

DRAFT REPORT

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

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Office of Behavioral and Social Sciences Research
Office of the Director
National Institutes of Health
Department of Health and Human Services

Acronyms

ACD	Advisory Council to the Director of the NIH
AHRQ	Agency for Healthcare Research and Quality
CDC	Centers for Disease Control and Prevention
FIC	Fogarty International Center
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
NSF	National Science Foundation
OAR	Office of Aids Research, Office of the Director
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 this draft of our strategic prospectus. The draft was developed over a year of consensus building and deliberation with representative groups involved in the behavioral and social sciences. 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 wellbeing.

Several exciting trends and daunting challenges provided the impetus for developing this prospectus at this 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. Increasingly, the most pressing and emergent population health challenges necessitate strong partnerships among biological, social, behavioral, economic, and other public health sciences.

In briefly examining past accomplishments and what we know today, it becomes clear in this prospectus how behavior – both individual and collective – bridges biology and society. New technologies and scientific discoveries are changing our fundamental assumptions. Robust findings are mounting with evidence of how biology, behavior, and the social and physical environment are dynamically intertwined in the ways they produce better health or premature 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 public health or socio-behavioral-ecological view of causation. The biological “causes” and the socio-behavioral-ecological “causes of the causes” may really be two sides of the same coin. The solutions to some of our biggest health challenges may depend on whether scientists from the biomedical and the behavioral and social science disciplines are able to learn each others' 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 for a long time, well before the establishment of the Office. Behavioral and social sciences research at NIH is supported throughout the 27 Institutes and Centers at NIH. 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 behavioral and social sciences. This prospectus provides a welcome opportunity to recognize, thank, and show our appreciation to the leadership and staff that nurture and value behavioral and social sciences research at NIH.

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 representing the rich tapestry of the behavioral and social science community and its supporters. 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 wellbeing.

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I. Introduction

This prospectus provides a research agenda for the behavioral and social sciences at the National Institutes of Health. Such research can make a substantial contribution to the mission of the National Institutes of Health to improve the nation's health. The prospectus briefly reviews the mandate establishing the Office of Behavioral and Social Sciences, the achievements and the current status of the Office. This is followed by the broad strategic recommendations and crosscutting common themes that emerged from a number of existing documents as well as a year-long process of consultation, deliberation, and consensus building. The emphasis is on areas that are likely to be transformative and integrative rather than extensions of existing programmatic foci.

This document is a prospectus rather than a formal strategic 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 general direction, vision and guiding principles, rather than more concrete objectives and action steps. Once this iteration of the prospectus is accepted, a variety of implementation action plans will then be developed. The prospectus remains flexible and fluid as circumstances change.

Establishment of the Office

The Office of Behavioral and Social Sciences Research (OBSSR) first opened its doors in 1995. Established by the U.S. Congress as part of the Office of the Director at the National Institutes of Health (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;
3. Improve communication among 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 & 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. 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 its NIH partners at the Institutes and Centers (ICs). 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 2006, overall cancer death rates dropped for the first time in a century, driven largely by the dramatic 50% reduction in male smoking from 47% in the 1960's to less than 23% today. While smoking still kills more women than breast cancer, the rates are slowing as women quit and fewer adolescents start. This success has been a trans-NIH victory, with significant investments over the last 60 years 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.
- OBSSR has 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 (HMCRC, 2006) to build research and practice capacity among health behavior intervention researchers.

- Through NIDA, NIAAA, NIMH, and NCI-supported basic and clinical research, our understanding of the bio-behavioral mechanisms and treatment of mental disorders 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.
- 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 and NCCAM-supported research include evidence of bi-directional links between stress, social involvement, and cancer.
- 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, 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 31% reduction with diabetes medication. These findings led to "Small Steps, Big Rewards", the first national diabetes prevention campaign (NDEP, 2006).
- Research at NIA, NICHD, NIMH, NIEHS, and others 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 has declined by more than 50%.
- International studies in collaboration with the 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 the socioeconomic and built environments. Discoveries in the behavioral and social sciences can inform life-saving environmental and policy changes (see sidebar).
- In the U.S., research supported by NIAID, OAR, NIMH, FIC, and others has made major contributions to slowing the spread of HIV/AIDS and managing those with the disease. Although still devastating, HIV/AIDS is no longer the epidemic it once was in the U.S. thanks to research breakthroughs in the biological, behavioral, and social sciences. Mother-to-child-transmission of HIV has fallen dramatically due to the widespread use of new antiretroviral drugs during pregnancy and labor. Socio-behavioral studies of risky behavior have improved our ability to prevent risk through improved screening and adherence to treatment. Large scale educational campaigns have been delivered effectively. Lessons learned are being provided to other countries. The impact of these innovations is dramatic. Previously, 1500 to 1800 babies in the United States were born infected with HIV. Today, fewer than 50 HIV-infected babies are born each year. It is estimated that 16,000-20,000 lives have been saved by preventing mother-to-child transmission of HIV in the U.S. Globally, 280,000 cases of HIV infection in children could be averted each year using this effective psychosocial and drug therapy combination.

