

# Integration of Behavioral and Social Sciences Research at the National Institutes of Health (NIH)

## NIH Council of Councils Working Group Report



## Working Group Members

Paul J. Kenny, Ph.D., *Co-Chair*, Icahn School of Medicine at Mount Sinai

Christine Hunter, Ph.D., ABPP, *Co-Chair*, National Institutes of Health

Ritu Agarwal, Ph.D., University of Maryland

Lourdes Baezconde-Garbanati, Ph.D., M.P.H., University of Southern California

Lisa L. Barnes, Ph.D., Rush University Medical Center

Karen Glanz, Ph.D., M.P.H., University of Pennsylvania

Penny Gordon-Larsen, Ph.D., The University of North Carolina at Chapel Hill

Richard Krugman, M.D., University of Colorado, Anschutz Medical Campus

David Weir, Ph.D., University of Michigan

Rebeca Wong, Ph.D., The University of Texas Medical Branch

Kathryn Morris, M.P.H., *Designated Federal Official*, National Institutes of Health

Farheen Akbar, M.P.H., *Advisor*, National Institutes of Health

Kristin Brethel-Haurwitz, Ph.D., *Advisor*, National Institutes of Health

Caitlin Burgdorf, Ph.D., *Advisor*, National Institutes of Health

# Integration of Behavioral and Social Sciences Research at the National Institutes of Health

## EXECUTIVE SUMMARY

Behavioral and social sciences are critical to achieving the mission of the National Institutes of Health (NIH) to “seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability.” The COVID-19 pandemic clearly illustrated that behavioral and social sciences research (BSSR) is essential to informing a public health response. Although the rapid development of highly effective and safe vaccines was a historic scientific feat, the success of both vaccine uptake and the mitigation measures of mask wearing and social distancing that have dominated the pandemic response depend on our understanding of behavioral and social factors. Beyond COVID-19, the value of BSSR is also well established for enhancing lifestyle behaviors and preventing disease across the lifespan (e.g., a healthy diet, physical activity, weight loss, cessation of tobacco use, enhancing adherence to screening or other preventive regimens), managing acute and chronic diseases and conditions, and informing the conduct of science (e.g., addressing ethics and health equity in research, enhancing trust in science, improving translation from basic to applied research). Furthermore, BSSR is essential in efforts to improve health equity and eliminate health disparities.

Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Bill 2021 (H. Rpt. 116-450) from the House of Representatives requested an assessment of the state of the integration of the behavioral sciences in the NIH research enterprise to realize the benefits of behavioral sciences to overall health. A working group was chartered by the NIH Council of Councils to examine BSSR integration. The working group approached this inquiry from two perspectives: research (i.e., how much of the research supported by the NIH has a significant behavioral and/or social component?) and practice/process (i.e., what is the representation of the behavioral and social sciences in the expertise of those who do the work of the NIH and in strategic planning?).

**Despite the relevance of BSSR across Institute and Center (IC) missions, the working group found significant gaps and variation in BSSR integration across the NIH.** The working group examined BSSR integration in research funding, initiatives, staff expertise, review practices, Advisory Council representation, public communications, and strategic planning and policy implementation. Integration in these categories varied widely across the ICs. Some ICs had a high degree of integration, but several had nominal BSSR integration in some or all metrics examined. Even within ICs that overall had significant BSSR integration, the level of integration varied across metrics, suggesting room for improvement. Although the NIH Office of Behavioral and Social Sciences Research (OBSSR) is tasked with BSSR integration, support for this Office has not kept pace with BSSR growth and support across the NIH.

**To improve integration of BSSR in the NIH research enterprise, the working group developed the following recommendations for NIH leadership:**

- As strategic plans are revised, or new strategic plans are developed, the NIH should ensure BSSR is more consistently included and linked to the IC mission and priorities.
- The NIH director and each IC director should evaluate and monitor the distribution of BSSR staff in the agency and identify strategies to address gaps in the number of BSSR staff and to increase diversity of BSSR expertise.
- The NIH should bring IC Advisory Council representation into alignment with the policy to have a minimum of two members on each council with behavioral or public health expertise as soon as possible.
- The NIH should continue to evaluate and monitor the composition of scientific review panels to ensure they adequately reflect BSSR knowledge and expertise and rapidly address any systematic gaps and biases.

