

**National Institute on Aging (NIA)
National Advisory Council on Aging (NACA)
Review of the Division of Behavioral and Social Research (BSR)**

2013 BSR Review Committee Report

Rev. February 26, 2014

Review Committee Members

*(*current NACA Member; **former NACA member)*

- *Laura Carstensen, Ph.D., Stanford University (Co-Chair)
 - *Jonathan Skinner, Ph.D., Dartmouth College (Co-Chair)
 - *Kimberly Acquaviva, Ph.D., George Washington University
 - *Norman Anderson, Ph.D., American Psychological Association
 - **Lisa Berkman, Ph.D., Harvard University
 - Paul Boyle, Ph.D., Economic and Social Research Council
 - **John Cacioppo, Ph.D., University of Chicago
 - Myron Gutmann, Ph.D., University of Michigan (formerly National Science Foundation)
 - Robert Hauser, Ph.D., National Research Council and the University of Wisconsin-Madison
 - **James Jackson, Ph.D., University of Michigan
 - **Ronald D. Lee, Ph.D., University of California, Berkeley
 - *Eliseo Perez-Stable, M.D., University of California, San Francisco
 - **James P. Smith, Ph.D., RAND Corporation
 - Linda Waite, Ph.D., University of Chicago
 - **Robert Wallace, M.D., University of Iowa
 - *Terrie (Fox) Wetle, Ph.D., Brown University
 - **David Wise, Ph.D., Harvard University
- Rose Maria Li, M.B.A., Ph.D., Executive Secretary

Table of Contents

I. Executive Summary	1
II. Introduction to the BSR Review Process.....	2
III. BSR Descriptive Background.....	4
IV. Overview of BSR Research Advances	5
V. Committee Findings	8
VI. Review of Scientific Topic Areas.....	11
A. Aging Minds.....	12
B. Biosocial and Biobehavioral Research	13
C. Genetic and Other Molecular Biomarkers in the Study of Behavior	14
D. Health Care Systems and the Burden of Illness.....	16
E. Health, Work, and Retirement.....	16
F. Sociology, Social Demography, and Social Epidemiology of Aging	18
G. Interventions and Behavior Change	19
H. Health Disparities	20
I. International Research.....	21
VII. Training	22
VIII. Grant Application Review Process	23
IX. Data infrastructure.....	23
X. Staff Collaborations.....	25
XI. Staffing.....	25
XII. Conclusion	25
Appendix I: Background Documents Provided to Committee	27
Appendix II: Subcommittee Meeting Dates and Participants	29

I. EXECUTIVE SUMMARY

In the United States and globally, the population is aging, with developing countries facing the greatest challenges because they are the least prepared for what is to come. Because behavior has large and pervasive effects on health outcomes for older adults, the study of behavior change, and the pathways by which social and behavioral stimuli operate, promises substantial improvements in public health as well as savings in healthcare costs. The National Institute on Aging (NIA), and in particular the Division of Behavioral and Social Research (BSR), is the only funding institution in the United States that integrates research on successful aging across genetic, social, clinical, psychological, and economic sciences.

The overwhelming impression of the 2013 National Advisory Council on Aging (NACA) Review Committee is that BSR continues to be successful in moving science forward. It embraces multidisciplinary research, in particular the integration of the biological, social, and behavioral sciences in ways that are innovative and illuminating for topics relevant for the NIA. BSR is also known for the quality of its staff, and the steadfast commitment of the NIA and BSR leadership to support compelling social and behavioral research that improves health and well-being. BSR's portfolio ranges from genetics to interventions and population research, from molecules to individuals to societies. It has also made significant investments in data resources and data management that have contributed fundamentally to the Nation's scientific infrastructure.

This report does not purport to be comprehensive about all the areas that BSR should support. Rather, the Committee sought to highlight the areas meriting particular attention, both in the overview and in the discussion of scientific topic areas, given the state of the science today. In this spirit, the Committee recommends four integrative research areas that merit high-priority support:

- Research that *illuminates the pathways* by which social, psychological, economic, and behavioral factors affect health in middle-aged and older adults.
- Research aimed at understanding and *modifying organizational or individual behaviors* associated with positive and negative health outcomes in later life, including organizational and individual interventions in the health care system.
- Research *on factors that affect population aging, as well as the consequences of population aging*, particularly in the context of demographic and epidemiologic transitions in progress and macro aspects about health, economics, and retirement.
- Research that *ameliorates the impact of disadvantaged position in society*, including research that focuses on critical periods for reversing such effects and/or the optimal timing of intervention.

The Committee also recommends a number of actions related to training, data infrastructure, and review that pertain to multiple content domains, chief among them:

- Continue to emphasize the integration of biology, social and behavioral science, and the environment in studies relevant to understanding population aging.
- Support the use of natural experiments on a national and international scale to study

differences in social environments and public policy and their effects on health and well-being at older ages.

- Continue to support cross-national research and cross-national harmonization of data collection.
- Integrate randomized controlled trials (RCTs) and other intervention designs with existing observational studies and iterate between them to maximize the utility of current studies, to improve the health and well-being of older persons.
- Continue to promote linkages to “big data” and demand data sharing by grantees to multiply the value of BSR’s resource investments.
- Encourage young researchers to pursue innovative, cross-disciplinary research, and support training and career development that ensure the diversity of the scientific community pursuing research on aging.

BSR is not without its challenges. This year’s review is conducted against a backdrop of recent threats to Federal funding for behavioral and social research. There is increased scrutiny about the salience of social science research topics to the mission of the NIH and the NIA. The Committee strongly endorses these topics and notes the need to better communicate to policymakers how important behavioral and social research findings contribute to health and quality of life among elderly Americans. As is highlighted throughout this report, behavioral and social research, including economics, has provided significant insights about the health and well-being of aging populations. Like other agencies, BSR also must operate in the current context of reduced and uncertain funding, and therefore must prioritize its many ambitions and seek creative ways to do more with less. BSR is also experiencing the effects of recent support staff departures, which requires professional staff to divert more time to administrative tasks. Every effort should be made to encourage staff retention at all levels and to fill vacancies without delay, to maintain the high-quality of research programming that has been the standard of this Division.

Although the Committee appreciates the diverse and fruitful collaborations that BSR staff has had with other units at multiple levels, it cautions that BSR must be strategic in terms of which new collaborations to pursue, particularly in the current budgetary climate and in light of constrained staff resources. In the face of diminished resources, BSR staff has remained committed to the quality and integrity of their research portfolio. The Committee commends the leadership of the Division and the NIA for continuing to push the innovative boundaries of behavioral and social research in the service of health and healthy aging.

II. INTRODUCTION TO THE BSR REVIEW PROCESS

The NACA is tasked with periodically reviewing each of the four Divisions within the NIA to assess whether the overall performance and, more importantly, the future trajectory of research being promoted and supported by the Division are appropriate. A key challenge is to evaluate the balance of research supported and identify areas that merit greater or less emphasis. The review is meant to help the Divisions improve through self-evaluation and expert advice.

Previous reviews of BSR were completed in February 1998, May 2000, May 2004, and November 2008. This cycle’s Review Committee, co-chaired by Drs. Laura Carstensen and Jonathan Skinner, consisted of 17 distinguished scientists, 6 of whom were at the time current

NACA members and 7 former NACA members. Several of the current committee members served on the previous BSR review (John Cacioppo [2008 review Co-Chair], Lisa Berkman, Laura Carstensen, James Jackson, Ronald Lee [2004 review Chair], James P. Smith, and David Wise).

The 2013 BSR Review Committee received background material to assist it in its deliberations, including copies of the 2004 and 2008 review reports, and memoranda prepared by BSR program staff on salient topics and in response to Committee queries. A more complete listing of the materials provided as supporting documentation to the Committee is provided in Appendix I. The Committee participated in two 90-minute conference calls (June 5 and August 9) prior to an in-person meeting on September 15-16, 2013, and one subsequent conference call (January 6) to discuss and complete this report. Beginning with the September 15-16 meeting, Committee members met for executive sessions that were closed to BSR staff as a way to encourage full and uninhibited deliberations about any potentially sensitive issues. The meeting on September 15-16 also included executive sessions with NIA leadership (Dr. Richard Hodes, Director and Dr. Marie Bernard, Deputy Director) and BSR leadership (Dr. Richard Suzman, Director; Dr. John Haaga, Deputy Director and Chief of the Population and Social Processes Branch; and Dr. Lisbeth Nielsen, Chief of the Individual and Behavioral Processes Branch).

The review was guided by the following three general questions:

- What is the overall assessment of accomplishments since the 2008 review?
- What are the most exciting areas going forward?
- Are there concerns, and, if so, are they being adequately addressed?

Subcommittees were organized around nine research areas deemed vital to BSR's research portfolio (Chair shown in parenthesis below; * denotes member of the Committee). Appendix II lists the subcommittee members and individuals from whom input was invited and indicates the extent of their participation.