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 biomedical, social/behavioral sciences, economics, epidemiology, demography, and community-based participatory principles. 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 the trajectory of 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 antipoverty programs that combine education, health, and nutrition interventions in one package can improve the capacity of families to pull themselves out of the poverty and adverse health effects that often ensnares generations.

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 (Progres) on rates of growth and anemia in infants and young children: a randomized effectiveness study. *JAMA*, 291(21), 2563-70.

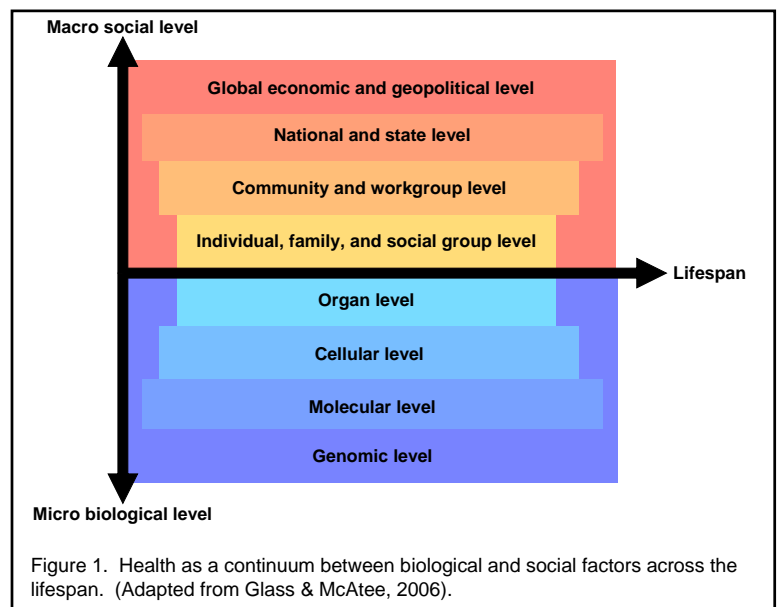
In the decade since its founding, OBSSR has supported behavioral and social science in many ways. OBSSR provides program development for funded research projects; contributions of personnel and funding to programs initiated by its NIH partners; and leadership in training, continuing education, and dissemination of research findings to the broader scientific community and the general public. OBSSR's efforts have become an integral part of research at NIH. Growth in the number of behavioral and social science projects in areas supported by OBSSR has matched and even outpaced the overall growth of NIH 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, 2000). These trends all serve as indicators that OBSSR is fulfilling its mission at NIH in a world that increasingly recognizes the contributions of the behavioral and social sciences to population health.

The Challenges and Opportunities Ahead

From longstanding health issues like tobacco use and cancer, to emerging threats of obesity, pandemic flu, and bioterrorism, the 21st century presents a multitude of complex and urgent problems. A number of health epidemics have social and behavioral roots, including obesity, diabetes, and HIV/AIDS infection; indeed, approximately half of premature deaths could be prevented through lifestyle behavioral change (Mokdad et al., 2005). Racial and ethnic minorities continue to suffer a heavier burden of illness, disability, and premature death from a multitude of health conditions and diseases. A "perfect storm" of rising demand for healthcare, an aging and increasingly economically disparate population, and unsustainable costs threatens the infrastructure of our health care system.

Addressing these health challenges effectively and efficiently will require 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 today:

- What links exist among social relationships, gene expression, brain structure, and immune function?
- How do positive aspects of health such as an optimistic outlook, or strong family and community ties translate physiologically into resistance to disease?
- How do differences in educational opportunity, access to medical care, cultural mores, income, and/or discrimination influence health?
- 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 are effective and cost-effective strategies to disseminate prevention and treatment interventions to the public? For whom, and under what circumstances are they effective?
- How do biomedical innovations impact the healthcare system, both positively and negatively?



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 the Office 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.

II. Informing the Prospectus

OBSSR is currently 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:

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

As part of the strategic planning process, OBSSR sought input from its key partners and stakeholders to gather their perspectives on specific actions OBSSR should take to maximize the contributions of the behavioral and social sciences to the NIH mission. The two trends described above were emphasized to ensure that stakeholder input was relevant to the financial and organizational contexts in which OBSSR operates. A group of 250 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 the Office works. Key components of this process, described in more detail in the OBSSR Strategic Planning Phase I Summary Report, 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 in depth around six open-ended questions (see sidebar) and participated in work sessions at an Expert Panel meeting.
- **IC Director interviews:** Selected IC directors were interviewed to obtain their view of the role for OBSSR 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 and stakeholders in the behavioral and social sciences.

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?

In addition to stakeholder input, OBSSR's strategic planning process leveraged the work of several recent advisory committees (see Advisory Committee Reports in references). Each of these sources has informed the strategic directions and specific implementation steps described in this document. This resulting report describes OBSSR's vision for a new, integrated approach to science and population health, and delineates the specific strategies that the Office will pursue to achieve this vision.

III. Defining OBSSR's Vision

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

Looking strategically towards the future, OBSSR has identified four programmatic directions to achieve this vision:

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.