- The NIH should direct ICs with nominal BSSR in their portfolios to work with the OBSSR to identify opportunities to increase the application of BSSR in their research and training initiatives to better advance their mission.
- The NIH should identify gaps and address opportunities to increase centers, resource grants, and trial networks that include BSSR capacity and focus.
- The NIH should increase resources allocated to the OBSSR for staff and initiatives.
- The NIH should engage BSSR expertise early and throughout the development and implementation of new research policies and practices.

The working group also identified the following crosscutting improvements to support BSSR integration:

- Enhance the precision in measurement and analysis approaches to characterize NIH funding to support greater nuance in tracking funding trends in BSSR and beyond.
- Draw from the rich body of behavioral and social sciences findings to create evidence-based approaches to address workforce diversity.
- Foster team science and multidisciplinary integration.
- Consistently involve BSSR to enhance the effective, efficient, equitable, and ethical conduct of science.

Addressing the recommendations in this report will allow the NIH to more fully integrate BSSR across the NIH to accelerate the potential of BSSR to address some of the most complex and pressing public health issues of our time.

# Integration of Behavioral and Social Sciences Research at the National Institutes of Health

## FULL REPORT

### BACKGROUND

This working group was formed in response to the following language from the House of Representatives for the Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Bill, 2021 ([H. Rpt. 116-450](#)):

*Behavioral Research—The Committee believes that a more robust and focused NIH commitment to behavioral science research and training would yield significant improvements to the nation’s health due to the important connections between behavior and health. Most of the leading public health issues facing our nation—including cancer, addiction, heart disease, mental illness, diabetes, violence, and AIDS—are rooted in individual and social behavior, yet behavioral science is decentralized across NIH’s Institutes and Centers, and the NIH commitment to manage and directly fund this important research is limited. The Committee directs the Director to convene a special advisory panel of behavioral scientists and other community experts to complete an assessment providing recommendations on how to better integrate and realize the benefits to overall health from behavioral research at NIH. The Committee requests that this assessment be finalized before the end of fiscal year 2021 and that a report be submitted to the Committee at that time.*

In 2021, the U.S. Department of Health and Human Services (HHS) and Congressional staff agreed to extend the deadline to finalize the report to the end of fiscal year 2022.

### Charge for the Behavioral and Social Sciences Research (BSSR) Integration Working Group

A working group of the National Institutes of Health (NIH) Council of Councils was established on January 29, 2021, and charged with the following:

- Convene a working group of experts in BSSR and in the function and structure of the NIH research enterprise.
- Assess the current status of BSSR in NIH-supported research and training. Identify existing NIH processes that should continue or be enhanced, as well as opportunities for new processes to improve the coordination and integration across the Institutes, Centers, and Offices within the Office of the Director.
- Make recommendations to the NIH director on ways to encourage greater BSSR integration and relevance across the NIH, including, but not limited to, the functions of the Office of Behavioral and Social Sciences Research (OBSSR).
- Generate a report with the findings of the assessment and recommendations to the NIH director for consideration and reporting to Congress.

Working group members were selected from the NIH Institute and Center (IC) Advisory Councils because of their established track record of excellence in the behavioral and social sciences and their familiarity with the NIH mission, structure, and processes. Member selection included an emphasis on diversity of perspectives, including their areas of scientific expertise and the size of the IC where they serve as a council member.

Upon convening and considering the Congressional report language and charge, the working group decided to make explicit a few assumptions about the focus of their recommendations: a focus on social science, as well as behavioral science, and on extramural research and training, rather than intramural efforts; and a broad examination of how the NIH operates to support integration, rather than a detailed look at integration in specific disciplines or disease areas.

The recommendations in this report are focused on opportunities to achieve greater integration of the behavioral and social sciences at the NIH toward the goal of more fully realizing the benefits of this research to overall health.

See [Appendix A](#) for more details on working group processes.

## BSSR AT THE NIH

---

### ***Definition and Scope***

When the U.S. Congress created the OBSSR at the NIH, it mandated that the Office develop a standard definition of the field to assess and monitor funding in this area. The [definition developed in 1996](#) was revised in 2019 based on input from the BSSR community. The [2019 definition](#) states, “Behavioral and social sciences research at the National Institutes of Health involves the systematic study of behavioral and social phenomena relevant to health.”

- Behavioral phenomena refer to the observable actions of individuals or groups and to mental phenomena, such as knowledge, attitudes, beliefs, motivations, perceptions, cognition, and emotions.
- Social phenomena refer to the interactions between and among individuals and to the characteristics, structures, and functions of social groups and institutions, such as families, communities, schools, and workplaces, as well as the physical, economic, cultural, and policy environments in which social and behavioral phenomena occur.
- Health refers to a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (as per the [World Health Organization](#)<sup>1</sup>).

