is the phase between unidisciplinary and multidisciplinary on the one hand, and full transdisciplinary synthesis on the other hand. Interdisciplinary research and education are inspired by the drive to solve complex questions and problems, whether generated by scientific curiosity or by pressing social need. Over time, collaboration among diverse scientists has the potential to produce new disciplines, as in bioinformatics, psychoneuroimmunology, behavioral genetics, and cognitive and social neuroscience.

Interdisciplinary approaches in the behavioral and social sciences have been discussed extensively (e.g., NRC, 2004; Kessel et al., 2003) and supported in several large-scale research programs. Two recent examples are the Research Teams of the Future theme of the NIH Director's Roadmap for Medical Research (Zerhouni, 2003) and the NCI Transdisciplinary Tobacco Use Research Centers (TTURCs) established at several universities during the 1990s. An interdisciplinary framework can be used to understand major population health problems such as tobacco use through a conceptual synthesis across three major domains: (1) lifespan developmental factors that span the prenatal period through older adulthood; (2) individual variation in biobehavioral factors such as genes, hormones, cognitions, and behaviors; and (3) group variation in factors such as the peer group, family, community, and economy. Recently there has been increasing interest in applying interdisciplinary thinking to other areas such as the obesity and diabetes epidemics and health disparities (Abrams, 1999, 2006a,b; Abrams et al., 2003; Adler and Ostrove, 1999; McLeroy et al., 2003; Merzel and D'Afflitti, 2003). Such integrated approaches require more than collaboration across disciplines; moving from interdisciplinary to true transdisciplinary work requires a shared knowledge base, common terminology, and the ability to work synergistically to develop new conceptual models,

measures, and interventions that change future health outcomes (Kahn and Prager, 1994).

Increasing numbers of researchers are calling for the use of more longitudinal and population-based approaches that integrate biomedical, behavioral, social, and public health sciences to address major health issues such as women's health (Marts, 2002), child and adolescent mental health (Hoagwood and Olin, 2002), and alcoholism (Holder, 2001; Meyer, 2001). A 2003 IOM report, *The Future of the Public's Health in the 21st Century*, points to the gap between health spending and health outcomes, and prescribes an interdisciplinary biobehavioral approach to evidence-based public health (IOM, 2003).

Despite the growing enthusiasm for interdisciplinary approaches and recent models of success (see sidebar on Page 14), broad acceptance of interdisciplinary research remains a goal for the future. In consultation with the scientific community, OBSSR will play a key role in defining relevant issues and facilitating an interdisciplinary, team-based approach to population health research by fostering collaborations among the broad base of stakeholders (e.g., policymakers, employers, practitioners, patients, the general public, and researchers) needed to ensure the implementation and adoption of scientific findings.

Strategic Recommendations

- ◆ Engage the scientific community through symposia, working groups, and ad hoc committees to identify research areas that can be effectively investigated using interdisciplinary approaches.
- ◆ Encourage and support the development of funding opportunity announcements and Requests for Proposals to address the areas identified for interdisciplinary study.
- ◆ Provide education and training activities to facilitate interdisciplinary research among biomedical, behavioral, and social science researchers and practitioners. Strive for appropriate representation of scientific disciplines across the natural sciences (e.g., psychology, biology), mathematics and computer science, social sciences (e.g., anthropology, economics, communications, political science, public health), and applied sciences beyond traditional health-related fields (e.g., business, education, engineering).
- ◆ Identify, document, and share with key audiences studies that demonstrate the value of integrating social and behavioral sciences perspectives, constructs, and measures in health research.
- ◆ Develop metrics and methods needed to demonstrate the economic benefits and public health impacts of rigorous, integrated biopsychosocial health research.
- ◆ Collaborate in the development of curricula, modules, and materials to train behavioral, social, and biomedical scientists to design and conduct interdisciplinary research.
- ◆ Strengthen the behavioral and social sciences research methods and analyses to support interdisciplinary biopsychosocial health research. Increase the degree to which behavioral and social scientists have the capacity to help fulfill OBSSR's mandate and the NIH mission.

Understanding Tumor Growth in Cancer: An Interdisciplinary Approach

Cancer remains one of the most challenging human diseases. Recent interdisciplinary research suggests that its pathophysiology is strongly influenced by the mind. What we are learning about this link may inform the development of biological and behavioral interventions to prevent and treat cancer in the future.

A recent review in *Nature* summarized molecular, cellular, and clinical studies that have elucidated many of the mechanisms underlying the links between biology and behavior in cancer. Evidence regarding links between psychosocial and behavioral factors and tumor growth include the following:

- Stress, depression, and lack of social support play a role in the growth and development of cancer. For example, the breakup of a marriage has been associated with a twofold increase in the risk of breast cancer, and long-term chronic depression appears to increase general cancer risks.
- Psychosocial factors have an impact on cellular and molecular processes that, in turn, contribute to the incidence and progression of cancer.
- Treatment of animals with drugs that block sympathetic nervous system (SNS) activity, a key component of the physiological response to stress, has been shown to inhibit the effects of behavioral stress on cancer.

Early results of this research indicate a complex matrix of psychological, social, and biological factors in cancer, ranging from social isolation to viral infection, which in turn affect known physiological processes that lead to specific types of cancers in animal subjects. Further research in this area may yield targeted interventions—for the mind, the body, or both—that use this knowledge to reduce the burden of cancer.

Reference:

Antoni, M.H., Lutgendorf, S.K., Cole, S.W., Dhabhar, F.S., Sephton, S.E., McDonald, P.G., Stefanek, M., and Sood, A.K. (2006). The influence of bio-behavioural factors on tumour biology: pathways and mechanisms. *Nature*, 6, 240-8.

Systems-Thinking Approaches to Health

The third component of OBSSR's vision focuses on systems-thinking approaches to population health research. Systems integration and modeling have advanced dramatically since their inception in the 1950s due to advances in computer sciences, mathematics, and the development of cyberinfrastructure, the informatics superhighway, and global connectivity (Atkins et al., 2003). Systems thinking addresses the dynamic relationships among individual components and whole systems related to health and disease. The term "systems" in this context has multiple levels of meaning (see Trochim et al., 2006). It refers to the multilevel, complex interrelationships among the many determinants of health as well as the networks of stakeholders and organizations involved in addressing health issues. It is important to note that the term "systems" is used broadly here and is not meant to refer exclusively to the organization by which health care is provided, commonly referred to as the *healthcare system* (Trochim et al., 2006).

Systems-thinking approaches encompass both qualitative and quantitative methodologies. "Soft" systems approaches (Checkland, 1981) bring together multiple stakeholders to define and analyze population health problems within a structured group process. These approaches allow for diverse input in framing a problem, selecting analytic tools, and evaluating outcomes, and are believed to yield a richer conceptualization of a problem and more creative solutions. Central to the success of soft systems approaches is the availability of a technology infrastructure that links individuals in a network in which knowledge can be shared across research teams and disciplines. This knowledge includes both explicit knowledge (data) and tacit knowledge (experience and wisdom of individuals and organizations from diverse backgrounds). Cutting-edge innovations in health technologies by networks of stakeholders will likely yield dramatic improvements in disease surveillance, environmental monitoring, food safety, emergency planning, disaster management, and tracking of environmental hazards through geographic information systems (see sidebar).

A second type of systems-thinking approach is quantitative in nature and focuses on the theories and methods to understand how numerous factors interact nonlinearly, over time in multiple feedback loops to determine health. Each of these tools enables systems approaches to address a broad range of factors within a single framework—from genetic to environmental, cellular to behavioral, and biological to social. For example, chaos and complexity theories have the potential to explain how small changes at the individual level that occur cumulatively in large populations can result in significant shifts in the absolute cases of disease (Rose, 1992; McKinlay and Marceau,

Information Technologies and the Behavioral and Social Sciences: The Promise of an Integrated Approach to Population Health

Recent advances in the computer sciences and information technology fields have spawned several methodological advances in the biological and molecular sciences (e.g., DNA chip technology and microarray analysis), enabled quantum leaps in molecular and submolecular medicine, and catalyzed the emergence of whole new fields of study such as proteomics, phenomics, nutrigenomics, and pharmacogenetics. Perhaps, in like manner, with the emergence of eHealth, the behavioral and population sciences may be on the verge of a similar information technology-based scientific revolution. New eHealth solutions may soon permit the real-time integrative utilization of vast amounts of behavioral-, biological-, and community-level information in ways not previously possible. Behavioral algorithms and decision support tools for scientists could facilitate the analysis and interpretation of population-level data to enable the development of "community (population) arrays" or community-wide risk profiles, which in turn could form the foundation of a new "populomics." This population-level risk characterization could potentially go beyond the limitations of typical geographic analyses and yield insights distinctly different from risk stratification based on current methodologies. Generically, these emerging technologies have been termed population health technologies and are believed to offer significant promise.

~ Gibbons, 2005

Reference:

Gibbons, M.C. (2005). A historical overview of health disparities and the potential of eHealth solutions. *J Med Internet Res*, 7(5), e50.

2000). System dynamics modeling and agent-based models are methods that can simulate complex and emergent behaviors, for example, the manner in which a pandemic bird flu might spread depending upon assumptions made about the behavior of individuals and clusters of individuals within different community, cultural, and national contexts.

Many of the components of systems-thinking approaches remain exploratory tools whose potential requires further study. However, successful application of these approaches in defense (Krygiel, 1999), business (Senge, 1994), and cellular biology (Weston and Hood, 2004; Grimm et al., 2005) have resulted in a growing interest in their application to population health research. An evidence base is growing for the impact of systems approaches in areas such as policy interventions for tobacco control (Levy et al.; 2004, Trochim et al., 2006), management of antibiotic resistance and the care of chronic disease (Homer et al., 2001), injury and violence prevention (SOPHE, 2006), and the synergistic interaction between infectious disease epidemics (CDC/NCCDPHP, 2005). Other examples include:

- ◆ **The Initiative for the Study and Implementation of Systems (ISIS) Project:** a proof-of-concept initiative for applying systems thinking to tobacco control.
- ◆ **The Models of Infectious Disease Agent Study (MIDAS):** a collaboration of seven multi-institutional research and informatics groups to develop computational models of the interactions between infectious agents and their hosts, disease spread, prediction systems, and response strategies (NIGMS, 2006).
- ◆ **The NIH Roadmap for Medical Research:** a large-scale initiative that promotes concepts from systems thinking such as stakeholder networks and systems modeling in its emphasis on new pathways to discovery and re-engineering the clinical research enterprise (NIH, 2006).

Systems-thinking approaches show promise for unlocking the secrets of complex, multidimensional health problems, and for transforming this knowledge into effective interventions that can fundamentally change population health (Trochim et al., 2006). OBSSR intends to harness systems-thinking approaches to support very clear and specific objectives: (1) to better understand the complex biobehavioral bases of current population health issues; (2) to create a research culture that works to find and implement solutions to these health problems by understanding how to organize networks of stakeholders at multiple levels; (3) to develop more efficient systems that maximize existing resources; and (4) to effectively disseminate emergent knowledge.

Strategic Recommendations

- ◆ Facilitate the development and application of conceptual frameworks and tools needed for the application of systems thinking to the study of human health and its determinants.
- ◆ Promote and support the development of biometrics, and the maintenance and widespread use of databases containing genomic information as well as biological, social, and behavioral data related to health.
- ◆ Contribute to the development of analytical frameworks, methods, and algorithms capable of integrating, analyzing, and interpreting highly diverse data with varying metrics from research on genomic sequences, molecules, behavior, and social systems.
- ◆ Collaborate in the development of curricula, modules, and materials required to train health scientists in the application of systems thinking and tools.
- ◆ Encourage the application of systems-organizing principles among stakeholder organizations in the behavioral and social sciences, and promote the development of systems-organizing expertise among leaders, policymakers, and researchers.
- ◆ Contribute to the science of dissemination to understand the factors promoting or impeding the adoption and implementation of research by health care providers, insurers, policymakers, and the public.
- ◆ Improve the dissemination of science by publicizing successful examples of collaborative research, fostering collaboration with health care delivery systems to translate research into practice, and encouraging a broad research dissemination mandate throughout NIH.