- **“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, and multilevel analyses.
- **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. It is anticipated that such collaborations will yield new conceptual frameworks, methods, measures, and technologies that will speed the improvement of population health.
- **Systems-thinking approaches to health:** OBSSR will stimulate research that integrates multiple levels of analysis – from cells to behavior to society – required to understand the ways in which individual and contextual factors interact to determine health status.
- **Problem-based research:** OBSSR will work with its NIH partners to identify key issues in population health where behavioral and social scientists, biomedical researchers, practitioners, and health services decision makers can work together to develop prevention and treatment interventions and to accelerate the translation and adoption of these interventions.

Each of these programmatic directions serves a critical role in improving the health of our Nation. Basic research provides the foundation for understanding the mechanisms and pathways 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 recognizes the need to integrate the disparate methods and technologies of various disciplines in order to understand fully the complex determinants of health. Interdisciplinary research must include the broad base of stakeholders (e.g., policy makers, employers, practitioners, patients, and the general public) needed to ensure the implementation and adoption of scientific findings. Systems-thinking approaches consider the various levels of analysis from the cellular to the geopolitical, taking into account the system and relationships among its component parts. And finally, problem-based research provides a framework to integrate and focus basic science, interdisciplinary collaborations, and systems approaches to yield demonstrable and tangible benefits of the scientific enterprise to population health.

In this section, we define the four programmatic directions of OBSSR's vision and what they mean for the Office's efforts. We then present recommendations from participants in the strategic planning process – Expert Panel members and Issues Summit attendees – regarding steps the Office may take to stimulate basic research, foster interdisciplinary collaborations, and develop systems approaches within a problem-based framework. Following input from the behavioral and social sciences communities on this document during and after the 10th Anniversary Celebration, the Office will review these recommendations and develop a formal implementation plan that will guide its work in the future.

"Next Generation" Basic Science

Basic behavioral and social science research is critically important to the mission of the NIH; indeed it is a core value of NIH's mission. Basic research in the behavioral and social sciences provides the knowledge, methodology, and measures that are essential for understanding individual and population variation in health; for predicting, preventing, and controlling illness; for minimizing the collateral impact of disease; and for promoting health. It does not address disease outcomes per se, but is designed to elucidate behavioral and social phenomena underlying or influencing health and disease. It includes research on behavioral and social processes such as perception, emotion, learning, cognition, and social connectedness; biopsychosocial research, which addresses the complex interplay of biological, psychological, and social factors; and the development of procedures for measurement, analysis, and classification of behavioral and social phenomena, incorporating methods such as clustering techniques to move from individual to higher levels of analyses. It spans the full range of scientific inquiry, from mechanisms and processes at the intra-individual level to a growing science of dissemination designed to investigate the barriers and facilitators that determine the implementation and adoption of evidence-based practice among practitioners, decision-makers, and the public.

There have been numerous exciting developments in basic behavioral and social sciences research (see sidebar) such as:

- A greater understanding of learning theory and how to apply it to models of psychopathology led to the development of empirically-validated behavioral treatments for 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 an illness.
- Basic research on stereotypes, stereotyping, and cognitive processing has led to insights about how the medical care system provides unequal treatment to racial minorities even when explicit racial bias is not evident.

At the same time, remarkable advances in biomedical research have greatly improved our understanding of genetic, molecular, cellular, and neural underpinnings of physiology and health. For instance, animal studies have demonstrated that maternal care can result in permanent alterations of the expression of behavioral, cognitive, and endocrine stress responses. The availability of whole-genome data makes possible the examination of the links between environmental changes, behavior, physiological responses, and gene expression across the lifespan. Translating breakthroughs in genetics, neural circuitry, biomarkers, and neurotransmitters to improve the Nation's health will require increasingly sophisticated and precise behavioral and social methods, measures, and constructs. With such advancements, behavioral and social scientists may be able to address exciting new questions, many of which are described in an ACD Report (2004) on research opportunities in the basic behavioral and social sciences:

- **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?
- **Work-related stresses:** What are the effects of conflicts between work and family associated with women entering the workforce on social stress and health?

Memory: Where Learning, Behavior, and Biology Intersect

Nobel Laureate Eric Kandel's work delineates the molecular changes that underlie learning and memory. His book, *In Search of Memory*, relates the story of how four distinct disciplines – behaviorist psychology, cognitive psychology, neuroscience, and molecular biology – converged into a powerful new science of mind. Through its 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 will focus more 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," says Dr. Roger Brown, Chief of NIDA's Behavioral Neurobiology Research Branch. "That is to understand how repeated exposure to drugs 'teaches' the brain to become addicted.

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

- **Gene-Environment interactions:** How are genetic traits and early life experiences linked to physical and emotional health later in life?
- **Biosocial stress markers:** What are the neurological effects 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 threats such as natural or man-made disasters?
- **Technology, Measurement and Methodology:** How can we apply advancements in biomarker data collection and other technologies to track behavior in real time (e.g., ecological momentary assessment, personal sensors, geo-spatial coding methods) to decipher multi-level pathways linking biology, behavior, environment, and society?
- **Intergenerational transmission of behavior:** How is 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?
- **Complex adaptive systems:** How can our growing understanding of complex adaptive systems be used to better understand the process of decision making in health at the personal and systems levels?