Behavioral and social sciences researchers study the complex interplay between biological, behavioral, social, and environmental processes, including both phenomena that occur within the organism (e.g., genetics, neurobiology, emotion, perception, cognition) and external to the organism (e.g., environment, social relationships, societal factors, culture, policy). Understanding the reciprocal influences of these internal and external processes is fundamental to understanding how to develop efficacious behavioral and social sciences–based approaches to improve health. This broad approach to multilevel and multimodal influences on health provides the behavioral and social sciences with a unique perspective on the dynamic interactions that influence health outcomes of individuals and populations.

The behavioral and social sciences at the NIH include a diverse set of research disciplines that incorporate behavior and/or social phenomena relevant to health into research. The range of health-relevant disciplines focused on BSSR is too large to fully list but, as illustrative examples, the field includes economics, anthropology, demography, sociology, psychology (e.g., clinical, social, health, experimental, organizational), social work, social policy, cognitive/behavioral neuroscience, and behavioral genetics.

### ***Importance of BSSR***

The behavioral and social sciences are integral to the NIH mission to “seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability.” BSSR plays an important role across the translational continuum. It is at the core of translating fundamental discoveries into actionable interventions and policies to improve the health of individuals and the public. It is also central to understanding how we can use the scientific evidence base to accelerate solutions to our biggest and most complex health issues. BSSR meaningfully informs dissemination and implementation research<sup>2</sup> to understand how to accelerate and enhance the widespread adoption, acceptability, and scalability of evidence-based approaches to improve health. BSSR is also essential in efforts to improve health equity and eliminate health disparities<sup>3</sup> through the identification of influential factors and testing of approaches to address social-, organizational-, and environmental-level factors that mitigate or exacerbate inequity.

The COVID-19 pandemic clearly illustrated that BSSR is essential to informing a public health response.<sup>4</sup> Although the rapid development of highly effective and safe vaccines was a historic scientific feat, the success of both vaccine uptake and the mitigation measures of mask wearing, social distancing, and hand washing that have dominated the pandemic response depend on our understanding of behavioral and social factors. Because the pandemic required large-scale behavior change, insights from BSSR have been used to help align human behavior and attitudes with the recommendations of scientists, health care providers, and other public health experts. For example, communication strategies for mitigation recommendations have relied on BSSR findings of social norms, behavioral nudges, threat perception, risk tolerance, and collective interests. In addition, BSSR strategies are essential for mitigating the behavioral and socioemotional impacts of the pandemic due to societal disruptions, such as stay-at-home orders, work and school disruptions, and social isolation. The COVID-19 pandemic has demonstrated that BSSR will also be essential as we prepare for future public health crises and identify approaches to better prevent the worst impacts. As former NIH Director Dr. Francis Collins noted, “You know, maybe we underinvested in research on human behavior. I never imagined a year ago, when those vaccines were just proving to be fantastically safe and effective, that we would still have 60 million people who had not taken advantage of them because of misinformation and disinformation that somehow dominated all of the ways in which people were getting their answers. And a lot of those answers were, in fact, false. And we have lost so much as a result of that.”<sup>5</sup>

Beyond the COVID-19 pandemic, the influence of BSSR on health is wide-ranging. Behavioral and/or social factors contribute to almost all the leading risk factors for and causes of death.<sup>6,7</sup> The value of BSSR is well established for enhancing lifestyle behaviors and preventing disease (e.g., a healthy diet, physical and social activity, weight loss, cessation of tobacco use, enhancing adherence to screening or other preventive regimens). BSSR is integral to promoting healthy development and well-being across the lifespan through approaches to understand and address risk and mitigating factors at the individual, family, societal, or environmental levels. It also has a major role to play in managing many acute and chronic diseases or conditions. For example, BSSR has been crucial in the development of effective evidence-based approaches to disease self-management, adherence to medical regimens, shared decision-making, health communication, initiating health behavior change, treatment of mental health conditions or substance use/misuse, and chronic pain management. Finally, BSSR can continue to contribute substantially to the more effective, efficient, equitable, and ethical conduct of science,<sup>8</sup> from informing recruitment and retention practices to addressing ethics and health equity in research, enhancing science messaging and trust in science, and improving approaches to accelerate translation from fundamental discovery to efficacy/effectiveness research and on to dissemination and implementation research.