Population Impact: Problem-Focused Research

Behavioral and social sciences research has made enormous contributions toward understanding the relationships among psychosocial and biological factors in promoting health and in minimizing the burden of disease and disability. At the same time, however, critical gaps remain in our understanding of well-being and disease. Urgent problems in need of innovative solutions include unintentional injuries and violence; health disparities across the disease continuum; major causes of death including heart disease, cancer, stroke, diabetes, and respiratory disease; and the social and behavioral risk factors that lead to these diseases and disparities (e.g., poverty, smoking, physical inactivity, social isolation, poor diet, stress). To address the complex and challenging population health problems facing our Nation, scientific inquiry must emphasize not only the pursuit of knowledge but also its application to solutions.

The three elements of OBSSR's vision discussed so far—next-generation basic science, interdisciplinary research, and systems-thinking approaches—describe the types of research needed to achieve OBSSR's vision. To maximize the population impact of scientific discovery in each of these areas, research products need to be translated into practical applications that are then implemented effectively and efficiently in real-world settings, disseminated broadly to all stakeholders, adopted by organizations and institutions, and maintained through policies. To realize this goal, health research must serve the needs of practitioners, decisionmakers, and the populations they represent, and must reach the audiences it is intended to help.

Making research relevant. Realizing the full potential of our Nation's investment in health research requires that science inform both practice and policy. With strong leadership, inclusive participation, and appropriate vision, we can stimulate relevant and usable research that is informed by the needs of end users whether they are healthy individuals, patients, practitioners, community leaders, or policymakers. Successful use of each of these elements is described in the sidebar about the North Karelia Project, a multi-modal community-based initiative that serves as a precursor to today's focus on public health as an integrated system.

To close the gap among research, practice, and policy, innovative models are needed for stakeholder participation throughout the research process. We need robust measures and consistent reporting of intervention and treatment costs that consider multiple perspectives such as those of the patient, payer, community, and employer. Research needs to provide relevant and timely information to practitioners, policymakers, and other decisionmakers. Subject participation in research trials needs to be maximized to understand the full spectrum of demographic, psychosocial, cultural, and religious factors related to health outcomes, and to ensure that research is culturally responsive and relevant to the context in which it will be implemented.

Improving Population Health: Lessons from North Karelia

The North Karelia Project underscores the value of a multi-modal approach to a major public health issue. In the 1960s, Finnish men had the world's highest rate of heart disease mortality. The death rate was especially high in the province of North Karelia, a rural area in the eastern part of the country. In response to this public health crisis, in 1972 officials in North Karelia began a community-based initiative to reduce cardiovascular disease and mortality. Directed by Pekka Puska, M.D., Ph.D., the North Karelia project included:

- Cultural interventions addressing traditional Finnish dietary norms, successfully reducing fat intake and increasing consumption of fruits and vegetables more than twofold.
- Media outreach including health-related news features, educational content, and a national "quit and win" contest.
- Training health care providers to provide cardiovascular risk factor assessment and counseling for all patients.
- Engaging community leaders and workplaces to spearhead health promotional activities.
- Policy interventions including public smoking bans, the elimination of tobacco advertising, and taxes earmarked for tobacco control programs.

The results of this project are impressive. By the early 2000s, the number of deaths of working-age Finnish men from coronary heart disease had plummeted by 75%. In North Karelia, the reduction was even greater (82%) and life expectancy for men went up 7 years. Much of this reduction in mortality came from reductions in risk factors like high blood pressure, high cholesterol, and smoking through nutritional changes and smoking cessation. Today, this project continues to sustain itself with a modest level of public resources.

Reference:
Puska, P., Pirjo, P., & Ulla, U. (2002). Influencing public nutrition for non-communicable disease prevention: From community intervention to national programme—experiences from Finland. *Public Health Nutr*, 5(1A), 245-51.

Implementation, adoption, and maintenance.

It is not enough for behavioral and social scientists to do rigorous research and develop effective interventions; there must also be delivery channels and systems in place to disseminate these interventions to the public, policymakers, and other decisionmakers to ensure that they are implemented, adopted, and maintained. Research is needed to understand the processes involved in successfully transferring evidence-based interventions from the setting in which they were tested into local settings, which may differ somewhat. Fruitful and innovative business models and partnerships are needed to facilitate the dissemination and adoption of evidence-based interventions throughout the health care system. Implementation efforts must address the science of how discoveries are adopted. This involves considering such factors as capacity, organizational values, and the dynamics of practice networks. These efforts also must address the many contextual variables involved in the adoption and sustained maintenance of evidence-based practices. The systems-thinking approaches described earlier can be used to understand and improve organizational readiness and capacity to adopt and implement best practices.

Finally, behavioral and social scientists must consider factors that relate to the reward structure inherent in today's health care delivery systems, including financial incentives, core business models, and alignment with organizational goals. The inherent rewards of putting what we know into widespread practice and policy are not built into existing social and economic systems (Kerner et al., 2005). This reality is in sharp contrast to other aspects of the health care industry, where new medications, devices, and technologies are rapidly being developed and deployed, secondary to financial incentives in the private sector pipeline of discovery, development, and delivery.

The past century has seen substantial improvement in overall mortality and morbidity. Life expectancy increased approximately 30 years (CDC, 2005), with adults now living well into their 70s. Despite this progress, the behavioral and social sciences still have enormous contributions to make in elucidating measured gene-environment interaction, and extending longevity, improving quality of life, and eliminating health disparities that have yet to be fully realized.

In some senses “population impact” requires scientists to “work backwards” from a complex but clearly defined problem to all possible causal pathways and their mechanisms of action and contributions to the problem. The “causes of causes” and the drivers of the large numbers of absolute cases of common and chronic disease burden and death may reside as much or more in macrosocioeconomic and lifestyle risk factors as they do in genetic variation or variation on DNA (McKinlay and Marceau, 2000; Rose, 1992).

Strategic Recommendations

- ◆ Collaborate in research on high-priority health issues that transcend the boundaries of individual NIH ICs, such as obesity, injury and violence, pain, parenting, and the management of chronic diseases.
- ◆ Develop and disseminate standards of evidence for the design, implementation, and reporting of biopsychosocial research of the highest quality and rigor.
- ◆ Facilitate a dialogue among researchers regarding the nature of evidence (e.g., randomized controlled trials versus qualitative methods) for behavioral and social science research.
- ◆ Help to define and establish consensus on terms such as dissemination, implementation, translation, and adoption.
- ◆ Use problem-focused research to strengthen the science of dissemination and the dissemination of evidence-based behavioral and social science.

IV. CAPACITY BUILDING AND SUPPORT

Three additional approaches are central to OBSSR’s ability to achieve its strategic aims: partnership, education and training, and communications. These areas transcend each of the programmatic directions described above and represent core functions of how OBSSR will work with its NIH partners, the behavioral and social sciences communities, the broader research communities, and stakeholders such as practitioners and policymakers to support the NIH mission.

Partnership

The key elements of OBSSR’s vision—“next-generation” basic science, interdisciplinary research, systems-thinking approaches, and population impact—all underscore the need for effective partnerships across NIH. Many of the urgent health problems transcend the boundaries of individual ICs. A systems-oriented approach requires innovation, new thinking, and new methods as basic research produces new knowledge about the multilevel complexities of health and disease.

Interorganizational partnerships may be relatively informal and focus primarily on information sharing. Alternatively, partnerships may be more formal, with common goals and objectives, ongoing interaction, defined complementary roles and working relationships, dedicated human and financial resources, and shared accountability for the expected mutual benefits (Butterfoss and Kegler, 2002; Gray, 1989; 1996; Milward and Provan, 2003). The six key factors for successful collaborative leadership include: (1) clear common aims, (2) trust, (3) collaborative leadership, (4) sensitivity to power issues, (5) a membership structure that facilitates shared goals, and (6) reflective shared action learning (Huxham, 2003;

Huxham and Vangen, 2000). OBSSR will seek to maximize each of these dimensions in its collaborative relationships. At times, OBSSR will play a leadership role in initiating and directing activities in support of NIH’s mission; at other times, OBSSR will play a facilitative role to support and empower the work of other ICs and partners within HHS.

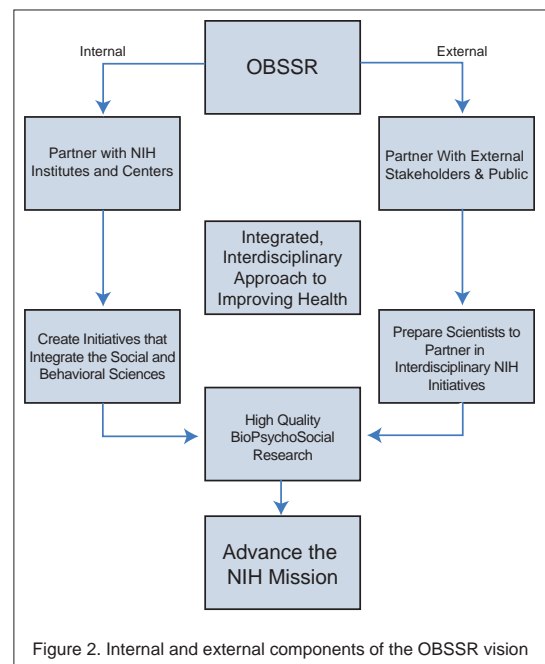


Figure 2. Internal and external components of the OBSSR vision

Strong collaborative relationships between OBSSR and its internal and external partners (see Figure 2) are crucial to realizing its vision of science and public health:

- ◆ OBSSR will work with its *internal* partners to improve the investment in basic and applied research in behavioral and social sciences at specific ICs and throughout NIH.
- ◆ OBSSR will work with its *external* partners to build support among key stakeholders, decisionmakers, gatekeepers, and the general public for a stronger science of behavior.

While relationships within NIH represent the *sine qua non* of OBSSR's work, an important future direction for OBSSR is expanding its outreach activities. Such efforts will include strengthening partnerships that help behavioral and social scientists gain the capacity to help fulfill OBSSR's mandate and the NIH mission, and exploring relationships with nontraditional partners such as the business community, third-party payers, and policymakers. OBSSR will work to clearly define the ways in which extramural researchers can work with OBSSR and its NIH partners throughout the research cycle.

In addition, OBSSR is strengthening partnerships with partners such as CDC and its affiliated National Center for Health Marketing, AHRQ, NSF, the Consortium of Social Science Associations, the Health Resources and Services Administration, and other federal agencies.

Communications

In today's digitally connected environment, an infrastructure for better communications and dissemination represents a key part of OBSSR's communications strategy. Concrete steps taken in this area include

- ◆ Promoting the development, maintenance, and widespread use of databases containing longitudinal social and behavioral data related to health.
- ◆ Identifying or creating dissemination channels for sharing social and behavioral sciences perspectives, constructs, measures, and findings in health research.

- ◆ Developing interdisciplinary models for biopsychosocial research that successfully integrate the social and behavioral sciences into biomedical research.

Communications is a multidirectional process that links communities of research and practice. Public health interventions cannot save lives if they are not implemented, and research cannot improve health if it is not informed by the needs and experiences of practitioners. Building communication channels that link all stakeholders of public health into a living, participatory community will form a critical backbone for the way we approach health, disease, and wellness in the future.