- Aging Minds (Ulrich Mayr, University of Oregon)
- Biosocial and Biobehavioral Research (*John Cacioppo, University of Chicago)
- Genetics of Aging (*John Cacioppo, University of Chicago)
- Burden of Illness and Efficiency of Health Systems (Michael Chernen, Harvard Medical School)
- Health, Work, and Retirement (Kathleen McGarry, University of California, Los Angeles)
- Sociology, Social Demography, and Social Epidemiology of Aging (*Linda Waite, University of Chicago)
- Interventions and Behavior Change (David Laibson, Harvard University)
- Health Disparities (*James Smith, RAND Corporation)
- International Research on Aging (Arie Kapteyn, RAND Corporation)

BSR provided each of the subcommittees a background brief highlighting BSR responses to the 2008 review report recommendations, additional program activities, new initiatives, and possible future directions. Potential future directions represent important, burgeoning areas, or areas needing extra attention that may be perceived as being deficient or potentially critical for

progress. In addition to considering the three overarching questions mentioned above, these subcommittees were additionally tasked with considering special issues in their respective areas. BSR staff posed questions that were meant to guide (but not dictate) discussions. The subcommittees were asked to think broadly and not be constrained in scope when defining priorities for their assigned areas.

For some topic areas, written input was invited from experts identified by BSR staff and subcommittee chairpersons. Written input was shared with BSR staff and all subcommittee members (if received in advance of the subcommittee meeting) and with the Chair of the subcommittee (if received after the subcommittee meeting) to ensure that all input was considered and incorporated into the subcommittee report as appropriate. BSR staff participated on the subcommittee calls as resource persons, and they had primary responsibility for drafting the subcommittee meeting summary reports.

The materials provided by BSR staff and the subcommittee reports served as the primary basis of deliberations of scientific directions by the full Committee. From this information, the Committee identified the overarching findings for BSR (see Section V, Committee Findings) as well as the top recommendations by topic area (see Section VI, Review of Scientific Topic Areas). Committee members continued to provide input after the September meeting. Final discussion took place on January 6 by teleconference, with all Committee members confirming their concurrence with this report shortly thereafter.

III. BSR DESCRIPTIVE BACKGROUND

BSR supports research and research training in the behavioral and social sciences on the processes of aging at individual and population levels. It focuses on how people change over the adult life course, on the interrelationships between older people, families, and other social institutions, and on the societal impact of the changing age composition of the population. Emphasis is placed upon multilevel interactions among psychological, physiological, genetic, social, and other environmental influences on health and well-being.

BSR operates under the direction of the Division Director, Richard Suzman; the Deputy Division Director, John Haaga; and the Assistant Director, Georgeanne Patmios. It has two branches, with substantial interactions between the two: The Individual Behavioral Processes (IBP) Branch is headed by Lisbeth Nielsen, and the Population and Social Processes (PSP) Branch is led by Dr. Haaga. A section devoted to research resources and development is housed within the BSR Office of the Director, and led by Ms. Patmios, to coordinate and implement initiatives related to research data and resources.

In 2013, the IBP Branch managed about \$69 million in awards and the PSP Branch about \$94 million. IBP sections include behavioral medicine and interventions, psychological development and integrative sciences, cognitive aging, behavioral genetics, and families. Within the PSP Branch, sections are devoted to demography of aging, economics of aging, epidemiology, and health and long-term care systems.

BSR research, training, and career development awards totaled more than \$183 million in fiscal year (FY) 2013. Funding has been growing in nominal terms since FY06 but roughly constant in real terms since 2000, leaving out the one-time-only American Recovery and Reinvestment Act

(ARRA) funds (using the Biomedical Research and Development Price Index as a deflator). Since around 2000, BSR awards have constituted about 20 percent of the NIA extramural research total, even though the grant budgets are no longer set at the division level (with the exception of centers programs).

By mechanisms, most BSR funding—just more than \$89 million in 2013—supports R01s and equivalents such as the R37. About \$28 million is devoted to P01s (program projects) and \$21 million to U01s (cooperative agreements that pay for large data projects or intervention trials). The three center programs managed by BSR—Demography and Economics of Aging; Roybal Centers for Translational Research; and Resource Centers for Minority Aging Research— together receive just more than \$15 million per year. Institutional training grants (T32s and T35s) and Career Development awards (Ks) receive roughly equal amounts, averaging \$10 million per year. The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs managed by BSR together average about \$6 million. Through FY17, 2.7 percent and 0.35 percent of an agency’s annual extramural budget must be set aside for the SBIR and STTR programs. BSR also spends approximately \$4 million annually on research-related contracts, for example, harmonization projects with the World Health Organization Study on Global Ageing and Adult Health (SAGE) and the Survey of Health, Ageing, and Retirement in Europe (SHARE); Census funding for core activities in the aging program and the National Longitudinal Mortality Study (NLMS); support for the National Center for Health Statistics (NCHS) to enhance the National Death Index and the activities of the Federal Interagency Forum on Aging Related Statistics; the development of subjective well-being measures in the American Time Use Survey with the Bureau of Labor Statistics; and scientific meetings convened by the National Academies.

IV. OVERVIEW OF BSR RESEARCH ADVANCES

The great strides in basic biology, public health, and clinical medicine in the past 50 years mean that more Americans will survive to older ages. This relatively sudden increase in life expectancy comes with accompanying challenges, including the increasing prevalence of debilitating chronic diseases in the population, shrinking financial assets for millions of individuals as they move through retirement, large numbers of people who experience cognitive decline, and social and environmental pressures that can undermine mental and physical well-being. Research also suggests that unprecedented numbers of older citizens are arriving at old age healthy and cognitively fit, thus representing a potential new resource for families, communities, and workplaces.

BSR supports a very broad research agenda as it aims to understand factors, from genes to economic infrastructures, that place individuals and societies on positive or risky trajectories as they live lives nearly twice as long as their ancestors a short century ago. It is now clear that aging per se does not result in inevitable debilitation throughout old age. Just as clearly, a large body of research now shows that optimal aging is rooted fundamentally in behavior and habits that extend across adulthood and that significant segments of the current adult population are at risk of poor outcomes when they retire. Addressing behavioral change and behavioral supports requires a deep understanding of interdisciplinary and translational approaches that rely on a broad range of social and behavioral sciences and that are informed by and complement advances in basic biomedical science and clinical practice.

BSR is distinguished from virtually all other behavioral science funding agencies in that it is organized around challenges rather than specific disciplines. BSR leads nationally and internationally in its mission to address the challenges associated with aging through cross-disciplinary and multilevel approaches. Central aims of aging societies include improving physical fitness and supporting those who are vulnerable, as well as harnessing the human capital represented in healthy mature older citizens.

Substantial progress has been made since the 2008 review, across all subdivisions of BSR. In sharing a few examples of recent research advances in four key areas, the Committee sought to highlight reasons for expecting that the recommendations in this report are poised to be particularly productive.

Understanding the pathways that lead to successful aging

- BSR is leading the nation in understanding the relationships between stress and health by addressing pathways, from genes to HPA-axis and stressful or nurturing environments. In recent years, research with nonhuman primates, coupled with parallel observations from longitudinal epidemiological studies of human populations, shows that early exposure to negative social environments alters bio-mechanistic pathways, which leads to deleterious outcomes for individuals across the life-course.
- BSR supports research aimed at improving health care delivery in the final stages of life to ensure compliance with patient wishes and to help patients and families at the difficult stage near death. Such analyses have examined the effects of advance directives on patient-preferred care delivery and on family reports concerning the overall experience for dying patients.
- Surprisingly large numbers of people are reaching very advanced ages in unprecedented physical and cognitive health, underscoring the potential to create high functioning older populations. Education, strong social ties, social engagement, work, and regular physical exercise are strongly tied to physical and psychological well-being, as well as length of life.
- Successful aging includes meeting the challenges of rising out-of-pocket acute care medical expenses and also long-term care services when needed. BSR has sponsored important research that has shown that, in many cases, out-of-pocket expenditures at the end of life pose large burdens on families of decedents, and that a large fraction of households do not have savings or other assets adequate to support their health care and long-term care needs as household members age.
- Aging is associated with more positive overall emotional well-being, with greater emotional stability, and with more emotional complexity. Positive emotional profiles are associated with longevity.
- Foundational research funded by BSR decades ago revealed that social isolation is as great a risk factor for death as is smoking. In recent years, grantees are making real progress by illuminating the pathways that behavioral, social, and emotional processes come to influence physical health. Similarly, research on subjective states, such as loneliness, is revealing the biological pathways through which persistent emotional states come to affect physical health.

- Age differences in decision quality, long thought to reflect cognitive decline, are increasingly recognized as the outcomes of motivational and experiential differences, such as age-related tendencies to avoid errors and to prioritize emotional satisfaction during the decision process.
- At the macro level, BSR grantees have revealed the potentially causal effects of social networks on obesity and smoking, even when friends are geographically distant. Other research shows that neighborhoods affect health and that relocations can produce long-term improvements in physical health and subjective well-being.

Identifying the pathways most amenable to change

- Individual health behaviors play a significant role in explaining longevity, yet behavior change remains a major challenge. Some of the best BSR research has studied the impact of behavioral “nudges” or conditioned incentives to turn good intentions into actions. Defaults, such as opt-out (as opposed to opt-in) employer-sponsored retirement accounts, for example, increase enrollments dramatically. In several studies, similar types of behavioral interventions have been shown to help reduce obesity and increase the use of effective preventive care such as influenza vaccinations.
- BSR-funded research has also documented the impact of extending health insurance benefits to the previously uninsured. In one randomized study of low-income adults in Oregon selected by lottery to receive Medicaid, the treated group had substantively and statistically significantly higher health care utilization (including primary and preventive care as well as hospitalizations), lower out-of-pocket medical expenditures and medical debt (including fewer bills sent to collection), and better self-reported mental health than the control group. After two years, however, there were no significant differences between the groups with respect to hypertension, high cholesterol levels, and blood sugar control, though the group with Medicaid coverage was less likely to report depression. Recent findings show that Medicaid coverage for low-income persons leads to increases in emergency-department visits for a broad range of conditions, including conditions that might be best treated in primary care settings.
- BSR-funded longitudinal studies have been able to identify distinct trajectories of cognitive decline for healthy individuals and those who will eventually develop Alzheimer’s disease. Furthermore, evidence is building that age-related cognitive decline associated with normal aging can be reduced. Across historical time, rates of cognitive impairment are declining; higher levels of education are associated with better cognitive health. Compelling evidence also suggests that workforce participation and volunteerism benefits cognitive health.