## DEFINING INTEGRATION

Based on the Congressional language directing the working group to make recommendations “on how to better integrate and realize the benefits to overall health from behavioral research at NIH,” a first task of the working group was to define what should be included in integration of BSSR at the NIH. The working group determined that to optimally realize the benefit of BSSR, relevant BSSR expertise should be integrated at multiple levels across the NIH. As such, integration should be evidenced through BSSR representation in the research and training funded at the NIH and represented in the key practices and processes at the NIH. As noted previously, the working group did not focus on integration within specific disciplines or disease areas. This resulted in the development of the following parameters to guide the working group’s assessment and recommendations:

- **Research:** Integration is demonstrated through involvement of behavioral and/or social scientists in developing and implementing relevant research and/or training programs and portfolios. Integration also is demonstrated through primary aims that are fully BSSR or a combination of BSSR and biomedical aims. If the research includes one or more behavioral or social outcome measures but these outcomes are not included in the primary hypotheses, this would not be considered integration of BSSR.

- **Practice and Processes:** Integration is demonstrated through representation of behavioral and social scientist experts within the NIH workforce, in review panels, and on high-level NIH decision-making committees. Integration also is demonstrated through inclusion of BSSR in strategic plans that drive research and training priorities and in research policy development and implementation.

## METHODS

---

To inform the recommendations included in this report, the working group reviewed quantitative and qualitative analyses, as well as expert input.

The working group assessed current (as of summer 2021) strategic plans at the NIH for BSSR integration. This included IC-specific strategic plans (n = 24), topic-specific NIH-wide strategic plans (n = 4; NIH Common Fund, COVID-19 Research, Data Science, NIH Obesity Research), and the *NIH-Wide Strategic Plan for Fiscal Years 2021–2025*.

Several quantitative analyses were conducted to understand the overall BSSR portfolio at the NIH over the past 10 fiscal years (FYs). The portfolio was defined by the awarded new grants identified as the Behavioral and Social Science category in the Research, Condition, and Disease Categorization (RCDC) system in fiscal years 2010 to 2020. In addition to examining the overall number of grants and amount of funding across ICs, the working group compared data by grant type, including research project grants (RPGs), training grants (Fs, Ts, Ks), and some resource and center grants (P50, P30, and R24) and noted trends within BSSR and differences between BSSR and non-BSSR portfolios.

Qualitative data were collected to give context to the quantitative analyses. The working group reviewed the accomplishments, programs, and processes of the OBSSR. IC Advisory Council membership was reviewed to determine inclusion of BSSR- and public health–focused members on the current roster. Additionally, an NIH-wide survey was conducted to assess how BSSR is represented, organized, and integrated across the NIH on different areas of integration. Representatives from all ICs (not including the NIH Intramural Research Program, Clinical Center, Center for Scientific Review [CSR], and Center for Information Technology) were surveyed about BSSR activities in the past three fiscal years (FYs 2019–2021) in the following areas: research and training workshops; funding opportunity announcements (FOAs); internal IC collaborations between BSSR and non-BSSR staff; external IC collaborations between BSSR and non-BSSR staff; and scientific communication to the external community. Additionally, the survey allowed ICs to provide information on their current BSSR workforce.

The working group also reviewed the CSR’s recent pilot programs and evaluations being conducted as part of its continuous quality improvement process, particularly with respect to BSSR. CSR’s Evaluating Panel Quality in Review ([ENQUIRE](#)) program assesses the output of CSR’s study sections by scientific cluster and recommends changes to ensure the scientific scope and function of study sections are optimized to identify high-impact science. Each year, ENQUIRE conducts several analyses within several study sections.