Education and Training

Consistent with its original mandate, OBSSR will continue to initiate and support a broad range of education and training experiences in intramural and extramural research programs at NIH. Two key areas of focus for OBSSR in this area include:

- 1. Fostering collaborative research skills in behavioral and social science.** OBSSR will increase the pool of behavioral and social scientists with the skills and knowledge necessary to conduct cutting-edge basic science, collaborate in interdisciplinary teams, and use systems approaches. OBSSR will continue to initiate and support theoretical, substantive, and methodological training activities to support the development of strong behavioral and social scientists at all stages of career development. These activities may take the form of summer courses, symposia, or workshops conducted by experts in relevant fields. Specific topics might include the measurement of social, environmental, and economic variables, and behavioral phenotypes; statistical methods for multicomponent, individually-tailored interventions; standards of evidence in research; and the use of large data sets.

To encourage interdisciplinary research, OBSSR will provide opportunities for behavioral, social, and biomedical scientists at an early stage of their careers to learn each other's methods, procedures, and/or theoretical perspectives, and for more

established scientists to acquire new approaches or perspectives that can be applied in their research. The aim is to allow scientists across the research continuum to understand other disciplines, and to recognize and use ideas applicable to their own work. Basic scientists will be introduced to the scope of application-oriented issues, and applied researchers will be kept abreast of basic research. In addition, OBSSR will help identify current gaps in medical training with regard to the behavioral and social sciences, and continue to facilitate the incorporation of IOM recommendations into medical school curricula (see sidebar).

- 2. Promoting behavioral and social sciences within the NIH community** through conferences and state-of-the-science panels that increase awareness throughout NIH of the important contributions from the behavioral and social sciences. OBSSR also will publicize examples of successful collaborative health research in which the behavioral and social sciences have played a role. OBSSR will continue to work with the Behavioral and Social Sciences Research Coordinating Committee to exchange information, to enhance communication, integration, and coordination of behavioral and social sciences research training activities at NIH, and to convene the behavioral and social sciences research seminar series, in which prominent behavioral and social scientists provide the NIH community with overviews of current research on topics of scientific and social interest.

Program Evaluation

Development of this prospectus has been and will continue to be a dynamic process. The programmatic directions and implementation priorities delineated in this document will necessarily evolve, and paths for future initiatives will depend upon the outcomes of current endeavors. In addition, the results of ongoing research will bring new knowledge to better inform future investments, and undoubtedly will lead to as yet unimagined new opportunities for the future. In light of this reality, evaluating OBSSR's success in implementing each of its programmatic directions and strategies will necessarily be an ongoing process that requires regular re-evaluation and assessment.

OBSSR's approach to program evaluation is best conceptualized as continuous quality improvement comprised of a series of opportunities for evaluation and "mid-course corrections." The primary step in developing an evaluation plan will be to identify the appropriate milestones to which OBSSR will hold itself accountable, and the metrics it will use to determine its progress in reaching those goals. In keeping with best practices for program evaluation, an equally important priority is to establish mechanisms for involving objective, independent external assessments and evaluations of OBSSR programs and strategies.

Bringing Behavioral and Social Sciences into Medical School

Despite the fact that a majority of health problems have behavioral roots, the core skills behind such behavioral health interventions have rarely been a focus within the standard medical school curriculum. In response to this need, OBSSR and the Robert Wood Johnson Foundation commissioned an IOM report, *Improving Medical Education: Enhancing the Behavioral and Social Science Content of Medical School Curricula*.

The report includes three core recommendations:

1. Integrate behavioral and social science topics into the mainstream curriculum. The report recommended six specific curriculum topics, including mind-body interactions, physician-patient communication skills, and social/cultural factors in health behavior change.
2. Develop a new national behavioral and social science curriculum database, as part of the Association of American Medical Colleges (AAMC)'s standard Curriculum Management and Information Tool (CurrMIT).
3. Create career development and curriculum development awards for behavioral and social science to reward excellence in teaching these subjects within medical schools.

NIH issued a Request for Applications and funded awards totaling \$1.5 million in 2005 for developing and implementing these curricula within medical schools. This initiative will result in a much stronger practice base for the plurality of behavior-related health problems seen in today's health care system.

References:

- Bailey, D.S. (2004). Expanding medical training. *APA Monitor on Psychology*, 35(6), 46. NIH, "Strengthening Behavioral and Social Science in Medical Schools," RFA Number: RFA-OD-05-001, URL: <http://grants.nih.gov/grants/guide/rfa-files/RFA-OD-05-001.html>, accessed April 30, 2005.
- IOM (2004). *Improving Medical Education: Enhancing the Behavioral and Social Science Content of Medical School Curricula*. Washington, D.C.: The National Academies Press.

V. LOOKING FORWARD

As behavioral and social scientists, we see enormous potential to improve the health and well-being of all citizens. Through the full realization of each of the elements of OBSSR's vision described in this prospectus, we envision healthy individuals, living in health-promoting communities, and supported by societal policies and economic incentives that maximize the potential to achieve good health—not merely the absence of disease or infirmity, but rather a state of complete physical, mental, and social well-being (WHO, 1946). As stated by Professor Colin Blakemore, Chief Executive of Medical Research Council in the United Kingdom, the biggest breakthroughs will be “...in prevention... and what one might call ‘populomics’, the study of the genetic and phenotypic diversity of human populations, and how they interact with their environments and how their behavior influences their health and disease patterns” (Blakemore, 2006).

As it enters its second decade, OBSSR and its partners are well positioned to help realize this vision. We have the knowledge, expertise, and tools needed to develop research initiatives that bring the perspectives and methods of the behavioral and social scientists to bear on complex problems in health and disease, several of which have been articulated in an NRC report (see sidebar). Additionally, as a congressionally established office within the Office of the Director, OBSSR brings to its work both a mandate from the legislative branch and a clearly defined role in partnership with NIH leadership. As a result of its modest budget, small staff, and relative freedom from the management of an extensive portfolio of research grants, OBSSR can devote its time and energy to working with its partners to create research, training, and communication initiatives. Because of its mandate, institutional status, and focus on promoting and facilitating the work of its internal and external partners, OBSSR is able to convene and mobilize the diverse disciplinary perspectives required to address complex biopsychosocial issues in health and disease, and collaborate with the biomedical sciences in addressing these issues. It is also well positioned to

play a key role in educating scientists and the general public about the importance of the behavioral and social sciences in improving our Nation's health.



This vision is tempered by social need and economic reality. Current public health and health care systems can neither sustain the pace of cost escalations, nor provide quality care for the growing population of older Americans. The scope and scale of the challenges overwhelm the pace and magnitude of current investments.

Recognizing these challenges, behavioral and social sciences research can and must be included in the broad research enterprise to address the challenges facing the health care system and to improve health. Behavior, individual and collective, is the bridge between biology and society. We must keep our “eye on the prize” of improving health, longevity, and quality of life. OBSSR’s vision is to mobilize the biomedical, behavioral, social science, and population science research communities as partners to solve the most pressing health challenges facing society.

Integrating Social, Behavioral, and Biomedical Sciences: Priority Research Areas for the Future

The integration of basic behavior and social science research with the broader fabric of health and science has been an evolving process. In 1999, OBSSR commissioned the NRC to evaluate the potential contributions of behavioral and social science research to the mission of NIH and to develop research priorities that support and complement the work of NIH. Ten priority research areas were identified, summarized in the report titled *New Horizons in Health: An Integrative Approach*:

1. **Predispose pathways:** Identify biological, social, behavioral, and psychological precursors to disease.
2. **Positive health:** Identify the biological, social, behavioral, and psychological factors in wellness and resistance to disease.
3. **Gene expression:** Explore the links among genetic, biological, social, and behavioral factors and their relationship with subsequent health outcomes.
4. **Personal ties:** Improve understanding of the associations between social connections and positive and negative health outcomes.
5. **Healthy communities:** Support research on building healthy communities, and determine how the collective properties of community-level units relate to health and disease outcomes.
6. **Inequalities:** Understand inequalities associated with socioeconomic status, race, and class, and their impact on health.
7. **Population health:** Investigate macro-level trends in health, as well as performance evaluation of the health care system.
8. **Interventions:** Develop new and innovative interventions that expand the scope and effectiveness of efforts to improve health.
9. **Methodology:** Build capacity in areas such as new measurement techniques and study designs that link information across levels of analysis (e.g., molecules to communities) and across time.
10. **Infrastructure:** Improve research infrastructure through activities such as maintaining long-term study populations and training scientists to participate in interdisciplinary health-related research and dissemination.

The report combines these general directions with very specific recommendations for their implementation. Each of these recommendations has served as a valuable strategic roadmap for OBSSR and NIH’s efforts to improve health.

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Appendix A: Informing the Prospectus

OBSSR was established in 1995 to stimulate behavioral and social sciences research throughout NIH and to integrate these areas of research more fully into others of the NIH research enterprise, thereby improving our understanding, treatment, and prevention of disease. Since that time, this organization has matured and the work of OBSSR has become critical to the mission of the NIH. OBSSR believes that it has arrived at an opportune time to revisit the strategic focus of the office.

The intent of this assessment project was to solicit the best thinking from a diverse audience to shape OBSSR's strategic focus. Because involving many people with diverse perspectives requires a structured process to organize each person's important contributions, Concept Systems Inc. (CSI) facilitated this process through the use of the concept mapping methodology, the convening of an Expert Panel and related interviews, interviews with key Institute Directors, content analysis of existing literature, and the convening of an Issues Summit of leaders throughout the fields of behavioral and social sciences. A Project Planning Group was established to advise and support these efforts.

Table 1: Streams of Inquiry (2005-2006)

Time	Expert Panel	Concept Mapping Framework	Institute Directors
August 2005	Invitations	Focus and Participants	
September 2005	Interviews	Sorting/Rating	Invitations
October 2005	Summary Report		Interviews
November 2005	Link to CM Framework	Preliminary Report	
December 2005	Expert Panel Meeting	Final Conceptual Framework	Summary, Link to Framework
	Meeting Summary		
January 2006		Issues Summit	
February 2006		Workgroups Report	
March 2006		Draft Plan SBM Presentation	
June 2006		10th Anniversary Event Town Hall Meeting	

The OBSSR leadership and the Planning Group were committed to multiple opportunities for engaging stakeholders and audiences. Table 2 describes the audiences, the key roles they played, and the resulting information from each phase of inquiry.

Table 2: Stakeholders and Audiences

Audience	Input	Results	Products
Expert Panel N = 18	Interview responses	Targeted observations on key topics	Summaries, integrated summary, extracted statements linked to conceptual framework, agenda for Expert Panel meeting
Institute directors N = 3	Interview responses	Targeted observations on key topics	Summaries, integrated summary, extracted statements linked to conceptual framework, agenda for Expert Panel meeting
Concept Mapping Brainstorming invitees (including Expert Panel and Issues Summit invitees) N = 208	Participation in brainstorming for conceptual framework	Statements to focus prompt N = 247	Final statements for framework development N = 93
Concept Mapping Sorting participants (including Expert Panel and OBSSR representatives) N = 48	Participation in individual relational sort of final statements	Concept map	Structured framework for linking information, framing Issues Summit
Concept Mapping Rating participants N = 208	Participation in two ratings events	Importance/feasibility values overlaid on map Pattern Matches Go Zones	Targeted guidance for strategic plan development, Issues Summit agenda and work groups

CONCEPT MAPPING

Concept mapping is a mixed methods planning and evaluation approach that integrates familiar qualitative group processes (brainstorming, categorizing ideas, and assigning value ratings) with multivariate statistical analyses to help a group describe its ideas on any topic of interest and represent these ideas visually through a series of related maps (Kane and Trochim, 2007). The Concept System® planning and facilitation methodology was used in this process.