Understanding population aging

- BSR leads the international community in fostering understanding of aging processes at the level of populations, particularly in the context of demographic and epidemiologic transitions as they unfold worldwide, notably macro-level aspects of health, economics, and retirement. Large-scale surveys in multiple countries provide the opportunity to compare populations at the level of entire cultures and frequently allow for natural experiments when new policies and/or programs are put in place.
- Neither access to health care nor population diversity fully explains the relatively poor health of Americans. Even white affluent middle-aged Americans are not as healthy as

their English counterparts. In both countries lower income and education levels are associated with poorer health. Yet Americans in the highest income bracket and with the most education still have rates of diabetes and heart disease similar to the least educated in England.

- Cross-country comparisons suggest that early retirement is associated with poorer cognitive functioning in older people.
- Some diseases are more threatening to financial security (particularly for surviving spouses) than others. One landmark study showed, for example, that dementia represents a financial burden on society that is similar in magnitude to heart disease and cancer.
- Many elderly households retire with very little wealth, despite the considerable risks of out-of-pocket medical expenses later in life. The potential for addressing these high costs have been considered in BSR-sponsored research demonstrating that in some cases advanced directives can be of value in ensuring that patients get only the treatments they want.

Assessing the impact of disadvantaged position in society

- Research has documented that people in disadvantaged positions in society experience poorer health than do advantaged people even when access to health care and education are controlled. Grantees are documenting the extent of these pernicious effects at multiple levels of analysis with the ultimate aim of reducing disparities.
- Chronic discrimination may be directly related to health, particularly cardiovascular function, through elevated serum levels of E-selectin. Similarly, dynamic telomerase activity is associated with exposure to an acute psychological stress.
- In animal studies, social inequalities have important health consequences for low-ranking baboon males. Although low-ranking males exhibit comparable levels of glucocorticoids to that of the alpha male, they appear to be at greater risk of suffering from the immunosuppressive effects of elevated glucocorticoids, because it takes them significantly longer to recover from illnesses and for their wounds to heal.
- Research shows that management of chronic diseases, such as diabetes, in daily life is related more strongly to education than to race or gender. Furthermore, differences may be reduced or eliminated through behavioral training and intensive patient monitoring so that patients better manage their own care.
- In studies of Medicare enrollees with heart attacks, African-American patients were more likely to be admitted to low-quality hospitals than were white patients. Thus efforts to improve the quality of medical care at the lowest-performing hospitals could, at the same time, reduce racial disparities in health outcomes.

V. COMMITTEE FINDINGS

For more than two decades, BSR has supported basic social and behavioral research from a multidisciplinary and multinational perspective, with an eye to ultimately addressing real-world problems. By integrating economics and psychology, and the latest in genetic and biological technology with the power of longitudinal social and behavioral studies, BSR continues to lead the field of behavioral and social research on aging by recognizing potential areas for advancement and capitalizing on strategic collaborative relationships that have multiplied the impact of its investments.

Behavioral and social factors are important contributors to national and international differentials in disease survival and mortality. These include health behaviors, social and economic inequality, social policy, health care, and environmental factors. Of note, BSR-supported research has led to conceptual approaches and interventions that have improved the health of aging individuals, while its insistence on data sharing has fundamentally altered the way that behavioral and social research is conducted around the world (see Section IV, Overview of BSR Research Advances).

The Committee recommends four research areas in particular that merit high-priority support:

- Research that *illuminates the pathways* by which social, psychological, economic, and behavioral factors affect health in middle-aged and older adults. Detailed information on the context of behavior can inform more effective interventions. Toward this end, it is important to collect activity, biomarker, and time use data; identify social and economic endophenotypes¹; and build upon international cohort studies to better understand the context of successful aging and health disparities. It is important to understand the health impact of expanding insurance coverage and quality differences across health systems (particularly as fundamental changes in health care coverage are occurring in the United States); support basic research in cognition, emotion, and motivation and how brain-processing functions change with age; and explicate the role of behavior and biology (including neuroscience and genetics) in mediating the link between stress and disease. There is increasing evidence that social systems are becoming recognized as a key part of the biology of social species. Additional insights are likely to be gained from studies with animal models and from collaborations between researchers working with humans and those working with animal models of complex social behavior; these collaborations often require encouragement to be launched successfully.
- Research aimed at *modifying organizational or individual behaviors* in order to improve important health outcomes at older ages, including examination of the cognitive effects of work and retirement, the basic science of behavior change, and changing environmental defaults to influence health-related aging outcomes. Already this area has generated findings with enormous practical implications. Country comparisons available through harmonized surveys have revealed the role of a longer work-life in maintaining cognitive function. Recent evidence suggests that personality and self-control are relatively enduring individual differences that predict long-term health and mortality. Promising interventions include behavioral treatments, economic incentives, dynamic recursive treatment regimes, and conditioned incentives interventions (e.g., flu shots, retirement savings options) to improve self-regulation and conscientiousness. How older individuals interact with their health care providers in light of the rapidly evolving organization and funding of medical care in the United States is also an important area of study.

¹ Endophenotype is a genetic epidemiology term referring to a measurable biological, behavioral, or cognitive marker that is more often found in individuals with an illness than in the general population. An endophenotype thus stresses the genetic connection in differentiating between potential diagnoses that present with similar symptoms.

- Research *on population aging*, incorporating macro aspects about health, economics, and retirement. BSR has been the major supporter of research on the causes and consequences of changes in social, demographic, economic, and health characteristics of the older population, and this scientific area is increasingly important as the demographic and epidemiologic transitions progress.² Of note, BSR has been a leader in the funding of research by economists on topics of great significance for individual health and well-being, such as decisions and behavior about work, saving, and health care, and also on the effects of incentives and reform in the health and long-term care sectors. BSR has also sponsored important findings on the pause in old-age chronic disability prevalence since the declines of the 1980s and 1990s, and the increases in disability for the current middle-age population. The study of sociology, social demography, and social epidemiology of aging is vitally important for understanding the causes and consequences of societal aging, the dynamics underlying disability trends in the 21st century, and the development of sound social policy. Methodological contributions and insights gained from studies using observational and quasi-experimental data that rely on the variation in social environments and public policy are critical to improving understanding about successful aging, complementing smaller-scale experiments to explicate underlying mechanisms.
- Research that explores *the mechanisms to ameliorate the effects of disadvantage*, including research that focuses on critical periods for reversing such effects and/or the optimal timing of intervention. Many old-age outcomes and behaviors are influenced by events, social relationships, noncognitive character skills, and habits (e.g., retirement savings) that begin relatively early in life. Subgroups of the population experience disadvantage throughout their lives or for extended periods in life (e.g., chronic disability, caregiving) that generate persistent stress. The patterns of stress reactivity appear to hasten the progression of disease. It is therefore important to identify key behavioral and social factors associated with how unfair treatment due to race, ethnicity, socioeconomic status, and gender affect health-related aging outcomes, and to invest in research on the effects of stigma and stereotypes associated with age, race, and ethnicity.

The Committee also recommends a number of cross-cutting actions related to training, data infrastructure, and review that pertain to multiple domains of BSR interest.

BSR should *continue to emphasize the integration of biological, social, and behavioral science*. The advent of cost-effective genotyping strategies will allow BSR to pursue the connection between biology and behavior in many of its longitudinal studies. The Committee recommends that BSR remain mindful of advances in scientific technologies and adopt both short- and long-term strategies for maximizing the data yield from its current cohorts. To strengthen linkages between biology and behavior, the Committee advises BSR to expand its repertoire of phenotypes and endophenotypes, to more fully establish the pathways through

² The demographic transition refers to a change from high birth and death rates, to a stage of high birth rates and low death rates (characterized by a period of rapid growth), and then to a stage of low birth and death rates associated with a stable low growth rate in population. The epidemiologic transition refers to a change from communicable to noncommunicable diseases as the primary sources of ill health as countries develop.

which genes, environments, and behavior interact. In all of these areas, needed replication efforts should be encouraged.

The integration of data from surveys and databases is a significant logistical and financial challenge. BSR has been a leader in *developing infrastructure for data sharing* and should continue to strategically allocate resources devoted to this important effort and demand timely data sharing by grantees. Moving forward, BSR should review on a regular basis its priorities for data collection to ensure the greatest value from its investments and should sunset studies with declining marginal returns. The Committee further endorses BSR's efforts to balance and *integrate or iterate where possible randomized controlled trials (RCTs) with existing observational studies*, to maximize the utility of current studies. Ideally RCTs should be informed by observational data findings, and important pathways found in cohort data should be tested through RCTs.