## SUMMARY OF FINDINGS

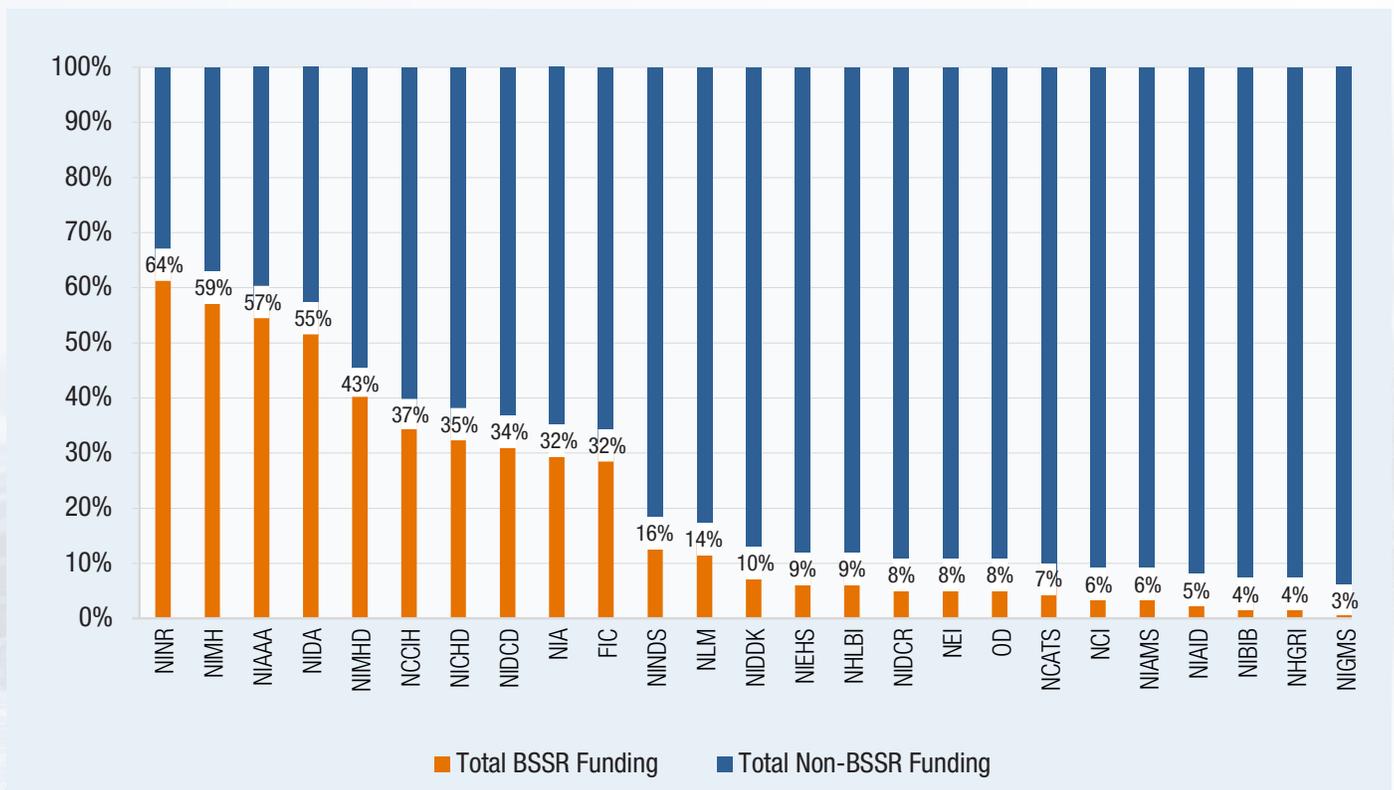
### Strategic Plans

Within each strategic plan, the group searched for key words relating to “behavior” and “social” and categorized each plan as having “nominal,” “moderate,” or “significant” integration of BSSR based on a close reading of each plan. Out of the 24 IC-specific strategic plans and 4 topic-specific NIH-wide strategic plans, 8 strategic plans (28.5%) were identified as having significant BSSR integration, 8 (28.5%) were identified as having moderate BSSR integration, and 12 (42.9%) were identified as having nominal BSSR integration. The NIH-wide strategic plan was categorized as having moderate BSSR integration.