The Planning Group, with guidance from CSI, developed a focus prompt to which stakeholders responded:

“What specific actions should the Office of Behavioral and Social Sciences Research undertake to maximize the contributions of the behavioral and social sciences to the overall NIH mission?”

The Planning Group invited over 200 people to participate in this project including leaders in the fields of behavioral and social sciences, NIH Institute representatives, and other external key stakeholders. Through the engagement of these stakeholders, this initiative was able to develop a strategic framework that provides OBSSR a broad conceptual

basis from which to identify priority strategies, while at the same time providing details regarding specific strategies, as well as an archived database of specific tasks or actions suggested by the participants to enable the priority strategies to be addressed efficiently and effectively.

In total, 247 specific ideas were contributed by 229 participants. The Planning Group conducted an idea synthesis, which surfaced 93 specific strategic elements, and archived the remaining tasks, activities, and considerations for use in the implementation of the plan. Participants were then contacted again and asked to participate in tasks to structure the information.

Sorting. In the sorting task, a core group of 48 participants were asked to organize or sort the entire database of 93 ideas into groups or themes based on similarity of the ideas.

Rating. For the rating task, all stakeholders who participated in the idea generation, along with several newly identified extended group members, were again contacted and asked to evaluate or rate each of the final ideas on a Likert five-point scale. Both the core group and the larger extended group participated in this process. Participants were asked to rate along two dimensions: *Importance and Feasibility*.

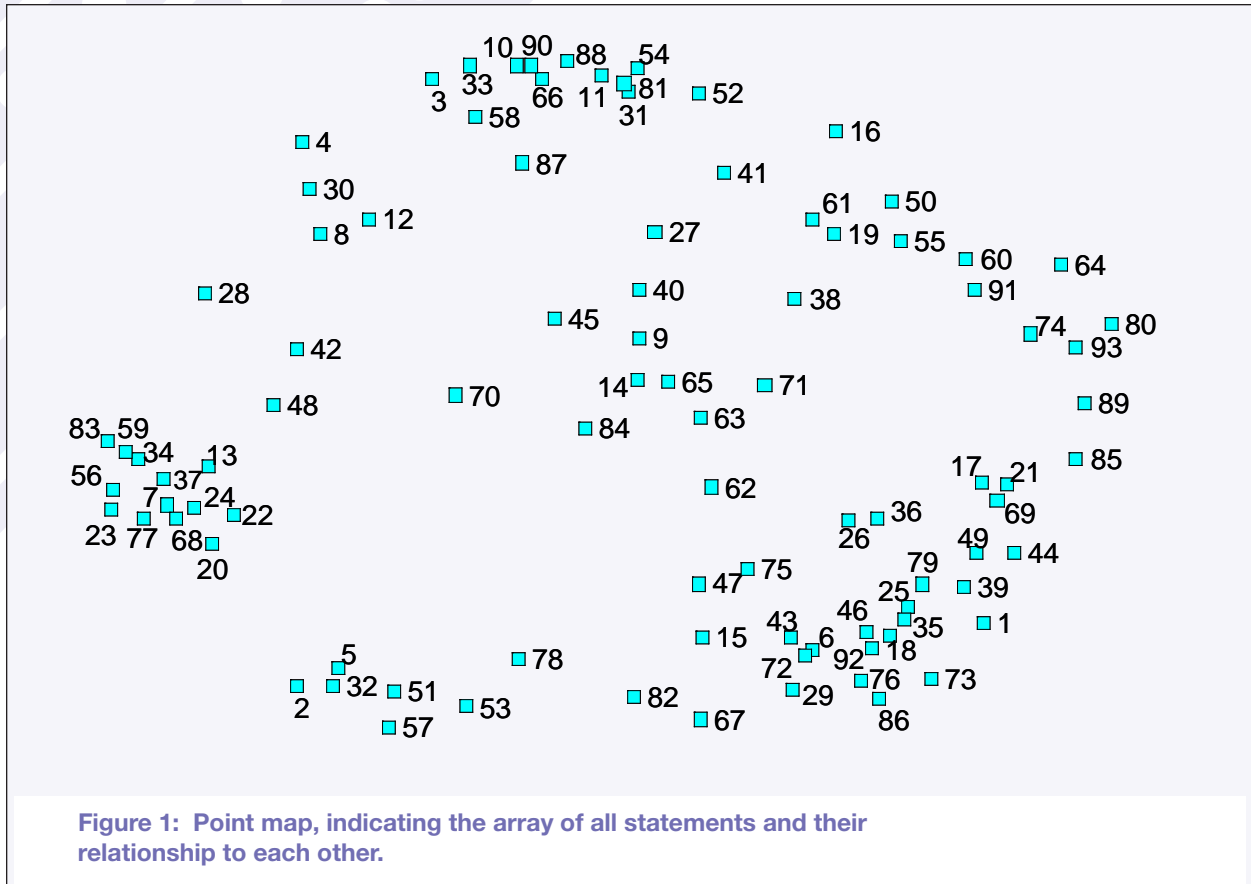
Importance: “Please enter a number from 1 to 5 for each statement to indicate how IMPORTANT you think it is for OBSSR to work on the stated action in the next 5 years. Keep in mind that we are looking for relative importance; use all the values in the rating scale to make distinctions. Use the following scales:

- 1 = Not at all important, compared to the rest;
- 2 = Somewhat important, compared to the rest;
- 3 = Moderately important, compared to the rest;
- 4 = Very important, compared to the rest;
- 5 = Extremely important, compared to the rest.”

Feasibility: “Please enter a number from 1 to 5 for each statement to indicate how FEASIBLE you think it is for OBSSR to accomplish the stated action in the next 5 years. Keep in mind that we are looking for relative feasibility; use all the values in the rating scale to make distinctions. Use the following scales:

- 1 = Not at all feasible, compared to the rest;
- 2 = Somewhat feasible, compared to the rest;
- 3 = Moderately feasible, compared to the rest;
- 4 = Very feasible, compared to the rest;
- 5 = Extremely feasible - already in practice.”

Concept maps were generated showing the relationships and importance ratings for the 93 distinct ideas generated as part of the brainstorming process (see Figure 1).

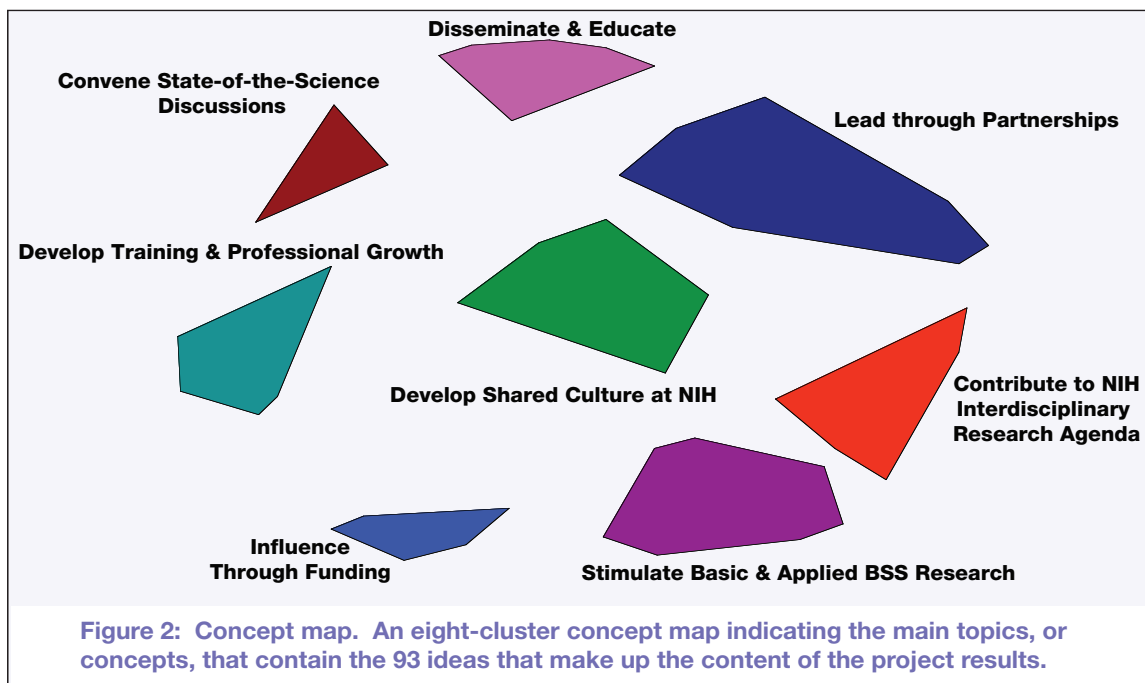


A point map shows each of the original brainstormed ideas as a point on the screen. Ideas that are closer together were sorted more frequently by participants into the same group. The map contains 93 points, each representing one of the distinct ideas brainstormed by the stakeholders from an original raw list of 247 statements.

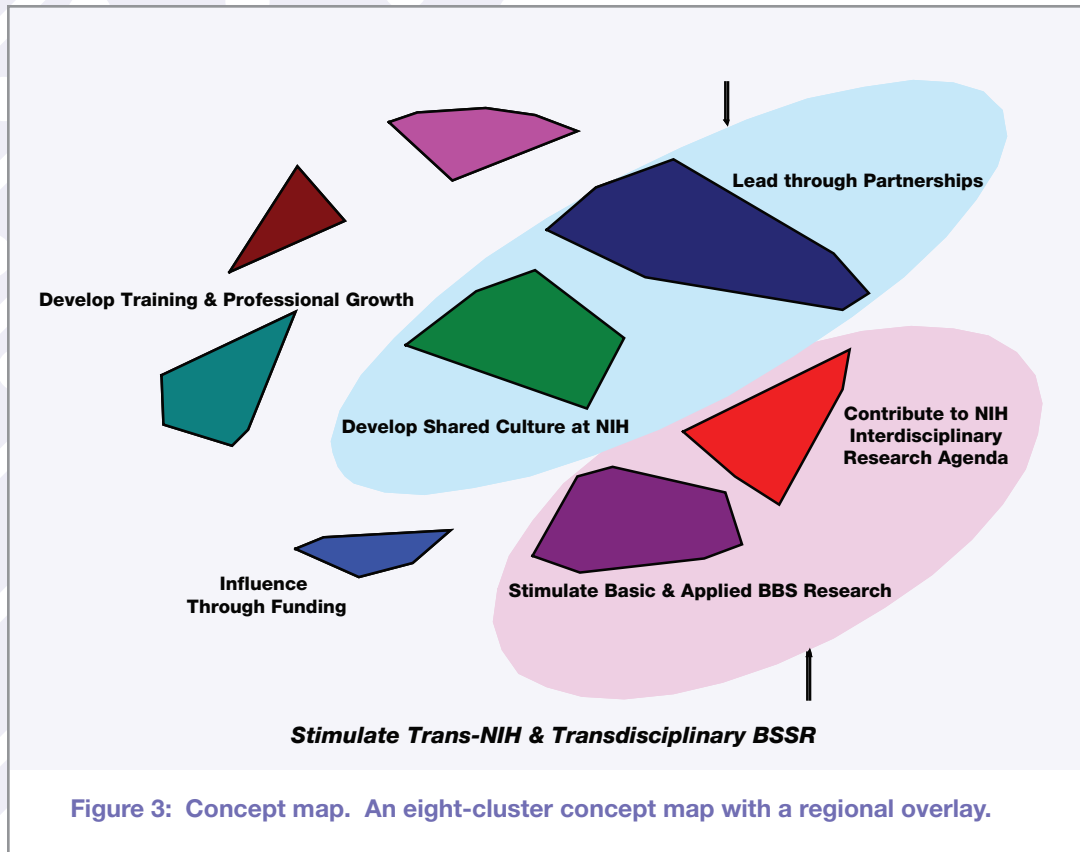
A cluster point map shows all the points, just as the point map does. But it also shows the categories into which the points were sorted. The name given to each cluster will reflect the theme or topic expressed in the statements within that cluster. In this case the optimal solution was an eight-cluster solution, as indicated in Figure 2 below.