To improve the development of effective interventions, the Committee recommends that BSR *promote the linkage of "big data."* Efforts to pursue deep phenotyping of some older adult cohorts to better understand mechanisms and pathways linking behavior, environments, biology, and aging outcomes can help improve the development of more effective interventions for behaviors of interest. Measures of time use and in-home sensor-based technologies offer potential for new insights for understanding and designing interventions to promote healthy aging. As more information becomes available at the individual level, it will be necessary to have infrastructure in place that protects the identity of study participants. BSR will need to consider the bioethics of an application that uses significant amounts of personal data.

If the trend of declining real funding continues, then new initiatives in exciting and productive areas will generally require counterbalancing reductions of effort in less promising areas. The Committee acknowledges the need for BSR to curtail funding in areas that do not promise significant advances, or whose early promise has been stymied by measurement, data, or conceptual barriers. Such scrutiny will be needed all the more in coming years. For similar reasons, the Committee endorses BSR's plans to review data infrastructure investments comprehensively, as was done in a 2007 ad hoc review of BSR data priorities.³

VI. REVIEW OF SCIENTIFIC TOPIC AREAS

The subcommittees contributed a large number of recommendations; however, only the top recommendations for each specific topic area are discussed below, as put forth initially by the subcommittees with BSR staff input and as endorsed by or further developed by the Review Committee. Recommendations that apply across multiple content domains (e.g., training, data infrastructure, review) are addressed elsewhere in the report and therefore may not be prominently featured under every topic area below. Fuller descriptions of the subcommittee recommendations are available by request. The number of recommendations or the length of the write-up for these topic areas below is not indicative of the relative importance attributed by the

³ See National Institute on Aging Behavioral and Social Research Program. 2007. *Data Priorities for Behavioral and Social Research on Aging Committee Report*. Available at: http://opasi.nih.gov/eo/documents/Data_Priorities_for_Behavioral_and_Social_Research_on_Aging_05-140_NIA.pdf.

Committee to the different topics. Differences simply reflect the styles of the groups assigned to each topic.

A. Aging Minds

A successful research portfolio on the aging of the mind needs to negotiate between two, at times opposing, demands. On the one hand, the effects of aging and individuals' responses to such effects cannot be fully understood through the lenses of individual scientific subdisciplines alone. NIA/BSR should be commended for stepping up to this challenge by using all available tools (e.g., workshops, training initiatives, special Funding Opportunity Announcements [FOAs]) to establish new and lasting connections between disciplines. On the other hand, the strong emphasis on interdisciplinary/translational research also entails potential pitfalls. Important constructs (e.g., self-control, memory, emotions, conscientiousness) often need to be "handed over" between disciplines in a simplistic, one-dimensional manner. Thereby, critical discipline-specific complexities are easily lost, even though they may be important for understanding the underlying mechanisms and, in the end, for designing appropriate interventions. BSR has realized numerous accomplishments over the past five years in multiple domains of psychological science, including relationships between emotion and cognition as well as behavioral decision-making. It remains very important that BSR's portfolio covers the entire pipeline from basic, discipline-specific research to cross-disciplinary, translational work.

In terms of interdisciplinary efforts, BSR's actions to foster integration between approaches from psychology, neuroscience, and economics have already been a great success. BSR is encouraged to push for even deeper collaboration between psychology and economics. Support of research in behavioral economics and environmental factors has the potential to provide powerful intervention tools to support individual behavior change.⁴ There is promise in exploring the interactions between environmental manipulations and individual differences in noncognitive-character-skills and cognitive function, including how these interactions change over the life course. Other notable and far-reaching successes include BSR's leadership role in a number of trans-NIH initiatives, including the Basic Behavioral and Social Science Opportunity Network (OppNet), the NIH Common Fund program on Science of Behavior Change (SOBC), and other NIA initiatives that support basic research and use-inspired basic research on decision-making, motivation, self-regulation, and the malleability of personality and self-control. This basic research can be leveraged to help conceptualize how interventions to promote adaptive aging can be successful at a local and population level. BSR should also undertake work in the NIH Brain Research through Advancing Innovative Neurotechnologies (BRAIN) initiative or in complementary areas.

BSR should continue to invest in development of new cognitive interventions based on social and behavioral principles and focused on improving everyday functioning. Multimodal interventions with potential to impact multiple outcomes, including cognition and noncognitive-character-skills, are encouraged to include approaches such as nutrition, exercise, social engagement, stress reduction, and meditation.

⁴ See also Section G, Interventions and Behavior Change later in this report.

A particularly important challenge is the further development of measures in critical areas (e.g., well-being, cognition, emotion, self-regulation, economic behavior) that have appropriate psychometric properties and are tied to real-world outcomes. Such a set of core measures of phenotypes related to social and economic behaviors would help unify the diverse approaches to studying self-regulation and decision-making across laboratory, field, and large survey studies, as well as provide a common yardstick for assessing the effectiveness of interventions. This measurement effort will be enhanced by further attempts to identify biological foundations of important social/behavioral and economic phenotypes (e.g., using genetic and neuroimaging analyses).

In addition to the above recommendations, the committee encourages BSR to continue its support for research on subjective well-being and positive psychobiology, to include a focus on the relationship between emotion and brain function in aging, thereby incorporating the contribution of positive psychobiology to trajectories of robust health. BSR is also encouraged to build upon the new Organisation for Economic Co-operation and Development (OECD) report⁵ and the recent BSR-sponsored National Academies report of the panel on measuring subjective well-being in a policy relevant framework.⁶

Finally, building on the initial success in exploring the emotion-cognition relationship, BSR should encourage further research in this area, both in terms of basic research in cognitive and emotional processes in aging populations and around the construct of self-regulation, in order to guide better intervention design.

B. Biosocial and Biobehavioral Research

BSR's efforts over the past five years to promote understanding and appreciation of the relevance of social behavior to biology and health have been notable, and BSR should be commended for its responsiveness to the recommendations made in 2008, particularly with respect to advances in the following areas:

- Identification of social and economic endophenotypes relevant for aging research
- Collection and harmonization of genetic and other molecular data across large-scale, longitudinal cohort studies involving older populations
- Inclusion of positive psychobiology and subjective well-being in promising and new translational interventions
- Development of funding opportunities to support research in biodemography, with applications evaluated in Special Emphasis Panels
- Adaptation of lifespan approaches and increased attention to reversibility of effects in later life stemming from early life adversity, particularly via efforts in the Reversibility Network
- Promote collaborations between researchers who study animals and researchers who study human populations so that trans-NIH efforts in the study of aging-related topics are optimized

⁵ <http://www.oecd.org/statistics/guidelines-on-measuring-subjective-well-being.htm>

⁶ http://www.nap.edu/catalog.php?record_id=18548.

Going forward, BSR is encouraged to expand its portfolio of theoretically driven research on mechanistic and biological links to personal and social behavior by 1) broadening the range of biomeasures to include additional cellular and molecular hallmarks of aging⁷ and 2) identifying important biomarkers to harmonize that are linked to aging-relevant social and behavioral phenomena, including the integration of neuroimaging data (resting state, structural, and functional) in large-scale surveys and laboratory-based studies with representative samples. This could help accelerate the discovery of pathways and developmental time points where changes in social circumstances and behavior could have the largest impact on health and well-being in aging individuals and populations.

Technological and computational developments over the past decade have transformed the nature and amount of data available on the social environment and its influence on aging and its underlying biobehavioral processes. However, with these advancements have come increased subdisciplinary specialization, interests, and conceptual frameworks. Although understandable, this specialization, especially in the context of constrained funding levels, can work against the integration of data across levels of analysis, model systems, and disciplinary expertise. Therefore, BSR is also encouraged to foster interdisciplinary collaborations in the study of aging-related topics to strengthen connections with fields such as evolutionary biology and systems biology.

Correlating health and well-being, or vulnerabilities to health and well-being, with single biomarkers or regions of activation in the brain to determine neural correlates is only a preliminary step toward specifying the responsible mechanisms. Any single biomarker or neuroimaging methodology provides a partial view of brain activity within a very limited range of spatial and temporal levels. The opportunities that derive from expanding the repertoire of biomarkers in large-scale surveys on the one hand and data on brain structures and functions (e.g., resting state and structural neuroimaging) on the other will likely be magnified if attention is also given to related experimental research and animal models to delineate the specific transduction pathways through which the social environment influences health and well-being.

Investigation of the joint and independent influence of biological and social mechanisms will require continued attention by BSR to 1) interdisciplinary, integrative analyses that emphasize interdisciplinary integrations and 2) animal models that are informed by or conducted in tandem with human research both to better specify the mechanisms through which the social world impacts biology and health and to provide greater clarity in the significance and interpretation of the biomarkers and endophenotypes in survey studies.

C. Genetic and Other Molecular Biomarkers in the Study of Behavior

Understanding the contribution of basic biobehavioral and biosocial processes to aging-relevant outcomes increasingly requires efforts by BSR to integrate genetically informative designs and a wide range of molecular methodologies, including measured genotypes, epigenetics, gene expression, and telomere length. Since the last review in 2008, the genetics portfolio has become

⁷ See, for example, López-Otín C, Blasco M A, Partridge L, Serrano M, Kroemer G. 2013. The hallmarks of aging. *Cell* 153, 1194–1217.

an increasingly productive research area within BSR. The genotyping of several longitudinal studies (most notably, the Health and Retirement Study [HRS]) and enhanced efforts at harmonization (including the twin studies that have been the historic strength of the BSR genetics effort) have created rich sources of genetic data. BSR now faces the challenges of leveraging these data resources for future studies, formulating shorter- and longer-term strategies for the adoption of emergent genetic technologies that will best serve BSR-relevant science, and harmonizing measures across countries to facilitate comparative and collaborative research.