Strategic Recommendations

At an intramural level, OBSSR will help to build consensus within NIH regarding the most important research areas. The Office will also explore in more depth the potential to link “islands” of behavioral and social sciences intramural research that currently exist within NIH to leverage their knowledge and resources. At an extramural level, OBSSR will facilitate a common research language and terminology between behavioral and social scientists and the broader scientific community. It will also educate behavioral and social scientists to use rigorous and emerging theories, methodologies, and tools necessary to answer the many questions facing our fields.

A detailed analysis of the state of basic behavioral and social sciences research at NIH and recommendations for next steps are contained in a recent report of the ACD working group on basic behavioral and social science (see sidebar). Other recommendations from participants in the planning process include:

- Work with partners and stakeholders to identify and reach consensus on priority research areas in the basic behavioral and social sciences.
- Promote the value of basic behavioral and social sciences research throughout the NIH community.
- Develop better research infrastructure by encouraging the identification of human and animal populations, birth cohorts, and community populations for future longitudinal studies
- Help NIH to articulate desired outcomes relative to basic research in behavioral and social sciences, and encourage NIH to keep a strong investment in such research.

Research Opportunities in the Basic Behavioral and Social Sciences at NIH: A Report of the Working Group of the NIH Advisory Committee to the Director

In the Winter of 2004, this working group was established to examine basic behavioral and social sciences research (BSSR) across the NIH. This process included a review of 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. Major findings from this report are highlighted below:

Applying Basic BSSR to Health: Exciting New Opportunities

- Macro-Social Behavior (e.g. migration)
- Social & Interpersonal Behavior (e.g. ethnic bias)
- Perception, Learning, Emotion & Cognition (e.g. vigilance)
- Early Development (e.g. temperament)
- Gene-Environment Interactions (e.g. bio-social stress)
- Technology, Measures & Methods (e.g. biomarkers)
- Cross-cutting research (e.g., health disparities, obesity, early life events)

Conclusions and Recommendations

- Basic Behavioral and Social Sciences research and training is critical to the NIH mission
- Greater support for Basic Behavioral and Social Sciences research is needed throughout NIH
- A trans-NIH strategy for Basic Behavioral and Social Sciences research and for training is needed
- A secure and stable home for Basic Behavioral and Social Sciences Research should be established at NIH
- Should be at a non-categorical disease IC where basic research that is not yet linked to specific diseases and/or life stages can be supported
- Will require staff with appropriate expertise in Basic Behavioral and Social Sciences Research.
- Will require sufficient budget to support staffing, training, administration
- Categorical ICs at NIH that are currently supporting Basic BSSR should continue supporting work that is relevant to their missions

Reference:

Report of the Working Group of the NIH Advisory Committee to the Director on Research Opportunities in the Basic Behavioral and Social Sciences. December 2, 2004.

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

Unraveling 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, it is increasingly recognized that particular problems 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.

Interdisciplinary collaborations refer to scientific endeavors in which a variety of disciplines work together closely from the outset to form a shared conceptual framework to address a problem (Rosenfield, 1992). 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, and behavioral genetics. Interdisciplinary research is distinct from multidisciplinary research in that the latter refers to a process in which researchers in different disciplines work relatively independently, each from his or her own disciplinary perspective with limited direct interaction and little cross-fertilization among disciplines (Rosenfield, 1992).

Interdisciplinary approaches in the behavioral and social sciences have been discussed extensively (e.g., National Academy of Sciences, National Academy of Engineering, and IOM, 2004; Kessel et al., 2003) and have been supported in several large-scale research programs. Two recent examples are the Research Teams of the Future initiative 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. Figure 2 shows an example of how an interdisciplinary framework can be used to understand major population health problems such as tobacco use, through a conceptual synthesis across three major domains (Abrams, 1999; Abrams et al., 2003; Clayton et al., 2000): (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. Such an integrated approach requires more than collaboration across disciplines – it requires a shared knowledge base, common terminology, and the ability to work synergistically to develop new interventions that change future levels of tobacco use.