The data suggests that eight major issues should be considered essential when developing a strategic plan for the Division. The concept map in figure 2 shows the clusters labeled with these categorical issues. The following are those categories, in no particular order:

- ◆ Develop Training and Professional Growth
- ◆ Convene State-of-the-Science Discussions to Disseminate & Educate
- ◆ Lead through Partnerships
- ◆ Contribute to NIH Interdisciplinary Research Agenda
- ◆ Stimulate Basic and Applied Behavioral and Social Sciences Research
- ◆ Develop Shared Culture at NIH
- ◆ Influence through Funding



Because the Planning Group considered some of the clusters closely related, overlaid “regions” were developed from the original eight clusters, as shown in Figure 3.



Pattern Matches and “Go Zones” describe the foundational framework of the above clusters in relation to the importance and feasibility values that stakeholders indicated on each statement on the map. Using the conceptual framework and the detailed importance and feasibility comparisons that the map provides—along with the results of the Expert Panel, Institute Director interviews, and the Issues Summit reports (all described below)—the Planning Group is able to arrive at specific priority strategies, and the tactics and actions that will enable those strategies to be implemented.

Pattern Matches indicate here a general disconnect between those clusters that are considered most important (e.g., “Influence through Funding”, “Develop Shared Culture at NIH”) and those considered most feasible (e.g., “Disseminate and Educate”, “Convene State-of-the-Science Discussions”), indicating a need to look closely at each of these areas. In addition, comparisons on importance between internal (NIH) and external (non-NIH) participants can assist the Planning Group in determining what groundwork needs to be done before the strategic priorities can be communicated to and supported by both internal and external stakeholders.

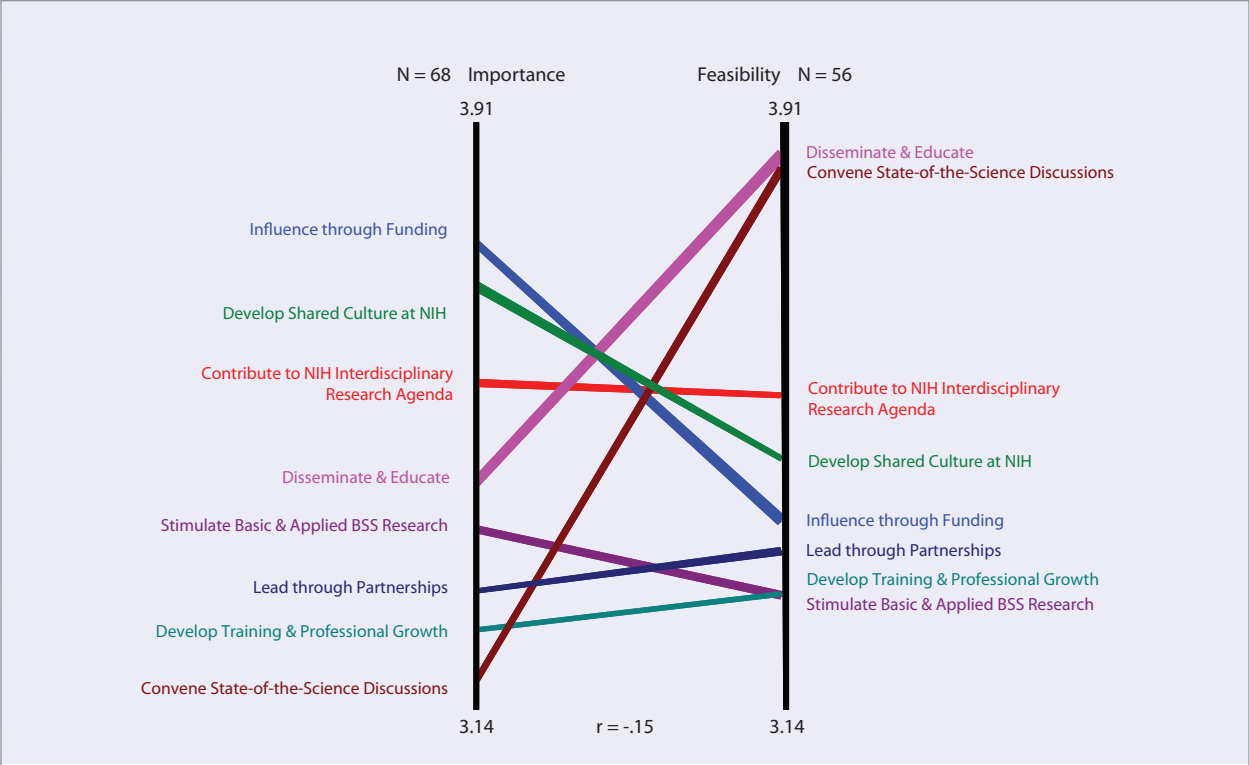


Figure 4: Importance and Feasibility Absolute Pattern Match: All Participants.

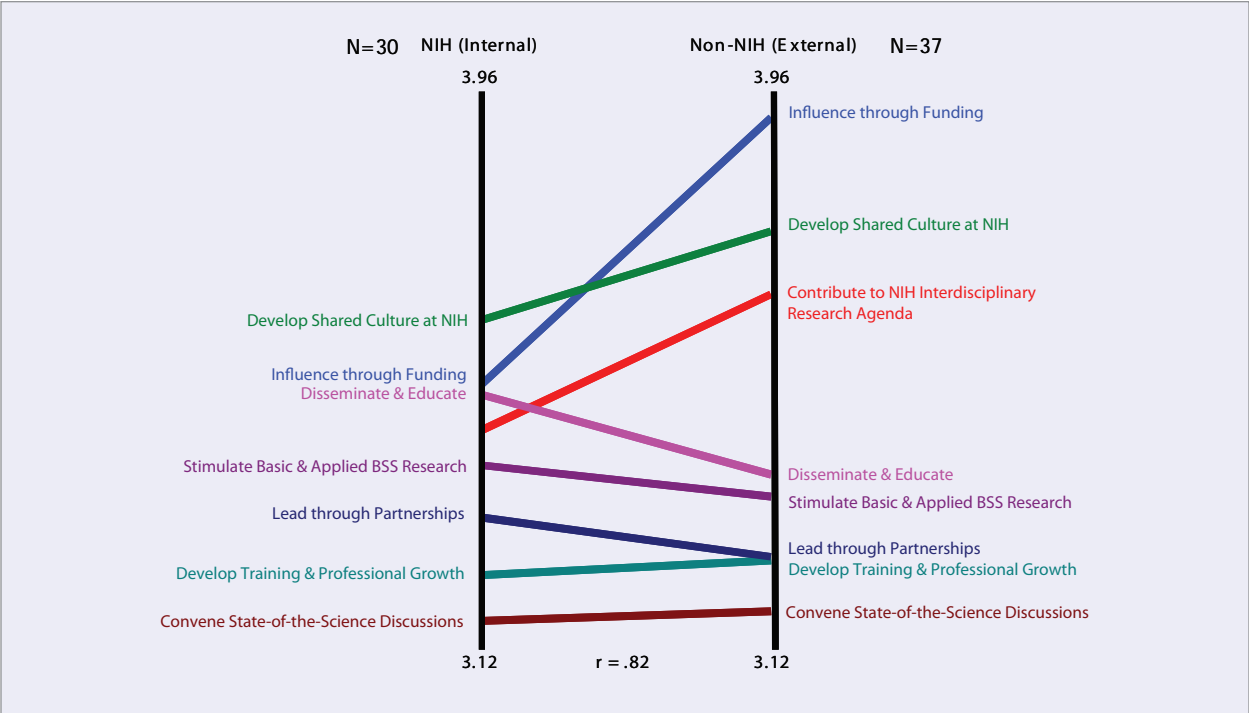
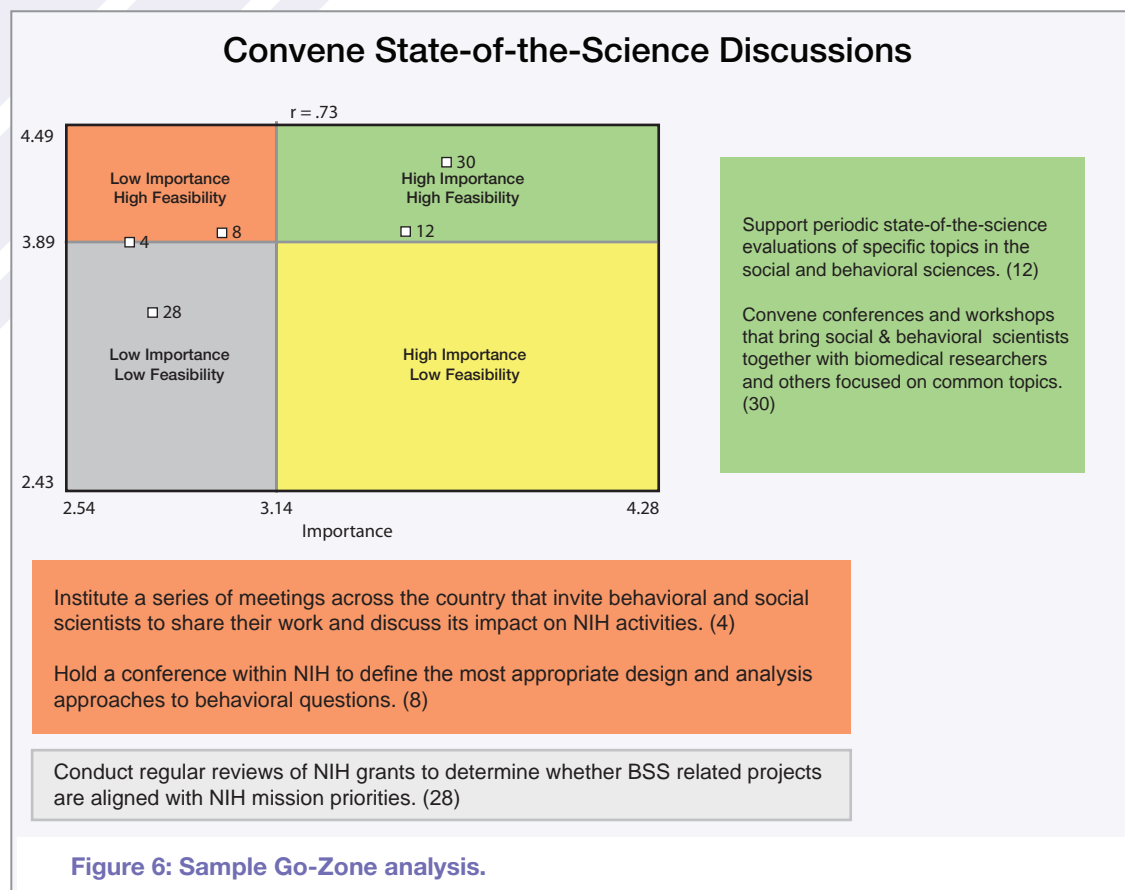


Figure 5: Importance Absolute Pattern Match: Internal to External.