BSR can maximize the scientific value and return of existing cohorts by promoting greater sharing and wider use of data; broadening the range of phenotypes sampled and the number of studies with deeper phenotyping; defining key phenotypes that are critical to collect across all studies; and developing better social and behavioral biomarkers and fostering their widespread use in BSR-supported cohorts. Further, BSR should consider genotyping longitudinal studies that currently do not include genetic information. Sample collection in the future could include venous blood and the most relevant and accessible tissue samples, which can enhance the analysis of biological pathways underlying behavioral and social phenotypes. Moreover, harmonization efforts are crucial to increasing the power of analyses of complex behavioral and social phenotypes and the interactions between genes and environments. Harmonization efforts could be facilitated by forging links to genetics community resource projects that have been designed to pool cohort data for analyses of complex behavioral and social traits.

BSR must ensure a balance between the expansion and enhancement of cohort studies and the development of new methods for enhancing interpretation of such data. It must bridge the gaps between genetic studies at the individual and population levels and the gaps between studies focusing on early life experiences versus aging.

BSR should also explore the readiness of the field to pursue study of the microbiome in population context to begin to understand what is “normal.” Particularly in studies where other biomarkers are already being collected, there may be opportunities to analyze the relation of the human genome to the metagenome and microbiome function.

BSR-funded researchers may need additional training in how best to use genetic and other biomarker data for their studies of older populations. In addition, BSR should support method development to optimize the comparison and integration of heterogeneous data sets, both within and across populations. It also should support the development and use of other models, including twin and family studies, well-motivated animal models that are closely tied or integrated with human studies, and tools to exploit the power of longitudinal designs and better address issues of causality.

Contrary to the notion that the molecular processes underlying human aging are fixed across time and situations, there is increasing evidence that changes in the expression of hundreds of genes can occur as a function of the physical and social environments people inhabit, the decisions they make, the relationships they form, and the memories and impressions they leave. Simply stated, social systems are becoming recognized as a key part of the biology of social species. For this reason, BSR is in a position to lead mechanistic studies on the mutual influences between genes and the social environment across the lifespan and on the potential reversibility of deleterious social influences on health and well-being.

D. Health Care Systems and the Burden of Illness

BSR's work in this area spans a broad range of valuable and appropriate topics. BSR has and should maintain an active role in this field, as the dynamic changes in the U.S. health care system present unique opportunities for understanding health and aging on an individual and population level. In particular, BSR's efforts to improve estimates and projections of the burden of dementia for families, health care finance, and society are critical to measuring progress in addressing the challenges facing people with Alzheimer's disease and their families as outlined in the National Plan to Address Alzheimer's Disease.⁸ In particular, BSR can offer a unique perspective on initiatives such as the Patient-Centered Medical Home, the effects of changes (recent or potential) in organization and financing of the long-term care system (residential and community-based) on the nation's ability to cope with the expected dramatic rise in dementia, and how these initiatives affect health-related aging outcomes. Comorbidity is another area where the science is challenging but the potential returns considerable. A great deal is known separately about frailty, diet, well-being, and various social, economic, and pharmaceutical interventions, but the complications of multiple conditions and multiple interventions are demanding of new insights and explanations.

Key recommendations for future research are three-fold. First, BSR priorities should include a focus on the determinants of health care innovation. Specifically, BSR priorities could include understanding the ways in which various factors such as public health policies and other public investments and market forces affect the rate of innovation, and how different types of innovation affect patient health and well-being. Second, BSR should consider a systematic study of patient preferences, for example the extent to which well-informed people want more- versus less-intensive therapies. Finally, BSR should support research that examines the many changes in the health care system that are occurring or are about to occur for older adults, including Medicaid expansion, the introduction of Patient-Centered Medical Homes, and the diffusion of Accountable Care Organizations.

E. Health, Work, and Retirement

Financial and familial resources are important for later life health and well-being. Extending paid and unpaid working life is the subject of keen interest in the United States as well as several European countries. While BSR makes important contributions to understanding successful aging during work and retirement, the program needs to crystallize the mechanisms that link work, wealth, and retirement to health and the NIH mission. Program descriptions should also show how findings led to changes in practice or to new areas and should broadly focus on social and behavioral research as opposed to a narrow focus on economics. Understanding how a country's changing demographic structure influences health-related aging outcomes on a population and individual level, and how differences in education and other variables (public programs, prices and rates of return, wages across the age distribution, etc.) contribute to individual and population-based differences in economic and health outcomes in later life, is critical for informing the design of national policies and can have global consequences.

⁸ <http://aspe.hhs.gov/daltcp/napa/natlplan.shtml>

In addition to studying macroeconomic consequences of population aging on health outcomes, BSR should continue to support research on interventions to extend the work life and promote health. Understanding workplace qualities and policies that promote health and support work into older ages as well as how work can finance health and long-term care is critical to successful aging at the population and individual levels. BSR should consider supporting evaluation of natural experiments across states and countries to identify how differences in the economic environment (pensions, taxes, unemployment, labor force composition, etc.) influence health and work.

The effects in later life of earlier life events such as low income and other economic shocks such as unemployment of parents appear to be much stronger during the childhood years than in any other stage of life. BSR should continue to support the linkage of data from early life to later life in a variety of ways, including:

- Linking the major BSR panels with a variety of administrative sources on health and behavior.
- Collecting retrospective life history health, socioeconomic status (SES), and family circumstances data in the major aging data sets it currently supports.
- Investing in data sources that were collected decades ago that contain high-quality information on early life collected contemporaneously. For example, Project Talent collected unique and high-quality data on cognition and many other psychological characteristics when some 400,000 participants were in high school in the early 1960s.
- Consider adopting existing panels such as NLSY79 when they age into the older adult age range. It is important when such transfers take place that the content of the survey be adapted where necessary to the research concerns of an aging population.

Recent evidence that links retirement to cognition is closely connected with the work on social engagement and cognition. Although the findings are intriguing, there is very limited understanding of the mechanisms that may link engagement in the paid labor force to cognitive decline or health. Furthermore, it is unclear whether similar experiences that may be paid or unpaid (such as volunteering) may substitute for each other. Additional investments, such as occupational cohorts and cross-country comparisons, are likely to produce important insights into the processes by which labor force participation and retirement policies affect health and cognition, and into managing health and independence in retirement.

Well-being in retirement depends critically on health and on assets (non-annuity assets in particular, but also income). Non-annuity assets are especially important because these assets are used to insure against the risk of large out-of-pocket medical expenditures as well as other health services, like home care, that often accompany poor health. Understanding how people accumulate assets or comparable financial security, as well as the level of assets needed to insure against risks in old-age (long-term care, out-of-pocket and premium costs, etc.), should be a BSR priority.

Additional research is needed to understand how education and technology affect older workers on an individual, population, and public policy level. BSR should investigate ways to facilitate longer working lives, including improving work environments to attract older workers, understanding how provisions of social security facilitate longer working lives, exploring

arrangements that would facilitate hiring of older workers, and supporting research that seeks to understand the pathways through which education produces health and affects asset accumulation.

F. Sociology, Social Demography, and Social Epidemiology of Aging

The aging of the U.S. population is occurring at a time of major economic and social changes, especially changes in the social context in which older individuals and families function. These may well affect the nature of key social relationships and institutions that define the environment for older persons. BSR has been a leader in promoting the study of the consequences of population aging, and this research tradition is especially needed at this stage of the world's demographic transition. In 2010-2011, BSR commissioned the National Research Council's (NRC's) Committee on Population to consider how to better apply the array of tools, analytic approaches, and theoretical perspectives of sociological research to the study of aging. The panel prepared a consensus report with commissioned papers, *The Future of the Sociology of Aging: An Agenda for Action*, which was published late in 2013.⁹

The Committee recommends that BSR encourage greater interaction between theorists and empiricists to address important questions related to aging populations and foster cross-linkages across existing networks of researchers. Two areas that deserve more attention in the sociology portfolio include the development of frameworks for standardizing the approach that social and behavioral science takes in assessing issues associated with an aging population, and creating the intellectual basis for the development of cross-disciplinary metrics. The Committee sees the development of such metrics as an important opportunity for BSR.

BSR should think broadly about combining types of data, including administrative data, information from social networking, environmental data, and data from behavioral and/or social interventions and their evaluation. Longitudinal surveys of young adults might be combined in some way with surveys of older adults, data earlier in life could be enriched with information at older ages, and studies could include multiple generations. Although cost and privacy issues are a concern for survey sampling within families, the Committee encourages BSR to explore such sample designs. Families provide networks of help and support, often share living arrangements, and have a long-standing and committed interest in the well-being of their aging members. The role of men in families is particularly understudied given its importance for health and well-being of family members at older ages.

As a first step, BSR should consider holding meetings or workshops on the challenges of designing surveys that include families. These might be organized by BSR or through the NRC. Some attention to the development of theoretical and conceptual models of families would lay the groundwork for these efforts. These workshops should identify and specify core and elaborated measures of families such as their structure, functioning, relationships, networks,

⁹ National Research Council. 2013. *The Future of the Sociology of Aging: An Agenda for Action*. Panel on New Directions in Social Demography, Social Epidemiology, and the Sociology of Aging. Committee on Population, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press. See: http://www.nap.edu/catalog.php?record_id=18508.

contact, location, living arrangements, transfers, caregiving, and neglect and mistreatment. Definitions and measurement are key. The development of a portfolio of family measures that could be used across studies across disciplines would be invaluable. Study of the culture of older populations, including of the community at large with respect to the treatment of older adults, could benefit from increased collaborations involving anthropologists.