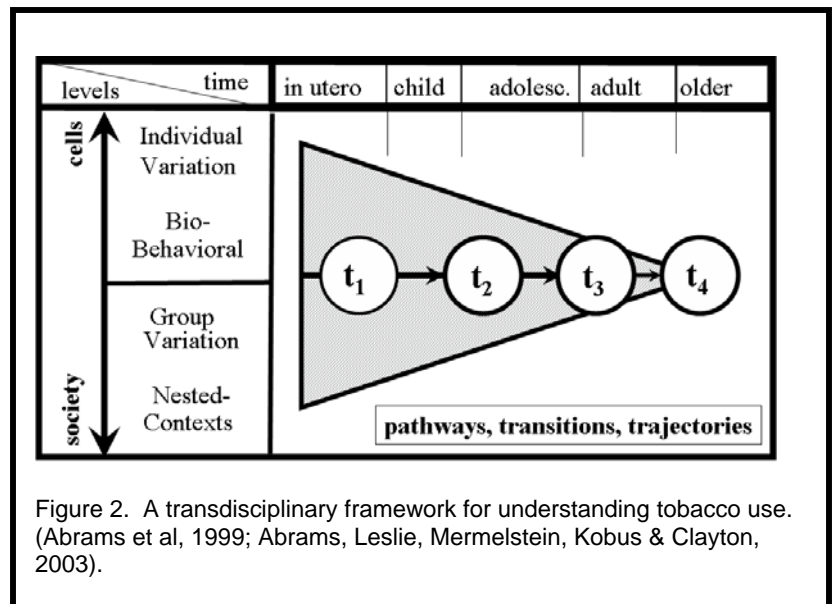


Figure 2. A transdisciplinary framework for understanding tobacco use. (Abrams et al, 1999; Abrams, Leslie, Mermelstein, Kobus & Clayton, 2003).

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 & Olin, 2002) and alcoholism (Holder, 2001; Meyer, 2001). A recent report by the Institute of Medicine, *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), 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 biomedical, behavioral, and social sciences across the broad spectrum of population health challenges.

Strategic Recommendations

- Identify areas that can be most effectively investigated using interdisciplinary approaches, by engaging the scientific community through symposia, working groups, or ad hoc committees.
- 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.
- Identify, document, and share with key audiences studies that demonstrate the value of integrating social and behavioral science 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, including metrics and models to indicate the public health and economic impacts of behavioral and social science research.
- Collaborate in the development of curricula, modules, and materials required to train health scientists to design and conduct collaborative, interdisciplinary health research that bridges science and practice, addressing both the behavioral/social science and biomedical research communities.
- Help to strengthen the power of behavioral and social sciences methods to support interdisciplinary biopsychosocial health research, and increase the degree to which behavioral and social scientists have the capacity to help fulfill the Office's mandate and the NIH mission.

Understanding tumor growth in cancer: an interdisciplinary approach

Cancer remains one of the most challenging diseases faced by mankind. 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 the journal *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:

- 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, 240-248.

Systems Thinking Approaches to Health

The third component of OBSSR's vision focuses on systems approaches to population health research. Systems approaches address the dynamic relationships among individual components and whole systems related to health and disease. While the term "systems" has become a fashionable concept in recent years, OBSSR's intends to harness systems approaches for 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; 3) to help illuminate redundancies in systems and remove them to make the most efficient use of existing resources; and 4) to effectively disseminate emergent knowledge.

There are multiple schools of thought related to systems thinking. "Soft" systems approaches (Checkland, 1981) emphasize the creation of a "system" of multiple stakeholders involved in population health problems. This approach provides new ways to harness the efforts of each component of the system – for instance, through stakeholder-driven planning and evaluation processes, or social networks that link communities of research and practice. These networks provide the infrastructure that allows data to be standardized and knowledge to be shared across research teams and disciplines, including both explicit knowledge (data) and tacit knowledge (experience and wisdom of individuals and organizations).

A second school of thought focuses on the powerful theories and methods developed through systems approaches that can be used to determine how numerous factors interact non-linearly, over time, in multiple feedback loops to determine health. 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 & Marceau, 2000). System dynamics modeling and agent-based models are methods that can simulate complex and emergent behavior. Perhaps most importantly, these tools enable systems approaches to address a broad range of factors within a single framework – from genetic to environmental, cellular to behavioral, and biological to social.

Systems thinking is also logically related to knowledge and computing infrastructures necessary to link networks of stakeholders in their collaborative work. As the digital divide is reduced, access to technology will enable diverse groups to take advantage of cutting edge innovations in health technologies that enhance disease surveillance, environmental monitoring, food safety, emergency planning, disaster management, and tracking of environmental hazards through geographic information systems (see sidebar).

Many of the components of a systems approach 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 & Hood, 2004; Grimm et al., 2005) have resulted in a growing interest in the use of systems approaches to population health research. The belief is that a systems approach shows promise for unlocking the secrets of complex, multi-dimensional health issues, and transforming this knowledge into effective interventions that can fundamentally change population health (Trochim et al., 2006).

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

References:

Gibbons, M.C. (2005). A Historical Overview of Health Disparities and the Potential of eHealth Solutions. *J Med Internet Res*, 7(5), e50.

An evidence base is growing for the impact of systems approaches in areas such as policy interventions for tobacco control (NIH, in press), models for the management of antibiotic resistance and the care of chronic disease (Homer et al, 2001), and the synergistic interaction between infectious disease epidemics (CDC/NCCDPHP, 2005) among many others. Other examples of the application of systems approaches in health research include:

The ISIS Project: Applying Systems Thinking to Tobacco Control

Despite substantial decreases in recent decades, tobacco use remains one of the leading causes of preventable death in the United States. The ISIS (Initiative for the Study and Implementation of Systems) project, sponsored by the National Cancer Institute, represented an ambitious effort to apply systems thinking techniques to the problems of tobacco control.