Pattern Matches (Figures 4 and 5) provide an overview of the concepts represented on the cluster map, or framework, and how the value ratings we have collected indicate, on the concept level, the perceptions of those who rated relative to importance and feasibility. As a reminder, each cluster is comprised of the specific statements or details contributed by participants during the brainstorming phase. We now turn our attention to those details, as they are organized within clusters, and with the specific statement rating values associated with each statement within a cluster.

CSI created Go-Zone analyses for this project. One cluster Go-Zone (Figure 6) illustrates the graphical approach to value perceptions. These analyses are bivariate plots for each cluster that show the average importance and feasibility rating of each statement within a cluster. Just as the concept map clusters, Pattern Matches, and conceptual framework model enable decision makers to observe, understand and agree upon the relationship and relative value of concepts, the Go-Zone analyses enable stakeholders to keep the larger conceptual view in mind, while returning to the detailed contents of each cluster.



This Go-Zone analysis enables the stakeholders to see and understand the key statements within each cluster, arrayed on a bivariate plot by the two ratings taken. Those items located in the upper right quadrant were rated higher than average on both importance and feasibility. Typically, these ideas are often the most logical ideas to act upon. However, this is not always the case. Sometimes ideas that are rated high on both importance and feasibility are indeed important ideas but are already being addressed sufficiently. Similarly, the items in the upper left (high feasibility and relatively low importance) and those in the lower right (high importance and relatively low feasibility) can be considered “gap” areas. These gap areas contain items for which value imbalance exists. However, sometimes ideas that are rated high in importance and low in feasibility have not yet been adequately tried or explored. In these cases, the feasibility may be unknown or underestimated. Certainly there are other interpretations that could be added to understand this graph. The key point is that this provides a way for all stakeholders to view the data and to then engage in assisted dialogue about implications.

The following section lists those items within each conceptual cluster that fell within the two quadrants associated with high importance; they are further described as falling within the range of either high or low feasibility. These statements serve as guidance for strategy and tactics focus.

CLUSTER Develop Training and Professional Growth:
High Importance/High Feasibility Concepts

- ◆ Develop mentoring opportunities for new researchers. (7)
- ◆ Increase outreach to universities that serve underserved populations, to support their research and preparation of funding applications. (42)
- ◆ Support training that allows biomedical scientists and MDs to receive training in behavioral or social sciences research and vice versa. (77)

CLUSTER Develop Training and Professional Growth:
High Importance/Low Feasibility Concepts

- ◆ Develop mechanisms for beginning researchers, to stimulate innovation and build capacity in under-represented researchers/schools. (20)
- ◆ Initiate opportunities to encourage development of behavioral and social science careers that transcend the disease silos. (22)
- ◆ Work with NIH administrators to provide sources of support for training in basic behavioral and social sciences that has implications for health. (23)
- ◆ Help implement the recent NAS research training recommendations for NIH that every Institute and Center support its appropriate level of behavioral and social sciences research training. (24)
- ◆ Encourage universities and other potential supporters to fund training and graduate education for behavioral and social scientists as they do for MDs and PharmDs. (83)

CLUSTER Convene State-of-the-Science Discussions:
High Importance/High Feasibility Concepts

- ◆ Support periodic state-of-the-science evaluations of specific topics in the social and behavioral sciences. (12)
- ◆ Convene conferences and workshops that bring social and behavioral scientists together with biomedical researchers and others focused on common topics. (30)

CLUSTER Convene State-of-the-Science Discussions:
High Importance/Low Feasibility Concepts

- ◆ None

CLUSTER Disseminate and Educate: High Importance/
High Feasibility Concepts

- ◆ Monitor and provide to the research constituency information on the current state of behavioral and social sciences research in each of the NIH Institutes and Centers. (3)
- ◆ Identify and disseminate research successes and encourage others to use these as a model for scientific funding. (10)
- ◆ Convene conferences and state-of-the-science panels to increase awareness of the important contributions from behavioral and social sciences. (66)
- ◆ Publicize examples of successful collaborative health research in which the behavioral and social sciences have played a role. (88)

CLUSTER Disseminate and Educate: High Importance/
Low Feasibility Concepts

- ◆ Serve as the primary conduit for informing NIH's constituencies on the latest behavioral and social sciences research findings supported by NIH. (33)
- ◆ Support opportunities for educating both scientists and the consuming public about the role of behavioral science in translational research. (81)
- ◆ Educate scientists from other disciplines, at NIH and other organizations, about behavioral and social sciences methods. (87)

CLUSTER Lead through Partnerships: High Importance/
High Feasibility Concepts

- ◆ Maintain and strengthen the OBSSR Coordinating Committee to ensure its effectiveness as a forum for trans-NIH communication and research collaboration. (19)
- ◆ Advocate for more social scientists to be involved at NIH. (38)
- ◆ Actively demonstrate that behavioral and social sciences variables can be reliably measured. (61)
- ◆ Identify and address barriers to interdisciplinary collaboration. (80)
- ◆ Promote to the Institutes a comprehensive, integrated approach to health research and disease prevention that emphasizes the connection of lab research to social & cultural contexts of human behavior. (91)

CLUSTER Lead through Partnerships: High Importance/
Low Feasibility Concepts

- ◆ Assure that the behavioral and social perspective on health is addressed and incorporated in all the NIH work. (55)

CLUSTER Contribute to NIH Interdisciplinary Research Agenda: High Importance/High Feasibility Concepts

- ◆ Develop a behavioral and social sciences research agenda to promote the NIH agenda of extended healthy life and reduced burden of illness and disease. (1)
- ◆ Develop initiatives that encourage collaboration between biomedical scientists and social and/or behavioral scientists. (17)
- ◆ Embrace a multilevel approach to health determinants, emphasizing links between the social and the biological. (49)
- ◆ Emphasize how behavioral and social factors affect biological processes and vice-versa. (85)
- ◆ Encourage integrative thinking across conditions to discourage thinking that is focused narrowly on a specific disease. (89)

CLUSTER Contribute to NIH Interdisciplinary Research Agenda: High Importance/Low Feasibility Concepts

- ◆ Find innovative ways to more fully include social science research, including cross-cultural investigations, that focuses on ethnic and culturally diverse populations. (39)

CLUSTER Stimulate Basic and Applied Research: High Importance/High Feasibility Concepts

- ◆ Identify and support research on specific, high-priority health problems that are particularly well suited to behavioral interventions. (29)
- ◆ Stimulate new research that advances basic behavioral and social sciences. (35)
- ◆ Promote the establishment of longitudinal health databases that include information about behavioral and social risk factors. (43)
- ◆ Identify current opportunities for significant advances in the social and behavioral sciences. (73)
- ◆ Support methodological improvements in behavioral clinical trials, so they meet the same quality standard as NIH- funded randomized clinical trials. (75)
- ◆ Include high-risk vulnerable populations in research efforts. (86)

CLUSTER Stimulate Basic and Applied Research: High Importance/Low Feasibility Concepts

- ◆ Promote expansion of the present “RoadMap” Translation focus to include translation of clinical research findings to public health impact. (6)

- ◆ Develop metrics to demonstrate the economic benefits of cutting-edge behavioral and social sciences research to other key sectors to fuel further investment in behavioral and social sciences research. (47)
- ◆ Develop a way to assess the economic impact of research and applications. (67)
- ◆ Support big science projects involving the social and behavioral sciences. (82)

CLUSTER Develop a Shared Culture at NIH: High Importance/High Feasibility Concepts

- ◆ Work with other NIH ICs to further develop and encourage (i.e., provide support for) behavioral and social sciences research. (9)
- ◆ Maintain OBSSR’s position in the Office of the Director, directly reporting to the NIH Director. (40)
- ◆ Work with each IC to increase its behavioral and social sciences agenda. (45)
- ◆ Facilitate “roadmap” and other cross-Institute initiatives where social and behavioral issues are central. (63)

CLUSTER Develop a Shared Culture at NIH: High Importance/Low Feasibility Concepts

- ◆ Ensure careful and fair review of applications in behavioral and social sciences across NIH. (70)
- ◆ Ensure a stable home for basic behavioral and social sciences that is integral to health, prevention, disease and intervention . (84)

CLUSTER Influence through Funding: High Importance/ High Feasibility Concepts

- ◆ Obtain funds to support behavioral and social sciences research that is relevant to many Institutes. (2)
- ◆ Continue and expand co-funding of promising Institute and Center initiatives in BSS. (32)
- ◆ Provide supplements to ongoing biomedical studies that will foster the inclusion of data measuring social/behavioral/environmental contexts. (53)
- ◆ Work more closely with other agencies to create joint funding initiatives. (78)

CLUSTER Influence through Funding: High Importance/ Low Feasibility Concepts

- ◆ Have responsibility for a pool of earmarked money to support Institutes, enabling OBSSR to influence the type and amount of behavioral research within NIH. (5)

EXPERT PANEL

In addition to establishing the strategic conceptual framework through the use of concept mapping, the Project Planning Group also engaged experts internal to NIH and within related professions. An Expert Panel was convened, composed of nine NIH staff members and nine experts external to NIH. Expert Panel membership represented the breadth of science and methodologies with which OBSSR works. Each Panel member participated in an individual interview to identify perspectives and opinions regarding OBSSR. A half-day meeting of the Panel reported the interviews findings and enabled additional observations and recommendations to be developed. Telephone interviews were conducted with the 18 members of the Expert Panel from August through October 2005. Members of the Expert Panel were asked to provide responses to the following six open-ended questions, with a range of sub-questions, during an individual telephone interview:

1. How can OBSSR best contribute to the stated mission of NIH over the next decade?
2. Over the next decade, which of the core areas of basic and applied (i.e., clinical, dissemination, and policy) behavioral and social sciences research hold extraordinary opportunities to achieve the stated mission of the NIH?
3. Given the direction and rapid advances in science/technology today, how should the behavioral and social sciences be positioned to capitalize on these advances (i.e., what is the new emerging role for the behavioral and social sciences and what are the challenges in bringing to full fruition the discoveries in the sciences)?
4. What is the appropriate role for OBSSR to play in the training and education of behavioral and social scientists of the future?
5. What is the role for OBSSR in disseminating the discoveries and findings of behavioral and social sciences research, and to what specific audiences?
6. Thinking about government agencies and nongovernment entities like those listed above, that OBSSR might create strong partnerships to increase OBSSR's reach and effectiveness, what agencies or groups might be productive partners in the future? Can you suggest any specific agencies or organizations?

During the interviews, a key tension emerged around whether OBSSR should provide support and advocacy for the behavioral and social sciences, or leadership in theory and research practice standards for these disciplines. In addition, nearly all Expert Panel members believed that interdisciplinary efforts are an important part of OBSSR's work. According to several respondents, OBSSR can also support interdisciplinary efforts by leading behavioral and social sciences researchers to define a common language and research standards. Finally, the respondents had different views about OBSSR's appropriate role in communication and dissemination of behavioral and social sciences information. The majority of respondents stated that all types of behavioral and social sciences research are still greatly underemphasized at NIH.

CSI developed three documents: the Expert Panel Interview Summary, the Expert Panel Interview Executive Summary, and the document describing Themes from the Expert Panel Interview. Expert Panel members were invited to a 4-hour meeting, where the results of the interviews in which they took part were presented and discussed. The group discussed the range of issues that affect, and are affected by, OBSSR's scope and focus of work.

The Summary of Emergent Themes is listed below, with summary responses indicated below each topic.