### Funding for BSSR

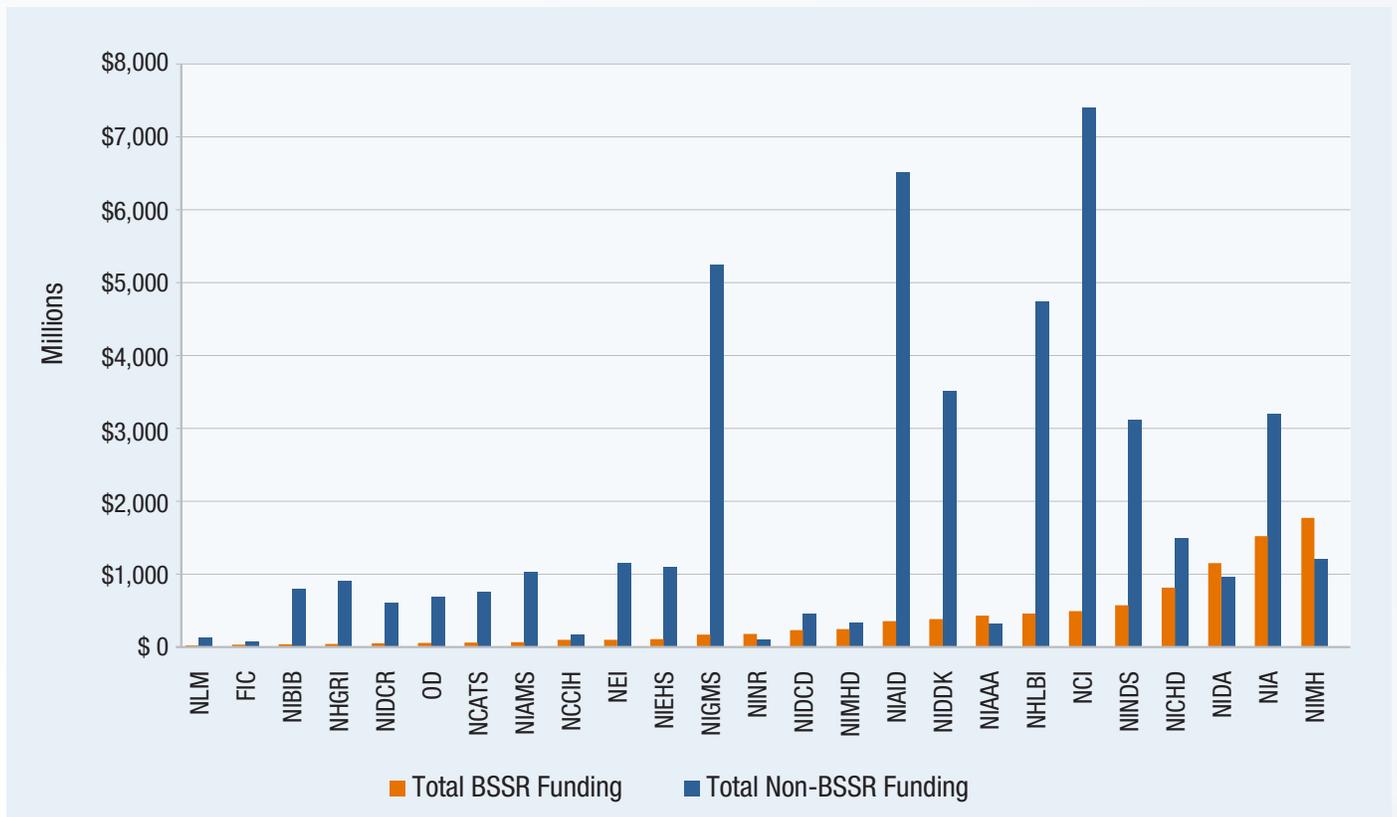
BSSR funding within an IC is a major indicator of the integration of these areas of science into the mission of an IC. The working group first examined funding for BSSR as a proportion of the IC research funding (i.e., relative to non-BSSR funding) (see **Figure 1**). Of the 24 ICs<sup>a</sup> assessed for integration, 10 (41.7%) had significant BSSR portfolios (>20% of its overall grant funding), 3 (12.5%) had moderate levels of BSSR funding (10–20% of its overall grant funding), and 11 (45.8%) ICs had nominal BSSR funding (<10% of its overall grant funding) (see **Figure 2**). The percentage of BSSR in IC funding portfolios as a percent of overall funding also varied widely (see **Figure 1**), but across the NIH, BSSR accounted for 21 percent of new and competing awards.