As a two-year proof of concept study, the initial phase of ISIS brought together a diverse group of stakeholders in tobacco control, including subject matter experts in systems modeling and networks, tobacco control and public health researchers, tobacco control activists and advocates. Some of the research areas explored within ISIS workgroups included:

- A system dynamics causal model for tobacco prevalence and consumption, including the simulation of an aging cohort of smokers over a 40-year period, and the impact of policy interventions.
- A case study of network analysis for the evaluation of state-level tobacco control programs.
- A knowledge management review of tobacco control efforts at the National Cancer Institute.
- A concept mapping study where a participatory group of stakeholders explored factors influencing the strength of local tobacco control.

The results of this project included a set of consensus guidelines for the future implementation of systems thinking in tobacco control, ranging from methodological research to education and infrastructure, as well as a National Cancer Institute monograph (in preparation) entitled *Greater Than the Sum: Systems Thinking in Tobacco Control*. OBSSR is currently involved as a stakeholder in the second phase of ISIS, focusing on implementation issues for a systems thinking approach.

- The ISIS Project: a proof-of-concept initiative for applying systems thinking to tobacco control (see sidebar).
- 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).

Strategic Recommendations

- Promote the development and application of intellectual frameworks and techniques needed for the systematic study and understanding of the complexity of health and its determinants. Examples include systems modeling and simulation tools, knowledge synthesis, decision-support tools, development of cyberinfrastructure, personal sensors for ecological momentary assessment, and other informatics tools.
- Promote and support the development, maintenance, and widespread use of databases containing significant longitudinal 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 from research on molecules, behavior, and social systems.
- Encourage the development of infrastructure tools, such as informatics, cyber-infrastructure, and networks, needed to bring a robust systems research environment to fruition.
- Collaborate in the development of curricula, modules, and materials required to train health scientists in the application of systems thinking and tools in their research.

Problem-Based Research

The three programmatic directions discussed so far – “next generation” basic science, interdisciplinary research, and systems approaches – describe the types of research needed to achieve OBSSR’s vision. The fourth programmatic direction of problem-based research relies on each of these areas to address and solve specific population health issues (see obesity example in sidebar):

- In a problem-based framework, basic behavioral and social science research findings are used not just as an end unto themselves, but as tools for improving health. For example, while basic research may examine the physiological underpinnings of motivation, problem-based research uses that knowledge to reduce the prevalence of obesity or substance abuse.
- Interdisciplinary collaborations pool the expertise of diverse disciplines to address specific population health problems. For example, problem-based research focuses on tangible outcomes such as preventing stroke through the collaborative efforts of experts in cardiology, physiology, behavioral medicine, nursing, and community health.
- Systems approaches are used to explore multi-level, multi-factor problems and to put solutions into practice. For example, a systems approach to health disparities in cancer screening might examine how cognitive processing (individual level) is influenced by cultural representations of disease (sociocultural level) and accessibility of care (socioeconomic level).

Behavioral and social scientists have made enormous progress in understanding the relationship between psychosocial and biological factors in promoting health and in minimizing the burden of disease and disability. At the same time, critical gaps remain in our understanding of preventable mortality and quality of life. To address the complex and challenging population health issues facing our Nation, scientific inquiry must emphasize both the pursuit of knowledge and its application to solutions. The future of our Nation’s health depends on developing a more comprehensive understanding of the mechanisms that underlie the numerous determinants of health, and translating that knowledge into tangible improvements in health. A problem-based approach to research, practice, and policy is a means towards these ends. Elements of a problem-based approach include:

A focus on outcomes. Throughout the planning process – from conceptualization to implementation and evaluation – problem-based research has its “eye on the prize” of improving health, longevity, and quality of life. The questions asked and the methods employed in problem-based research are designed to develop solutions to real-world issues that can be implemented in real-world settings. While the list is seemingly endless, urgent problems in need of innovative solutions include: 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).

The Problem of Obesity: Developing Solutions through Basic Science, Interdisciplinary Collaborations, and Systems Approaches

“Obesity should no longer be regarded simply as a cosmetic problem affecting certain individuals, but an epidemic that threatens global well being.”

~ Kopelman (2000)

Research has demonstrated that obesity is deeply rooted in environmental, sociocultural, economic, behavioral, physiologic, and genetic factors. The complex etiology of this major population health problem, and the numerous questions that remain to be answered, illustrate clearly the contributions OBSSR can make through each of the programmatic directions described in this prospectus.

- Basic behavioral and social science is needed to better understand, for example, how genetic variation and environmental factors interact to produce obesity, and the mechanisms that link socioeconomic status and obesity.
- Interdisciplinary research involving experts in nutrition, epidemiology, sociology, geography, and urban planning is needed to better understand the connections among neighborhood environmental factors, physical activity, and dietary intake.
- Systems approaches can be used to model the impact of multiple factors in obesity, both as causal factors and covariates, within a research framework that engages a broad spectrum of stakeholders in research and practice.
- Problem-based research must inform policy to modify the macro socioeconomic and physical environment. The built environment needs to support physical activity; schools and worksites need to support healthy food choices and physical activity; research must inform the manufacturing, delivery and marketing of food; economic and other incentives must support healthier food choices and exercise habits.

Solving all of our major population health problems will require more active and comprehensive intervention strategies informed by basic behavioral and social science research, developed through innovative and interdisciplinary collaborations, and targeted to all the relevant systemic factors.