BEHAVIORAL AND SOCIAL SCIENCES: CLARITY OF DEFINITION, SCOPE, AND BOUNDARIES OF THE PROFESSION(S)

Interview responses demonstrated a wide range of professions and specialties that are considered behavioral and social sciences. As one interviewee indicated: “The terminology needs to be clarified among us. Even the term ‘behavioral and social science’ has different meanings to different people.” The Expert Panel members themselves richly represent the fields associated with behavioral and social sciences research. It is both a value and a challenge that this richness exists. Panel members indicated the following problems associated with a multi-profession field:

- ◆ Lack of standard methodologies, tools, data, and “good science” standards.
- ◆ Difficulty in communicating across disciplines within behavioral and social sciences research due to different methodologies and categories of research.
- ◆ Siloed specialties where integration is not supported in the university or in research funding organizations like NIH.
- ◆ Rapid growth of behavioral and social sciences research areas.

CROSS-OR MULTIDISCIPLINARY RESEARCH: CONNECTING BIOMEDICAL WITH BEHAVIORAL AND SOCIAL SCIENCES

This important topic elicited positive responses from Expert Panel members. Virtually all responses were in philosophical support of interdisciplinary research, and Panel members indicated key areas of appropriate research, such as social/environmental context and physical well-being or illness recurrence or mind/brain/body research opportunities. But barriers to active engagement in such research were many, including

- ◆ Lack of complementary training at the professional level.
- ◆ Difficulty within university settings for researchers to engage in such research without jeopardizing their research agendas.
- ◆ Difficulty in publication opportunities, including placement in refereed journals.
- ◆ Weak NIH commitment to interdisciplinarity, with few rewards for interdisciplinary research.

BEHAVIORAL AND SOCIAL SCIENCES RESEARCH CATEGORIES: DEFINING TRANSLATION, DISSEMINATION, AND DISSEMINATION RESEARCH

Interview responses indicated that, by and large, individuals don’t articulate a difference between translation and dissemination; they see a continuum rather than separate approaches. They see research on dissemination as a related but not well-defined area. This seems to indicate that the Expert Panel members, as active researchers involved at NIH and other locations, are not receiving clearly articulated information from NIH regarding the definitions of translation research, dissemination research and research on dissemination. It was observed that the commitment to translation and dissemination varies from Institute to Institute, and there does not exist a common understanding of these research categories, nor does there exist NIH-wide emphasis on them.

This raised the question in the interview process about OBSSR’s appropriate roles in communicating discoveries, encouraging dissemination and evaluating the impact of behavioral and social sciences research discoveries.

OBSSR’S IDENTITY IN NIH: LEADERSHIP OR SUPPORT

The prevailing thematic element of the interviews was the fundamental identity of OBSSR within NIH, and its relationship to ICs. The type of relationship that OBSSR has to NIH was also thought to affect the types of relationships of OBSSR to external researchers, other government agencies, and other naturally related entities.

This theme emerged in responses throughout the interview process, and can be captured by the question: Is OBSSR a leader or a facilitator? In a content scan of the interview results, the terms associated with leadership and leading new initiatives or efforts were noted 87 times. Words included *lead*, *change*, *create*, *innovate*, and *develop*. Terms associated with facilitation or support roles numbered 84. They included *facilitate*, *coordinate*, *support*, *help*, and *integrate*. This indicates a range of views regarding OBSSR’s appropriate role in NIH.

Topics where this range of opinion was noticeable included

- ◆ Information development, management, and dissemination.
- ◆ Professional education.
- ◆ Interdisciplinary research innovation.
- ◆ Dissemination of discoveries for public health impact.

OBSSR's relationship to the ICs was reflected with a range of opinions as well—from establishing OBSSR as a separate entity with a targeted research agenda and funding to enabling support of the Institutes' behavioral and social sciences research to encouraging interdisciplinarity to include behavioral and social sciences research foci. Recommendations included using existing mechanisms like the BSSR Coordinating Committee and behavioral and social sciences research groups within each Institute, as well as establishing OBSSR as “the home” for behavioral and social sciences research in NIH, with funding support.

Funding support emerged across the spectrum of inquiry as well, indicating that Expert Panel members were aware that current support for OBSSR's program is well used but not sufficient for an expansion of its role and responsibilities.

INSTITUTE DIRECTOR INTERVIEWS

In conjunction with the Expert Panel interviews, CSI also conducted phone interviews with three key NIH Institute Directors to help OBSSR understand their perspectives on the appropriate role of OBSSR at NIH. Interviewees were asked to provide their perspectives on the following six themes:

1. OBSSR's contributions to the NIH.
2. What opportunities in behavioral and social sciences there might be in the future.
3. The influence of rapid science and technology advances on behavioral and social sciences.
4. OBSSR's role in training behavioral and social scientists of the future.
5. OBSSR's role in dissemination of behavioral and social science research discoveries.
6. OBSSR's potential for building productive partnerships.

These Institute Directors agreed that the role of OBSSR should be a facilitative and, in some cases, an advocating one. In contrast to the Expert Panel interviews, however, there was no mention of OBSSR taking a leadership role in defining theory or methods in the behavioral and social sciences. They indicated that facilitating interdisciplinary efforts are an important part of OBSSR's work. The respondents agreed that all types of basic behavioral and social sciences research are still greatly underemphasized at NIH.

ISSUES SUMMIT

Concluding this phase of strategic planning development, OBSSR held a 1.5-day Issues Summit, with participation from the Expert Panel members and other key leaders of the relevant fields. At this summit, five working groups were formed, with each group focused on a region of the concept map, as outlined below:

- ◆ Develop Training and Professional Growth
- ◆ Knowledge Synthesis Convene State-of-the-Science Discussions
- ◆ Disseminate and Educate
- ◆ Partnerships
 - Lead through Partnerships
 - Develop Shared Culture at NIH
- ◆ Stimulate Trans-NIH and Transdisciplinary Behavioral and Social Sciences Research
- ◆ Contribute to NIH Interdisciplinary Research Agenda
- ◆ Stimulate Basic and Applied Behavioral and Social Sciences Research

(Note: The concept map cluster: *Influence through Funding* was not specifically addressed by the Issues Summit working groups).

The meeting enabled OBSSR to gain consensus of strategic priority areas that the new plan must address. It was agreed that OBSSR must focus its attentions on the internal NIH audience, while engaging various outside partners to help foster NIH appreciation and demand for OBSSR. Its continued goal should be the improvement of credibility and standards in behavioral and social sciences research. Finally, OBSSR should look for opportunities to align its research agenda with emerging public health demands.

CONCLUSION

At the conclusion of the first phase of this strategic planning effort, OBSSR achieved its goal of soliciting and aggregating the best thinking of a diverse audience in order to shape its strategic focus. OBSSR used this information immediately to inform the content, priorities, and overarching themes of OBSSR's Strategic Prospectus. A comprehensive draft of the Prospectus was presented for review at OBSSR's milestone 10th Anniversary Summit. During the Summit's open Town Hall Meeting, experts, researchers, and partners from a wide range of fields and perspectives contributed responses to the Prospectus that confirmed, challenged, and enriched the document's priorities as well as its potential to serve as a framing foundation for OBSSR's work at this time, and in the future. OBSSR provided an additional opportunity for input and feedback, via a customized website for the receipt of post-Summit meeting comments. The Planning Group of this initiative received and reviewed all comments and revised the document in the Summer of 2006, with the specific intention that the Prospectus would inform and support a comprehensive, well-articulated implementation strategy for the OBSSR's mission-driven priorities.

APPENDIX B:

OBSSR Strategic Planning Initiative Participants

Planning Group

Last Name	First Name	Institution
Abeles	Ronald	NIH, Office of Behavioral and Social Sciences Research
Abrams	David	NIH, Office of Behavioral and Social Sciences Research
Best	Allan	Vancouver Coastal Health Research Institute
Cain	Virginia	CDC, National Center for Health Statistics
Chesney	Margaret	NIH, National Center for Complementary and Alternative Medicine
Hall	Katy	Concept Systems, Inc.
Kane	Mary	Concept Systems, Inc.
Kertes	Darlene	NIH, Office of Behavioral and Social Sciences Research
Maddox	Yvonne	NIH, National Institute of Child Health and Human Development
Nakamura	Richard	NIH, National Institute of Mental Health
Olster	Deborah	NIH, Office of Behavioral and Social Sciences Research
Philogene	G. Stephane	NIH, Office of Behavioral and Social Sciences Research
Prager	Denis	Strategic Consulting Services
Solomon	Susan	NIH, Office of Behavioral and Social Sciences Research
Wible	Brad	NIH, Office of Behavioral and Social Sciences Research

Concept Mapping

Last Name	First Name	Institution
Abeles	Ronald	NIH, Office of Behavioral and Social Sciences Research
Abrams	David	NIH, Office of Behavioral and Social Sciences Research
Ader	Deborah	NIH, National Institute of Arthritis and Musculoskeletal and Skin Diseases
Adler	Nancy	University of California, San Francisco
Anderson	Norman	American Psychological Association
Bachrach	Christine	NIH, National Institute of Child Health and Human Development
Baldwin	Wendy	University of Kentucky
Balsam	Peter	Columbia University
Banaji	Mahzarin	Harvard University
Bartoshuk	Linda	Yale University
Benjamin	Michael	National Council on Family Relations
Bennett Johnson	Suzanne	Florida State University
Berkman	Lisa	Harvard University
Biegel	David	Case Western Reserve University
Blascovich	James	University of California, Santa Barbara
Bloom	Floyd	The Scripps Research Institute
Boonstra	Heather	Alan Guttmacher Institute
Boyce	Cheryl	NIH, National Institute of Mental Health
Boyer	Joy	NIH, National Human Genome Research Institute

Concept Mapping

Last Name	First Name	Institution
Bradford	Ann	National Association of Social Workers
Brandon	Susan	Indian Health Services
Brekke	John	University of Southern California
Brownell	Kelly	Yale University
Browning	Andrea	American Psychological Association
Bryan	Yvonne	NIH, National Institute of Nursing Research
Bryant	Patricia	NIH, National Institute of Dental and Craniofacial Research
Burton	Linda	Pennsylvania State University
Cacioppo	John	University of Chicago
Cain	Virginia	CDC, National Center for Health Statistics
Campbell	Jessica	NIH, National Institute on Drug Abuse
Cherlin	Andrew	Johns Hopkins University
Chesney	Margaret	NIH, National Center for Complementary and Alternative Medicine
Clark	Elizabeth	National Association of Social Workers
Coates	Tom	UCLA School of Medicine
Cohen	Jonathan	Princeton University
Cohen	Sheldon	Carnegie Mellon University
Cooper	Leslie	NIH, National Institute on Drug Abuse
Crawley	Jacqueline	NIH, National Institute of Mental Health
Croyle	Robert T.	NIH, National Cancer Institute
Cutler	David	Harvard University
Cutting	Laurie	Kennedy Krieger Institute
Czajkowski	Susan	NIH, National Heart, Lung, and Blood Institute
Dashner	Ralph	NIH, National Center for Research Resources
Davidson	Richard	University of Wisconsin
Dimsdale	Joel	University of California, San Diego
Dressler	William W.	University of Alabama
Ecker	Heidi Ann	American Psychological Society
Edwards	Emmeline	NIH, National Institute of Neurological Disorders and Stroke
Egeth	Jill	Federation of Behavioral, Psychological, and Cognitive Sciences
Engel	Randy	Georgia Institute of Technology
Evans	Jeffrey	NIH, National Institute of Child Health and Human Development
Fine	Lawrence	NIH, National Heart, Lung, and Blood Institute
Fiske	Susan	Princeton University
Flanzer	Jerry	NIH, National Institute on Drug Abuse
Freund	Lisa	NIH, National Institute of Child Health and Human Development
Friedman	Matthew	Dartmouth College
Friedman	Heidi	NIH, National Institute of Allergy and Infectious Diseases
Furstenberg	Frank	University of Pennsylvania
Gaist	Paul	NIH, Office of AIDS Research
Garfield	Sanford	NIH, National Institute of Diabetes and Digestive and Kidney Diseases
George	Linda	Duke University