**Figure 1. Percentage of BSSR in IC Funding Portfolios as a Percent of Overall Funding, FYs 2010–2020.**



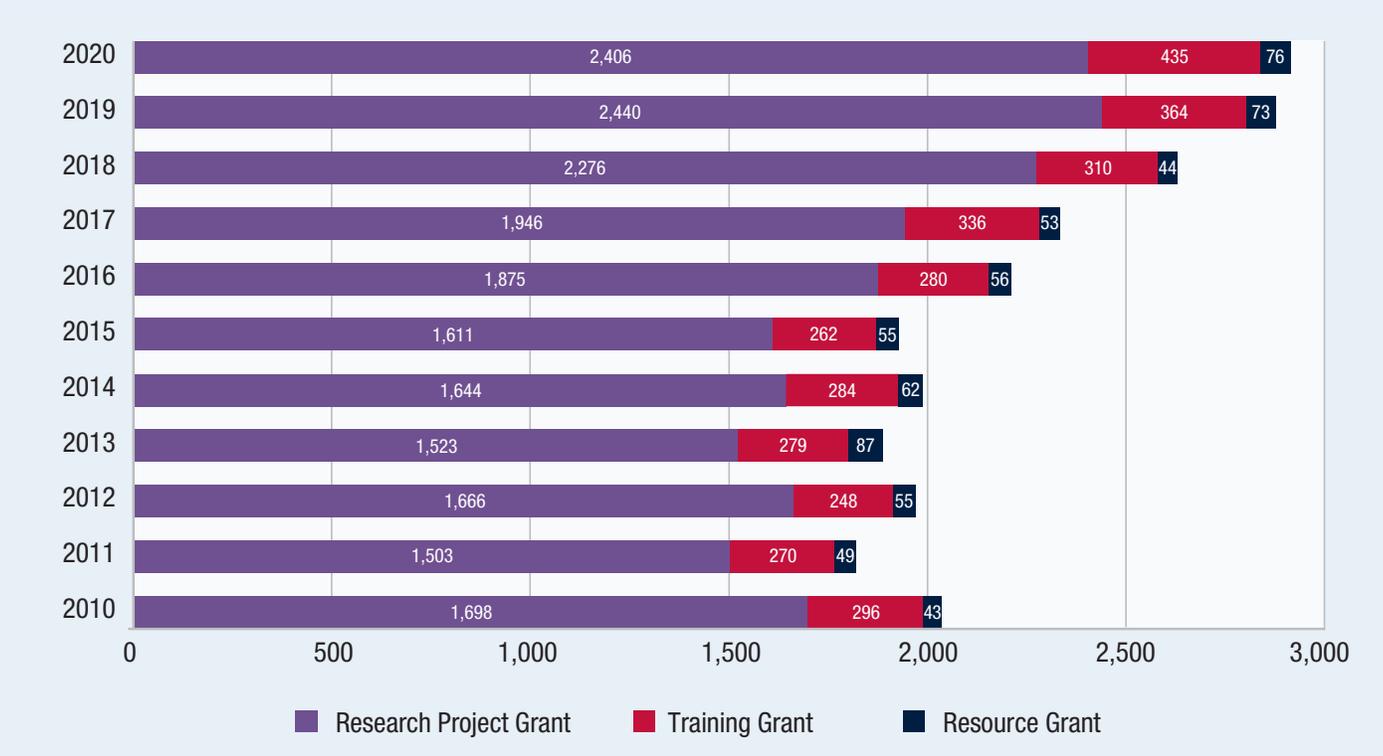
<sup>a</sup> The funding analysis included grants administered by the Office of the Director (OD), and these grants are included in charts and graphs; however, for the purpose of analyzing percentage of integration, the OD was excluded.