G. Interventions and Behavior Change

In response to the 2008 review, the primary BSR action has been to augment research funding in the area of behavioral economics and expand the diversity of portfolio holdings in the area of cognitive and non-cognitive character-skill interventions that ultimately benefit aging adults. In spearheading the White House conference in May 2013 on Psychological Science and Behavioral Economics in the Service of Public Policy, BSR successfully highlighted the potential for enormous return on investment from harnessing basic and translational research on behavior change to benefit the health and well-being of all older Americans.¹⁰ This effort helped to catalyze the formation of a White House team at the intersection of psychology and economics to inform policy making with approaches based on studies of human behavior. BSR has assumed a leading role in the support of research on long-term intervention outcomes for older populations and should be encouraged to continue with these efforts.

In the past decade, research has shown that some kinds of behavior change interventions can be highly effective, nearly costless, and scalable. Such successful interventions based on principles of behavioral economics align people's actions with their good intentions by making it easy for people to embrace socially desirable behaviors that they already want to pursue in the domains of health, medical adherence, exercise, nutrition, and saving. The Committee recommends continuing BSR's critical and cost-effective leadership in these areas, and expanding this portfolio to new applications, including interventions that target social isolation, loneliness, education, cognition, non-cognitive character-skills, and volunteerism in older adults.

To improve the efficacy of these efforts, the committee recommends continuing improvements in study design, including the use of randomized control trials as well as less expensive "natural experiments" and other well-identified observational designs (e.g., estimating structural models with non-experimental data). Intervention designs should be aligned with basic research questions and employ powerful analytic strategies. Researchers should adopt innovative measurement techniques, including the development of massive existing data sources (information obtained from automated/mechanical systems), dynamic recursive treatment regimes, as well as physiological activity sensors and measurements of brain health. Researchers should strive to harmonize measurements across different interventions, so outcomes can be meaningfully compared. In addition, unbundling components in alternative intervention streams can be effective in identifying what features of the intervention are important.

¹⁰ Keller-Allen C, Li R. July 2013. *Psychological Science and Behavioral Economics in the Service of Public Policy*. Summary of a meeting held May 22, 2013, Washington, DC. Co-sponsored by the White House Office of Science and Technology Policy, White House Council of Economic Advisers, Association for Psychological Science, and the National Institute on Aging. Available at: http://www.nia.nih.gov/sites/default/files/psychological_science_and_behavioral_economics.pdf.

BSR should encourage the creation of national and international public-private partnerships and other innovative collaborations to access untapped resources in workplaces, hospitals, foundations, and the military. For example, BSR could promote research that would explore the role of volunteerism as a specific intervention tool in these research areas. Given the differences of these settings from conventional laboratory or clinic settings, BSR should consider the kinds of training, including immersive experiences, that researchers may need to be able to take advantage of such resources.

New trial designs may be able to integrate targeted randomized intervention trials into long-term observational studies; there are risks involved as well but the possibilities should be explored. Research should also include long-term follow-up to determine whether behavior change is sustained. Furthermore, researchers should use state-of-the-art statistical methods to guard against high rates of false positives, for example by reporting all hypothesized test results (and not just those with favorable results) and the use of appropriate tests for multiple hypotheses.

H. Health Disparities

BSR has been the major NIH contributor in developing the research infrastructure to promote the study of health disparities in aging populations. Three recent reports by the National Academies, all of which were commissioned in whole or part by BSR, have been instrumental in calling attention to indications of poorer health status and lower life expectancy in the United States relative to countries of comparable income and in meticulously reviewing the evidence to understand the reasons for these outcomes, which occur despite U.S. advantages in wealth and health care spending.¹¹ The NIA's investment in large-scale longitudinal studies (e.g., the Health and Retirement Study, English Longitudinal Study of Ageing, Survey of Health, Aging and Retirement in Europe) has allowed for health disparities research that is simply not possible with cross-sectional studies. BSR's health disparities portfolio has generated several high-impact findings and publications related to racial and ethnic disparities, SES, and geographic/neighborhood differences.

The Committee recommends foremost that BSR encourages bold intervention strategies that are informed by well-conceived hypotheses or conceptual models and that address the increasing societal burden of health disparities at older ages. BSR should continue to emphasize a life course approach, and it should support research that considers a wide range of causal mechanisms, including discriminatory treatment, education, and poor health behaviors. Changes in Medicaid that differ across states offer potential natural experiments that can be exploited for disparities research as well.

BSR should also continue to invest in the development of data infrastructure and training to promote research in disparities at older ages. It should make greater efforts to include population

¹¹ National Research Council. 2011. *Explaining International Differences in Mortality at Older Ages: Dimensions and Sources*. Washington, DC: National Academies Press.

National Research Council. 2011. *International Differences in Mortality at Older Ages: Dimensions and Sources*. Washington, DC: The National Academies Press.

National Research Council. 2013. *U.S. Health in International Perspective: Shorter Lives, Poorer Health*. Washington, DC: The National Academies Press.

survey content about issues salient for specific minority populations especially in light of the new minority supplemental samples in surveys such as the HRS. Although there is some evidence that diversity supplements and the Resource Centers for Minority Aging Research (RCMAR) program enhance career development for minority participants, prospective data about award recipients would be useful to ascertain the success of such mechanisms.

The Committee also endorses six additional areas related to health disparities research proposed by BSR for greater emphases: 1) Mutability/reversibility of risk factors, including the contribution of medical interventions; 2) Health and long-term care systems; 3) Stigma; 4) Regional variations in health and life expectancy (e.g., revisiting Eight Americas¹²), with greater attention to behavioral histories; 5) Racial and ethnic differences in NIH research awards; and 6) Education and health, particularly understanding causality.

BSR's commitment to infrastructure development and training in the area of health disparities is evidenced by its leadership and support of efforts like the RCMAR program. As disparities in health outcomes widen despite overall improvements in health in the United States, the field of health disparities is and should remain a top research priority moving forward.

I. International Research

BSR has been a driving force in the investigation of aging and health outcomes in the international arena. The rapid demographic, epidemiologic, and risk-factor transitions in the United States and around the world make this an opportune time to invest in cross-national comparative research on the health and well-being of older adults and their determinants. There is an outstanding opportunity to undertake systematic comparative and collaborative research, for example in the areas of extending work life, or the social sources of dementia and harmonizing measures across countries and studies.

The NIA is committed to improving health and aging-related outcomes both nationally and internationally. Research on chronic diseases and the health of older adults is important in order to understand the growing global burden due to these conditions, as well as understanding better the specific challenges of aging in the United States.

The Committee recommends a number of steps that BSR can take to further strengthen its international activities:

- **Foster cross-national comparative research on aging to exploit different policy and social environments.** It is important to evaluate how the economic recession, striking different countries with varying timing and severity, has affected work, health, and wealth interactions at older ages. BSR should encourage research on aging and the changing burden of disease in low- and middle-income countries and should invest in the collection of contextual data to realize the full value of microdata for comparative studies

¹² Murray CJL, Kulkarni SC, Michaud C, Tomijima N, Bulzacchelli MT, et al. 2006. Eight Americas: Investigating mortality disparities across races, counties, and race-counties in the United States. *PLoS Med* 3(9): e260. Doi:10.1371/journal.pmed.0030260.

in health and long-term care, retirement and disability, and other key areas. The December 2013 G8 dementia summit in London provided an opportunity to review the UK Economic and Social Research Council (ESRC)–commissioned research investment on the social science of the dementias, and to stimulate greater investment and innovation in international dementia research efforts.

- **Promote studies of new technologies for data collection that may overcome some current challenges to comparability.** For example, actigraphy, a non-invasive approach to measuring physical activity and sleep, is one example that has shown considerable promise. BSR should also improve standardization in the collection and analysis of biomarkers from body fluids and tissues and performance measures and should investigate comparable measures of time use and well-being across diverse settings involving older adults. Microbiome studies may also lend themselves to useful international contrasts.
- **Set priorities among proposed expansions (the number of countries in which longitudinal studies are funded, the size of samples, and frequency of measurement in existing studies).** Artificial limits should not be imposed on the number of studies per country; scientific opportunity should drive the choices. BSR should balance efforts to ensure that host countries have developed the scientific infrastructure to perform rigorous studies of the aging population relative to subsidizing the direct collection of data in those countries. This will ensure that the costs of collaborative efforts will yield the greatest scientific return in comparisons of aging processes and policies across countries. Added attention should be given to studies in countries that serve as the places of origin for U.S. immigrants because these populations are vital for understanding demographic differences in health and aging in the United States. BSR should also continue its leadership on data sharing by strongly encouraging public release of data collected by NIA-supported projects.

VII. TRAINING

The Committee strongly encourages BSR to *support training of researchers who pursue innovative, cross-disciplinary research*. BSR understands the critical need to sustain a research workforce that is multidisciplinary and diverse, at both junior and senior levels. In particular, scientists will need skills that can cut across multiple scientific disciplines. The Committee recommends that BSR consider several approaches for attracting the brightest young researchers to study age-related issues and train them in the required skills for a multidisciplinary career.