Reference:

Kopelman, P.G. (2000). *Nature*, 404(6778). 635-643.

Linking research, practice, and policy. Problem-based research seeks to close the gap between research and the needs of practitioners, decision-makers, and the populations they serve. Innovative models are needed for stakeholder participation throughout the research process. 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 policy-makers.

The science of implementation. Realizing the full potential of our Nation's investment in health research to improve individual and population health and well being requires that science inform both practice and policy. To achieve this goal, we need robust measures and consistent reporting of intervention and treatment costs that consider multiple perspectives, including that of the patient, payer, community, and employer. We need to develop and use research designs, methods, and outcome measures that provide relevant and timely information for practitioners, policy-makers, and other decision makers. We need to maximize participation in research trials to understand the full spectrum of demographic, psychosocial, cultural, and religious factors related to health outcomes, and to ensure that research is relevant and respectful of the cultural context in which it will ultimately be implemented.

In essence, we need both a stronger "science of dissemination" and better "dissemination of science" (Kerner, Rimer, & Emmons, 2005). The science of dissemination includes basic and applied research to investigate the barriers and facilitators that shape political will, advocacy, and policy. This understanding must then be used to more effectively align incentives to improve the "dissemination of science", especially when the inherent rewards of putting what we know into widespread practice and policy are not built into the social and economic fabric of our society (Kerner, Rimer, & Emmons, 2005). The lack of inherent rewards for implementing socio-behavioral interventions is in sharp contrast to other parts of the pharmaceutical and health care industries, where new drug discovery, devices, and technologies are rapidly developed and deployed, presumably because there are strong financial incentives to reward the private sector pipeline of discovery, development and delivery. Although the long term benefits of eliminating health disparities are huge and are measured not only in financial terms but also in human terms, there are few inherent incentives and no immediate financial rewards in implementing the best psychosocial innovations and discoveries that could eliminate disparities.

The past century has seen substantial improvement in mortality and morbidity. Life expectancy increased approximately 30 years (CDC, 2005), with adults now living well into their seventies. Despite this progress, the behavioral and social sciences have enormous contributions to make in extending longevity and quality of life that have yet to be fully realized.

Strategic Recommendations

- Collaborate in the development of research on high priority health issues that transcend the boundaries of individual NIH ICs, such as obesity, pain, parenting, and the management of chronic diseases.
- Contribute to the development of the science of dissemination and its application to increase the degree to which health research results are translated into practice and policy, with a particular focus on the factors promoting or impeding the adoption of research results by health providers, insurers, policy makers, 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 dissemination mandate for research within NIH.
- Address gaps in knowledge regarding the methodologies and outcomes measures of different disciplines that often exist among behavioral and social scientists and researchers in fields such as biology and medicine.
- Develop and promulgate standards of evidence for the design, implementation, and reporting of biopsychosocial research of the highest quality and rigor.

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 OBSSR program directions – “next generation” basic science, interdisciplinary research, systems-oriented approaches, and problem-based research – all underscore the need for effective partnerships among the NIH ICs. Many of the urgent health issues transcend the boundaries of individual ICs. A systems-oriented approach requires innovation, new thinking, and new methods to address the increasingly complex and interdisciplinary problems in health and disease emerging from foundational research.

Interorganizational relationships may be relatively informal and center on the sharing of information. These may also be more formal collaborative partnerships 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 & Kegler, 2002; Gray, 1989, 1996; Milward & Provan, 2003). The six key factors for successful collaborative leadership include: clear common aims, trust, collaborative leadership, sensitivity to power issues, a membership structure that facilitates shared goals, and reflective shared action learning (Huxham, 2003; Huxham & Vangen, 2000).

Strong collaborative relationships between OBSSR and its internal and external partners are crucial to realizing its vision of science and public health, as outlined in Figure 2:

- OBSSR will work with its *internal* partners to improve the investment in basic and applied research in behavioral and social sciences at NIH.
- OBSSR will work with its *external* partners to build support among key stakeholders, decision makers, 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 the Office is expanding its outreach activities. Such efforts will include strengthening partnerships that help behavioral and social scientists gain the capacity to help fulfill the Office's mandate and the NIH mission, and aggressively exploring relationships with non-traditional partners such as the business community, labor unions, third-party payers, and providers.

In addition, the Office is strengthening partnerships with closely aligned partners such as the Centers for Disease Control and Prevention and its affiliated National Center for Health Marketing, the Agency for Healthcare Research and Quality, the National Science Foundation, the Directorate for Social, Behavioral and Economic Sciences, the Consortium of Social Science Associations, and the Office for Cyberinfrastructure.