Concept Mapping

Last Name	First Name	Institution
Gernsbacher	Morton Ann	University of Wisconsin, Madison
Gordon	Christopher	NIH, National Institute of Mental Health
Grace	William	NIH, Office of AIDS Research
Gray	David	Washington University School of Medicine
Gruman	Jessie C.	Center for the Advancement of Health
Gunnar	Megan	University of Minnesota
Ham	Becky	Center for the Advancement of Health
Hanna	Eleanor	NIH, Office of Research on Women's Health
Hare	Martha	National Institute of Nursing Research
Harootyan	Linda	The Gerontological Society of America
Hauck	Rob	American Political Science Association
Herman	Dana	Columbia University
Herring	Lee	American Sociological Association
Heurtin-Roberts	Suzanne	NIH, National Cancer Institute
Hillsman	Sally	American Sociological Association
Hoeksema	Mary Jo	Population Association of America/Association of Population Centers
Huebner	Robert	NIH, National Institute on Alcohol Abuse and Alcoholism
Ickovics	Jeannette	Yale University
Israel	Barbara	University of Michigan
Jackson	James	University of Michigan
Jackson	Morgan	NIH, National Center for Complementary and Alternative Medicine
Jackson-Taylor	Kawanna	NIH, Office of Behavioral and Social Sciences Research
Jamison	Dean	Fogarty International Center
Johnson	Robert	University of Medicine and Dentistry of New Jersey
Juliano-Bult	Denise	NIH, National Institute of Mental Health
Kagawa-Singer	Marjorie	University of California, Los Angeles
Kaplan	George	University of Michigan
Kaufmann	Peter	NIH, National Heart, Lung, and Blood Institute
Kawachi	Ichiro	Harvard University
Kihlstrom	John	University of California, Berkeley
Kobor	Patricia	American Psychological Association
Kraut	Alan	American Psychological Society
Krieger	Nancy	Harvard University
Kubovy	Michael	University of Virginia
Laumann	Edward	University of Chicago
Lawrence	Reva	NIH, National Institute of Arthritis and Musculoskeletal and Skin Diseases
Leath	Brenda	National Consortium for African American Children, Inc.
Levenson	Robert	University of California, Berkeley
Leventhal	Howard	Rutgers University
Levine	Felice	American Educational Research Association
Levitin	Teresa	NIH, National Institute on Drug Abuse
Lipton	James	NIH, National Institute of Dental and Craniofacial Research

Concept Mapping

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Lubben	James	Boston College
Lynch	Minda	NIH, National Institute on Drug Abuse
Maholmes	Valerie	NIH, National Institute of Child Health and Human Development
Manson	Spero	University of Colorado Health Sciences Center
Marsh	Jeanne C.	Institute for the Advancement of Social Work Research
Matthews	Karen	University of Pittsburgh
McBride	Colleen	NIH, National Human Genome Research Institute
McCabe	Mary Ann	Society for Research in Child Development
McClelland	Jay	Carnegie Mellon University
McEwen	Bruce S.	Rockefeller University
McRoy	Ruth	University of Texas, Austin
Melville	Paula	National Academy of Sciences
Miles	Shari	Society for the Psychological Study of Social Issues
Miranda	Jeanne	University of California, Los Angeles Health Services Research Center
Mullan-Harris	Kathleen	University of North Carolina
Mulvihill	Judith	NIH, Office of Behavioral and Social Sciences Research
Murray	Peggy	NIH, National Institute on Alcohol Abuse and Alcoholism
Neil	Evelyn	NIH, National Institute on Aging
Nowjack-Raymer	Ruth	NIH, National Institute of Dental and Craniofacial Research
Oberdorfer	Mike	NIH, National Eye Institute
Ockene	Judith	University of Massachusetts
Oliveri	Molly	NIH, National Institute of Mental Health
Olster	Deborah	NIH, Office of Behavioral and Social Sciences Research
Onken	James	NIH, National Institute of General Medical Sciences
Orleans	Tracy	Robert Wood Johnson Foundation
Ota Wang	Vivian	NIH, National Human Genome Research Institute
Overbey	Peggy	American Anthropological Association
Padget	Deborah	New York University
Patmios	Georgeanne	NIH, National Institute on Aging
Paxson	Christine	Princeton University
Pebley	Anne	University of California, Los Angeles
Pescosolido	Bernice	Indiana University
Philogene	G. Stephane	NIH, Office of Behavioral and Social Sciences Research
Pickering	Tom	Mount Sinai Hospital
Plomin	Robert	Kings College London
Pomerantz	James	Rice University
Powell	Lynda	Rush-Presbyterian-St. Luke's Medical Center
Price	Lashawndra	NIH, National Institute of Mental Health
Proctor	Enola	Washington University
Ramirez	Amelie	Baylor College of Medicine
Reed	Melba	NIH, Office of Behavioral and Social Sciences Research
Rimer	Barbara	University of North Carolina
Rubio	Mercedes	American Sociological Association

Concept Mapping

Last Name	First Name	Institution
Ruiz	Monica	NIH, National Institute of Allergy and Infectious Diseases
Salovey	Peter	Yale University
Sampson	Dana	NIH, Office of Behavioral and Social Sciences Research
Sandefur	Gary	University of Wisconsin, Madison
Schneider	Jo Anne	NIH, National Cancer Institute
Schneiderman	Neil	University of Miami
Scott	Marcia	NIH, National Institute on Alcohol Abuse and Alcoholism
Scrimshaw	Susan	University of Illinois
Sharpe	Angela L.	Consortium of Social Science Associations
Shaywitz	Sally	Yale University
Shekim	Lana	NIH, National Institute on Deafness and Other Communication Disorders
Sher	Ken	University of Missouri, Columbia
Sheridan	John	Ohio State University
Shiffrin	Rich	Indiana University
Shumaker	Sally	Wake Forest University Baptist Medical Center
Siegel	Elliot	NIH, National Library of Medicine
Silver	Howard J.	Consortium of Social Science Associations
Singer	Burt	Princeton University
Smith	James	RAND Corporation
Solomon	Susan	NIH, Office of Behavioral and Social Sciences Research
Solt	Barbara	Institute for the Advancement of Social Work Research
Sorensen	Gloria	Harvard University
Srinivasan	Shobha	NIH, National Institute of Environmental Health Sciences
Stahl	Sidney	NIH, National Institute on Aging
Stefanek	Michael	NIH, National Cancer Institute
Sternberg	Esther	NIH, National Institute of Mental Health
Stoney	Catherine	NIH, National Center for Complementary and Alternative Medicine
Studwell	Karen	American Psychological Association
Sue	Stanley	University of California, Davis
Sullivan	Teresa	University of Texas, Austin
Suzman	Richard	NIH, National Institute on Aging
Takeuchi	David	University of Washington
Taylor	Herman	University of Mississippi Medical Center
Taylor	Shelley	University of California, Los Angeles
Thompson-Fullilove	Mindy	Columbia University
Trotter, II	Robert	Northern Arizona University
Vega	William	Robert Wood Johnson Medical School
Vogel-Taylor	Martina	NIH, Office of Disease Prevention
Walker	Elaine	Emory University
Wanchisen	Barbara	Federation of Behavioral, Psychological, and Cognitive Sciences
Weller	Robert	NIH, Center for Scientific Review
Wells	Charles A	NIH, National Institute of Environmental Health Sciences

Concept Mapping

Last Name	First Name	Institution
White	Ann Marie	University of Rochester Medical Center
Whitfield	Keith E.	Pennsylvania State University
Williams	David	University of Michigan
Williams	Redford	Duke University
Wilson	Jerome	NIH, National Center on Minority Health and Health Disparities
Zayas	Luis	Institute for the Advancement of Social Work Research
Zlotnik	Joan	Institute for the Advancement of Social Work Research
Zweben	Allen	Columbia University

Expert Panel

Last Name	First Name	Institution
Ader	Deborah	NIH, National Institute of Arthritis and Musculoskeletal and Skin Diseases
Bachrach	Christine	NIH, National Institute of Child Health and Human Development
Croyle	Robert T.	NIH, National Cancer Institute
Fine	Lawrence J.	NIH, National Heart, Lung, and Blood Institute
Garfield	Sanford A.	NIH, National Institute of Diabetes and Digestive and Kidney Diseases
Johnson	Robert	New Jersey Medical School
Lane	Richard	University of Arizona
Lurie	Nicole	RAND Corporation
Matthews	Karen	University of Pittsburgh
McBride	Colleen	NIH, National Human Genome Research Institute
McEwen	Bruce S.	Rockefeller University
Meltzer	David	University of Chicago
Merikangas	Kathleen R.	NIH, National Institute of Mental Health
Proctor	Enola	Washington University in St. Louis
Scott	Marcia	NIH, National Institute on Alcohol Abuse and Alcoholism
Sterk	Claire	Emory University
Thomas	Yonette Felicity	NIH, National Institute on Drug Abuse
Williams	David R.	University of Michigan

Issues Summit

Last Name	First Name	Institution
Abeles	Ronald	NIH, Office of Behavioral and Social Sciences Research
Abrams	David	NIH, Office of Behavioral and Social Sciences Research
Bachrach	Christine	NIH, National Institute of Child Health and Human Development
Baldwin	Wendy	University of Kentucky
Best	Allan	Vancouver Coastal Health Research Institute
Cain	Virginia	CDC, National Center for Health Statistics
Chesney	Margaret	NIH, National Center for Complementary and Alternative Medicine
Croyle	Robert T.	NIH, National Cancer Institute
Fisher	Edwin	University of North Carolina at Chapel Hill
Garfield	Sanford A.	NIH, National Institute of Diabetes and Digestive and Kidney Diseases
Herring	Lee	American Sociological Association

Issues Summit

Last Name	First Name	Institution
Hoeksema	Mary Jo	Population Association of America/Association of Population Centers
Jackson	James	University of Michigan
Johnson	Robert	New Jersey Medical School
Kertes	Darlene	NIH, Office of Behavioral and Social Sciences Research
Kobor	Patricia	American Psychological Association
Kraut	Alan	American Psychological Society
Lane	Richard	University of Arizona
Lurie	Nicole	RAND Corporation
Mabry	Patricia	NIH, Office of Behavioral and Social Sciences Research
Maddox	Yvonne	NIH, National Institute of Child Health and Human Development
Matthews	Karen	University of Pittsburgh
McBride	Colleen	NIH, National Human Genome Research Institute
McKinlay	John	New England Research Institutes
Merikangas	Kathleen R.	NIH, National Institute of Mental Health
Mulvihill	Judith	NIH, Office of Behavioral and Social Sciences Research
Nakamura	Richard	NIH, National Institute of Mental Health
Olster	Deborah	NIH, Office of Behavioral and Social Sciences Research
Orleans	Tracy	Robert Wood Johnson Foundation
Philogene	G. Stephane	NIH, Office of Behavioral and Social Sciences Research
Prager	Denis	Strategic Consulting Services
Proctor	Enola	Washington University in St. Louis
Scott	Marcia	NIH, National Institute on Alcohol Abuse and Alcoholism
Sharpe	Angela L.	Consortium of Social Science Associations
Solomon	Susan	NIH, Office of Behavioral and Social Sciences Research
Stoney	Catherine	NIH, National Center for Complementary and Alternative Medicine
Takeuchi	David	University of Washington
Thomas	Yonette Felicity	NIH, National Institute on Drug Abuse
Wible	Brad	NIH, Office of Behavioral and Social Sciences Research
Williams	David R.	University of Michigan
Zlotnik	Joan	Institute for the Advancement of Social Work Research