One approach is to develop short-term intensive workshops with researchers from different disciplines centered on a common research question or methodology. Workshops were overwhelmingly recommended as a method to increase multidisciplinary knowledge, as well as forge collaborations between, for example, biological and behavioral scientists. Specific examples of potential workshop topics include the identification of behavioral phenotypes and endophenotypes to elucidate biological pathways involved in behavior; a state-of-the-science workshop to address known factors contributing to health disparities; the role of education in the reversibility of health disparities; best practices for sample and survey methodology, data

collection, and data archiving; and an intensive course on genetic applications to social science (and vice versa).

Another approach is to encourage the use of the T32 mechanism to encourage cross discipline training (e.g., MD/PhD or dual PhDs) and the use of the F32 mechanism to facilitate mentoring of recent PhD graduates. Additional approaches include increasing the flexibility of timing of and percentages of effort on K awards, as well as increasing the visibility of diversity supplements and other award mechanisms through the NIA blog and communications from program officers.

VIII. GRANT APPLICATION REVIEW PROCESS

The development of “big data” and scientists’ ability to access data from multiple sources has contributed to the large interdisciplinary nature of research. This shift in the production of cutting-edge knowledge has been documented in all fields of scholarly activity, ranging from physical and biological sciences to the social and behavioral sciences. BSR has been and continues to be a world leader in the use of interdisciplinary research on fundamental questions of aging. The NIH grant application review process has not adequately addressed the nature and requirements of interdisciplinary research, which require multidisciplinary reviewers.

The trend toward and value of interdisciplinary science show no sign of abating, so continued attention to the issues of peer review is critically important. BSR is encouraged to work with scientific review staff to explore innovative review processes for interdisciplinary research bridging fields of interest, including genetics, interventions, economics, behavior, and disparities. Cross-disciplinary research efforts are enhanced by a grant review apparatus that matches the changing landscape and can provide longer-term continuity, for example by establishing repeat submission dates and continuation grants in interdisciplinary areas that fall between traditional review panels.

In addition, BSR should advocate for special review panels for data infrastructure projects, including archiving and continuation of longitudinal studies that are essential building blocks for pathbreaking research, but that often score poorly on innovation in regular review panels.

IX. DATA INFRASTRUCTURE

A robust data infrastructure is critical to stimulating new hypotheses. Developments in technology and data collection have resulted in an explosion of available data in the past 50 years. Although complex and challenging, BSR should support research exploiting truly “big data” (e.g., social media or cell-phone connections, comprehensive claims and health-system data) and should continue to facilitate linkages and harmonization among data sets to obtain maximum value from cohort studies.¹³ For both types of data (linked cohorts and passively collected big data), privacy and confidentiality issues are important, and BSR should be commended for sponsoring a series of NAS workshops on these issues.

¹³ The HRS and BSR are to be commended for recently accomplishing data linkages between the HRS and data from the Department of Veterans Affairs.

Survey data are rich resources for scientists, holding great promise for potentially novel insights, yet pose unique and significant hazards. For example, the linkage of data from surveys and other databases requires that data resources are standardized across multiple levels so that outcomes can be meaningfully compared. This standardization includes harmonization of measures, such as survey questions, biomarkers, and genetic tools. Identification of valid phenotypes and endophenotypes is required for researchers to consistently and effectively make use of these vast data resources. This data distribution effort will undoubtedly require significant time and financial resources that must be strategically allocated, but BSR's exceptional international orientation can make a difference.

In addition to primary data from population surveys, BSR has supported data sources from agencies such as the Centers for Medicare and Medicaid Services, Social Security Administration, National Center for Health Statistics, Veterans Health Administration, and the Bureau of Labor Statistics. Additional data sources that hold great scientific promise are 1) large clinical trials with behavioral variables such as care adherence and quality-of-life dimensions; 2) electronic clinical records that contain routinely collected selected behavioral variables; 3) long-term military and veterans records that contain a wealth of social, economic, and health variables; 4) documented economic behaviors from commercial data sets of fiscal transactions; 5) social media data; and 6) institutional and related social data on younger persons that are likely to reflect and presage important effects on the trajectories of aging.

The Committee agrees that requirements for data sharing should be in place and enforced. In addition, BSR should give adequate consideration to desired overlap and prioritization of data collection by requiring that applicants state what data sources exist, make the case why these are insufficient, and promise availability of new data for subsequent researchers. BSR should periodically review all ongoing efforts and should sunset studies that have reached their goals and are no longer state of the art.

An update of the November 2007 Report by the Data Priorities for Behavioral and Social Research on Aging Committee would be timely.¹⁴ A working group comprised primarily of members of the 2006-2007 Committee on Data Priorities for Behavioral and Social Research on Aging convened in December 2013 to suggest future directions for evaluating data priorities over the next decade. The working group expressed enthusiasm for the extent to which the priorities identified in 2006 have been implemented by the NIA and congratulated BSR staff on developing a strong and innovative portfolio of large ongoing studies addressing the critical needs of the aging U.S. and international populations. Important insights into the determinants and consequences of population aging and aging societies have resulted from these investments. The working group recognized the need in the coming years to safeguard the integrity of many of these studies while simultaneously conducting a rigorous evaluation of them, including their scientific contributions, alignment with new research priorities, and cost-effectiveness. The Committee recommends that BSR move forward with a new review of its data priorities to help

¹⁴ See National Institute on Aging Behavioral and Social Research Program. 2007. *Data Priorities for Behavioral and Social Research on Aging Committee Report*. Available at: http://opasi.nih.gov/eo/documents/Data_Priorities_for_Behavioral_and_Social_Research_on_Aging_05-140_NIA.pdf.

guide decisions in the coming decade. Evaluating all of these studies will take time. With Council advice, BSR can develop ways of prioritizing data infrastructure projects.

X. STAFF COLLABORATIONS

The Committee commends BSR on its diverse and fruitful collaborations at multiple levels (within the NIA, within the NIH, with other Federal agencies, and with national and international organizations). The Committee endorses the principle that the NIA should partner with relevant NIH Institutes and Centers (e.g., *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, National Institute of Mental Health, National Institute on Drug Abuse), other Federal agencies (e.g., the Department of Labor and the Department of Defense), and other organizations wherever it is deemed appropriate, relevant, and financially justifiable. As examples, infrastructure for individual studies and for the harmonization of analyses across cohorts must be supported.

The scientific and cofunding benefits of successful collaboration are evident. However, the staff cost of collaboration, in both time and skill, is considerable with possible diversion from BSR priorities. Given the number of current collaborations within BSR and future budgetary constraints, BSR must carefully evaluate the possible gains against the costs of beginning new collaborative efforts.

XI. STAFFING

BSR is distinguished by the outstanding quality of its leadership, particularly in the face of budget decreases and staff departures. Dr. Suzman is highly respected as a scientist and is a rigorous proponent of high-quality behavioral and social research. He has assembled a stellar team, which has clearly contributed to growth in topic areas critical to BSR. BSR leadership and staff have continued to function at a top level, bringing new and innovative ideas to the BSR portfolio. Recruitment of new staff to fill vacant positions is a top priority for BSR in order to maintain the high quality of research programming that has been the standard of this Division.

BSR staff has remained committed to the quality and integrity of their research portfolio in the face of a diminished work force, as well as reduced and uncertain funding streams. The Committee commends the leadership of the Division and NIA for continuing to push the innovative boundaries of research in aging.

XII. CONCLUSION

BSR has been a world leader in cross-cutting research into the mechanisms of successful aging and continues to be a thought leader in health-related aging outcomes. It has been most proactive in engaging internationally on issues such as reversibility and measurement of well-being, as well as health and retirement. It has and continues to be a model for the NIH and other agencies, both inside and outside the United States, for interdisciplinary research, investment in data resources, and innovative research approaches at the national and international levels. Technological advances coupled with strategic planning put BSR in a prime position to continue its significant contributions to the public health of an aging world population.

The Division's activities in response to the 2008 Review demonstrate outstanding progress in the continuation and support of interdisciplinary research across multiple disciplines that impact health-related aging outcomes. Multilevel analyses of aging require a range of expertise that is not likely to be found in solitary investigators. While multidisciplinary research is characterized by the aggregation of expertise, interdisciplinary research is defined by synergies among experts that can transform both science and scientists. BSR has played a key role in stimulating such efforts, but funding constraints represent new challenges to doing so in the foreseeable future. Moreover, the challenges of understanding and measuring the multiple pathways affecting health and well-being have stymied research in the past, but increases in computational speed and capacities are increasingly simplifying the problem of addressing questions across levels of organization that involve large data sets, complex mappings, and/or previously computationally prohibitive simulations or analyses. Continued attention by BSR to interdisciplinary, integrative efforts may be especially important in the coming decade.

BSR's success can be attributed in large part to its unwavering commitment to integrative research, the high caliber of its staff, and the consistently strong support of NIA leadership. BSR staff have been exceptionally successful in establishing two-way communication with scientists in the field. Despite budgetary constraints, this has allowed them to respond to new challenges and developments in a nimble and effective manner.

The importance of behavioral and social research for the public health of an aging population needs to be reinforced at every opportunity. Maintaining research momentum in these critical areas will provide a return on investment in the improved health of a nation.

APPENDIX I: BACKGROUND DOCUMENTS PROVIDED TO COMMITTEE

All materials provided to Committee members were posted on a password-protected Web site so that reviewers could access them at their leisure.