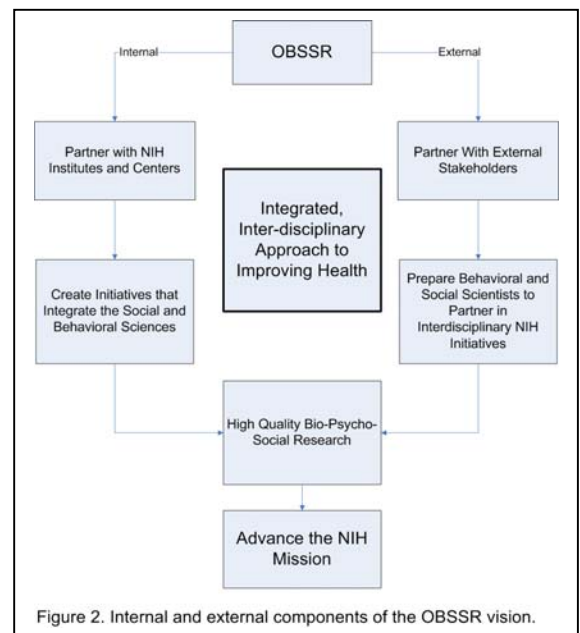


Figure 2. Internal and external components of the OBSSR vision.

Education and Training

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

1. **Fostering collaborative research skills in behavioral and social science**, to increase the pool of behavioral and social scientists – at all stages of career development – with the skills and knowledge necessary to conduct cutting edge basic science, collaborate in interdisciplinary teams, and use systems approaches to solve our Nation’s population health problems. To support the development of strong behavioral and social scientists, OBSSR will continue to initiate and support theoretical, substantive, and methodological training activities. 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, or economic variables; statistical methodologies appropriate for multi-component, individually-tailored interventions; 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 new perspectives that can be applied in their research. The aim is to allow scientists across the research continuum – from basic scientific discovery to dissemination and implementation – to understand other disciplines and to recognize ideas applicable to their own work. Basic scientists should be introduced to the scope of application-oriented issues, and applied researchers should be kept abreast of fundamental research. In addition, OBSSR will help to 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 behavioral and social science. OBSSR will also publicize examples of successful collaborative health research in which the behavioral and social sciences have played a role. The Office will continue to support the Behavioral and Social Sciences Research Coordinating Committee in convening guest lectures and symposia on selected topics in the behavioral and social sciences. These presentations by prominent behavioral and social scientists provide the NIH community with overviews of current research on topics of scientific and social interest.

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 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 a report by the Institute of Medicine report entitled, “Improving Medical Education: Enhancing the Behavioral and Social Science Content of Medical School Curricula.” This report resulted in three core recommendations:

- 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.
- 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).
- Create career development and curriculum development awards for behavioral and social science to reward excellence in teaching these subjects within medical schools.

These recommendations have led to the funding of grants 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 healthcare system.

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Bailey, D.S. (2004). Expanding medical training. *APA Monitor on Psychology*, 35(6), 46.

National Institutes of Health, “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.

Institute of Medicine (2004). *Improving Medical Education: Enhancing the Behavioral and Social Science Content of Medical School Curricula*. National Academies Press.

Communications

In today's digitally connected environment, an infrastructure for better communications and dissemination represents a key part of the Office's communications strategy. Concrete steps 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 science perspectives, constructs, and measures in health research.
- Developing interdisciplinary models for biopsychosocial research that successfully integrate the social and behavioral sciences into biomedical research.

Communications are a multi-directional 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 of the stakeholders of public health into a living, participatory community, from research through dissemination of results, will form a critical backbone for the way we approach health, disease, and wellness in the future.

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.

The Office'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, external expertise in conducting assessments of OBSSR programs and strategies.

V. Looking Forward

As behavioral and social scientists, we see enormous potential to improve the health and well-being of all of our 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, 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, PhD, FMedSci, FRS, 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 behaviour influences their health and disease patterns" (Blakemore, 2006).

As it enters its second decade, OBSSR and its partners at NIH 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. 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.

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, it is evident that behavioral and social science research can and must be included in the broad research enterprise to address the challenges facing the healthcare system and to improve the health of our Nation.

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 National Research Council 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 ICs. Ten priority research areas were identified, summarized in the report titled "New Horizons in Health: An Integrative Approach":

1. **Predisease pathways**, identifying biological, social, behavioral, and psychological precursors to disease,
2. **Positive health**, identifying the biological, social, behavioral, and psychological factors in wellness and resistance to disease,
3. **Gene expression**, exploring its link with biological, social and behavioral factors, and relationship with subsequent health outcomes,
4. **Personal ties**, and their relationships to positive and negative health outcomes,
5. **Healthy communities**, and how the collective properties of such community-level units relate to health and disease outcomes.
6. **Inequalities** at levels such as socioeconomic, race and class, and their impact on health.
7. **Population health**, as it relates to macro-level trends in health, as well as performance evaluation of the health care system,
8. **Interventions** that expand the scope and effectiveness of efforts to improve health,
9. **Methodology**, particularly in areas such as new measurement techniques and study designs that link information across levels of analysis (molecular, cellular, behavioral, psychosocial, community) and across time,
10. **Infrastructure**, including ways to maintain long-term study populations and train scientists to participate in interdisciplinary health-related research and dissemination.

The report combines these general directions with very specific recommendations for their implementation, ranging from multilevel analysis techniques and evaluation approaches to the development of more birth cohort populations for future research. Each of these recommendations serves as a valuable strategic roadmap for the future of OBSSR and NIH's efforts towards aligning research with improved health.

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