In advance of the June 5, 2013, teleconference:

- 1) June 5, 2013, teleconference agenda
- 2) Three-page letter from Dr. Richard Suzman outlining the goals of the review and the proposed timeline, May 30, 2013
- 3) Roster of Review Committee members (rev. June 5, 2013)
- 4) BSR Memos (rev. May 29, 2013) on the following topics:
 - a. Health Disparities
 - b. Health Economics of Aging
 - c. Aging Minds
 - d. Biosocial and Biobehavioral Research
 - e. Behavior Change and Interventions
 - f. Volunteering and Social Engagement
 - g. Social Environment
 - h. Collaborations
- 5) BSR program brochure (updated January 24, 2013)
- 6) BSR organizational chart (May 29, 2013)
- 7) NIA organizational charts (April 8, 2008)
- 8) 2008 BSR Review Committee Report (rev. November 18, 2008)
- 9) BSR Subcommittee Reports, September 2008
- 10) RLA Policy Guidelines for Conflict of Interest, Composition and Balance (Bias), Confidentiality, Non-Disclosure, and Lobbying Practices (for non-Council members)

In advance of or in conjunction with the August 9, 2013, teleconference:

- 1) August 9, 2013, teleconference agenda
- 2) Notes from June 5, 2013, Committee teleconference
- 3) BSR Review Committee and Subcommittee Meetings Schedule and Participants (rev. August 2, 2013)
- 4) 2008 BSR Review Committee Report (rev. November 18, 2008)
- 5) BSR organizational chart (updated July 26, 2013)
- 6) New BSR grants, competing continuations, and supplements funded FY2008-2013
- 7) BSR Research Training and Career Development Awards, 2008-2013
- 8) List of BSR Training (T32) Grants Active in July 2013
- 9) BSR Memo: Recent changes to the Roybal Centers (P30) Program (prepared July 30, 2013)
- 10) Links to NIH [career development \(K\)](#), [fellowship \(F\)](#), and [training \(T\)](#) awards, and the link to the [NIA page on research training and career awards](#)

In advance of the September 15-16, 2013, meeting in Bethesda:

- 1) September 15-16, 2013, meeting agenda
- 2) Updated Committee roster (rev. September 11, 2013)
- 3) Notes from August 9, 2013, Committee teleconference
- 4) Notes from June 5, 2013, Committee teleconference

- 5) BSR Organizational Chart (rev. July 26, 2013)
- 6) BSR Background Briefs on the following topics:
 - a. BSR Memo 01 Health disparities (rev. August 20, 2013)
 - b. BSR Memo 03 Aging Minds including questions for subcommittee (rev. August 19, 2013)
 - c. BSR Memo 04 Biosocial and Biobehavioral Research including questions for subcommittee (rev. August 21, 2013)
 - d. BSR Memo 05A Interventions and Behavior Change (rev. August 26, 2013)
 - e. BSR Memo 05B Interventions to Increase Social Engagement (rev. August 26, 2013)
 - f. BSR Memo 07 Collaborations (rev. September 11, 2013)
 - g. BSR Memo 08 Sociology, Social Demography, and Social Epidemiology of Aging (rev. August 30, 2013)
 - h. BSR Memo 09 Roybal RFA changes (rev. July 30, 2013)
 - i. BSR Memo 10 Research training career development 2008-2013 including T32s (rev. September 4, 2013)
 - j. BSR Memo 11 International Research on Aging (rev. August 8, 2013)
 - k. BSR Memo 12 Health, Work, and Retirement (rev. August 24, 2013)
 - l. BSR Memo 13 Burden of Illness and Health Care Systems (rev. August 23, 2013)
 - m. BSR Memo 14 Genetics (rev. August 29, 2013)
- 7) DRAFT Subcommittee Reports
 - a. REPORT International Research on Aging (rev. September 10, 2013)
 - b. REPORT Burden of Illness and Efficiency of Health Systems (rev. September 10, 2013)
 - c. REPORT Aging Minds (rev. September 11, 2013)
 - d. REPORT Biosocial and Biobehavioral Research (rev. September 11, 2013)
 - e. REPORT Genetics of Aging (rev. September 11, 2013)
 - f. REPORT Health, Work, Retirement (rev. September 11, 2013)
 - g. REPORT Sociology, Social Demography, and Social Epidemiology of Aging (September 11, 2013)
 - h. REPORT Interventions and Behavior Change (rev. September 11, 2013)
 - i. REPORT Health Disparities (rev. September 12, 2013)
- 8) Draft Appendix I to Report: Background Documents Provided to Committee (Rev. September 13, 2013)
- 9) Draft Appendix II to Report: Subcommittee Meeting Dates and Participants (Rev. September 11, 2013)
- 10) Embargoed copy of National Research Council. 2013. *The Future of the Sociology of Aging: An Agenda for Action*. Panel on New Directions in Social Demography, Social Epidemiology, and the Sociology of Aging. Committee on Population, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

In advance of the January 6, 2014, teleconference:

- 1) Draft Committee report
- 2) Link to the final version of National Research Council. 2013. *The Future of the Sociology of Aging: An Agenda for Action*.

APPENDIX II: SUBCOMMITTEE MEETING DATES AND PARTICIPANTS

Subcommittee topic area	Call date and time (ET)	NIA staff (lead in bold)	Participants (Chair in bold) *Full Committee member; <u>Council member</u> ; ^written input provided
International Research on Aging	Aug 16 (Fri) 1-2:30 pm	Bhattacharyya , Akbar, Haaga, Phillips, Suzman	Arie Kapteyn , * <u>Lisa Berkman</u> , Somnath Chatterji, Eileen Crimmins, Angus Deaton, * <u>Eliseo Perez-Stable</u> , *James P. Smith, Andrew Steptoe, Arthur Stone, David Weir, *David Wise
Aging Minds	Aug 21 (Wed) 12:30-2 pm	Nielsen , King, Akbar, Bhattacharyya, Gerald, Haaga, Harris, Neil, Patmios, Phillips, Suzman	Ulrich Mayr , * <u>Norman Anderson</u> , * <u>Laura Carstensen</u> , Jacqui Eccles, Elissa Epel, James Gross, Sarah Hampson, ^James Heckman, Eric Johnson, Arthur Kramer, David Laibson, ^Mara Mather, Brent Roberts, Martin Sliwinski, Arthur Stone, *Robert Wallace, Robert Willis
Biosocial and Biobehavioral Research	Aug 22 (Thu) 11:30 am-1 pm	Gerald , Nielsen, Haaga, Harris, King, Patmios, Suzman	* John Cacioppo , * <u>Kimberly Acquaviva</u> , Jeanne Altmann, * <u>Norman Anderson</u> , John Capitanio, James Carey, Elissa Epel, Hillard Kaplan, Robert Levenson, Mara Mather, Bruce McEwen, ^Terrie Moffitt, Andrew Steptoe, ^James Vaupel, *Robert Wallace
Burden of Illness & Efficiency of Health Systems	Aug 29 (Thu) 4-5:30 pm	Baker , Bhattacharyya, Haaga, Patmios, Phillips, Suzman	Michael Chernew , Kate Baicker, Amy Finkelstein, Dana Goldman, Michael Hurd, Daniel Kessler, Vince Mor, Joseph Newhouse, * <u>Eliseo Perez-Stable</u> , * <u>Jon Skinner</u> , * <u>Terrie Wetle</u>
Health, Work, and Retirement	Aug 30 (Fri) 1:30-3 pm	Phillips , Bhattacharyya, Akbar, Haaga, Nielsen, Patmios, Suzman	Kathleen McGarry , James Banks, * <u>Lisa Berkman</u> , * <u>Laura Carstensen</u> , *Myron Gutmann, *Robert Hauser, David Laibson, Phyllis Moen, * <u>Jon Skinner</u> , *James Smith, Robert Willis, *David Wise
Genetics of Aging	Sep 3 (Tue) 11:30 am-1 pm	King , Gerald, Akbar, Haaga, Harris, Nielsen, Patmios, Torrey, Suzman	* John Cacioppo , ^Goncalo Abecasis, Jason Boardman, ^Steve Cole, ^Maria Glymour, John Hobcraft, Sharon Kardia, Steve Manuck, Matt McGue, ^Terrie Moffitt, Nancy Pederson, ^Chandra Reynolds, ^Peter Visscher
Sociology, Social Demography, and Social Epidemiology of Aging	Sep 3 (Tue) 2-3:30 pm	Patmios , Haaga, Gerald, King, Nielsen, Suzman	* Linda Waite , * <u>Lisa Berkman</u> , Nicholas Christakis, Vicki Freedman, *James Jackson, *Ron Lee, Hillard Kaplan, Teresa Seeman
Interventions and Behavior Change	Sep 4 (Wed) 8-9:30 am	King , Haaga, Bhattacharyya, Nielsen, Patmios, Suzman	David Laibson , * <u>Norman Anderson</u> , Kate Baicker, * <u>Lisa Berkman</u> , Nicholas Christakis, Sara Czaja, ^James Heckman, Arthur Kramer, ^Jens Ludwig, George Rebok, Matt Rizzo, Erwin Tan, Kevin Volpp
Health Disparities	Sep 9 (Mon) 3-4:30 pm	Phillips , Nielsen, Haaga, Patmios, Suzman, Bernard, Hill	* James Smith , * <u>Norman Anderson</u> , Eileen Crimmins, Jose Escarce, *James Jackson, Becca Levy, Bruce McEwen, * <u>Eliseo Perez-Stable</u> , Samuel Preston, George Rebok, * <u>Jon Skinner</u> , *Linda Waite, * <u>Terrie Wetle</u>