**Figure 2. Funding for Competing Awards FYs 2010–2020, Broken Down by BSSR and Non-BSSR Funding.**



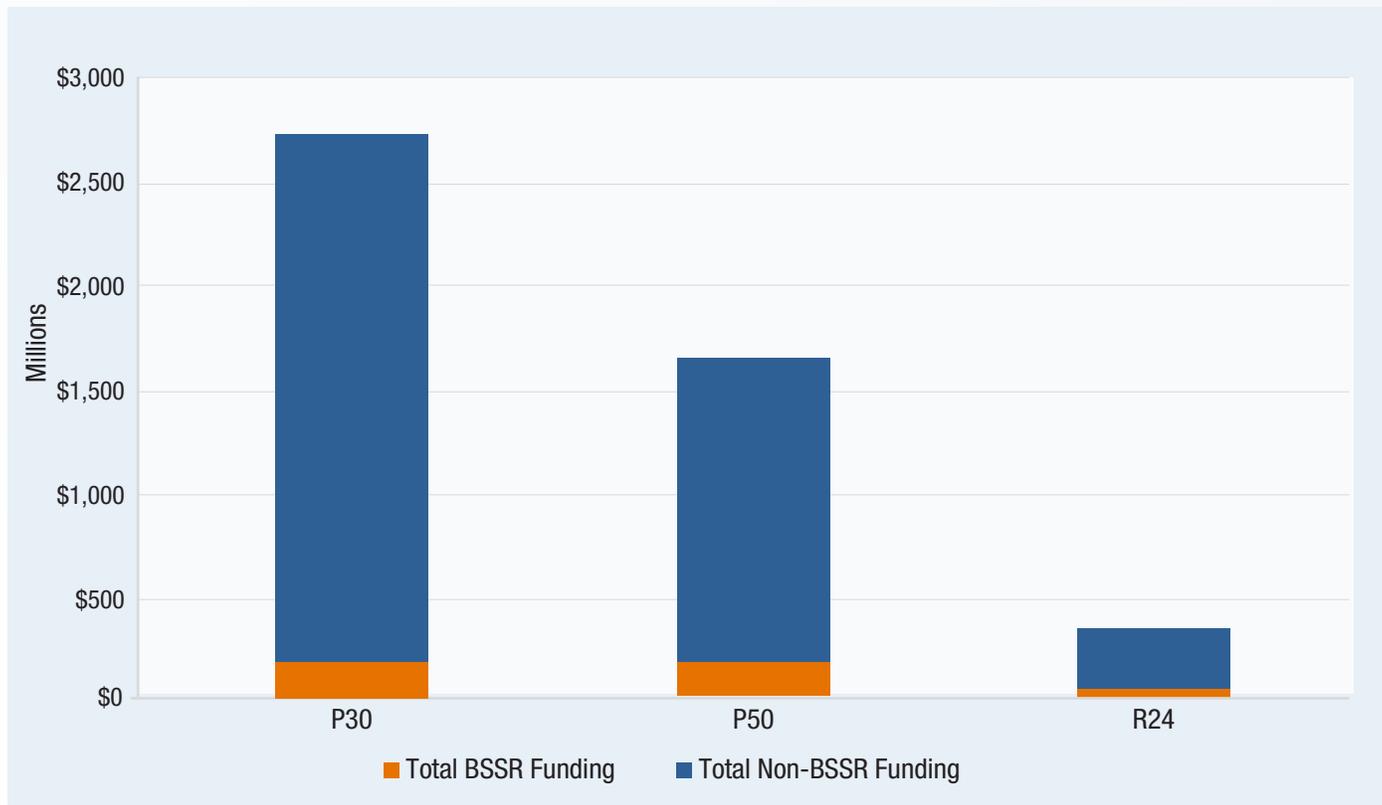
From FY 2010 to FY 2020, the number of BSSR-coded research grants increased. BSSR training and resource grants saw increases but, overall, are funded at relatively low numbers compared with the overall NIH portfolio (see **Figure 3**).

**Figure 3. Number of Research, Training, and Resource Grants FYs 2010–2020.**



Research, resource, and center grants are often large and long-term investments by ICs to provide additional support and resources to various areas of science to enhance research development, capability, and productivity. Therefore, the working group examined funding for select resource and center grant mechanisms: P30, P50, and R24 over the past 10 years (see **Figure 4**). Of the approximately \$4.8 billion in funding through these mechanisms at the NIH in that 10-year span, BSSR is included in 10 percent of the portfolio.

**Figure 4. NIH BSSR vs. Non-BSSR Funding FY 2012–2021 for P30, P50, and R24.**



### **Advisory Councils Membership**

By policy, 42 U.S.C. § Chapter 6A, Subchapter III, Part B (2019), NIH Advisory Councils are required to include “not less than two individuals who are leaders in the fields of public health and the behavioral or social sciences.” Two levels of BSSR expert review in December 2021 found five IC Advisory Councils (21% of those assessed) with only one member who had primary expertise in behavioral science, population science, or public health. However, these ICs may technically be in compliance with the policy if the IC interpretation of expertise is broad, and they do not require public health or behavioral and social sciences to be the Advisory Council member’s primary expertise.

### **Qualitative Assessment from the Survey**

The survey results demonstrated IC variation in BSSR integration across the domains surveyed, including participation in BSSR-related workshops, FOAs, NIH-wide initiatives, internal and external IC collaborations, and scientific communication. The survey was distributed to each IC (excluding the Center for Information Technology, CSR, and OD) to consolidate a response from communications, program, and policy teams within each IC. Responses were affirmed and new information added by IC representatives to the NIH Behavioral and Social Sciences Research Coordinating Committee, who are subject matter and program experts in BSSR. The survey also assessed the workforce structure used for BSSR portfolio management across the ICs. See **Appendix B** for survey questions.

- **Workshops and FOAs:** Of the 24 ICs surveyed, 16 ICs reported developing a research or training workshop with a BSSR focus led by their IC in the last three fiscal years. Six ICs had no such activities in the last three fiscal years and two were unsure.

Eighteen ICs reported leading FOAs with a BSSR focus. The most reported content areas were COVID-19, social determinants of health, HIV, health disparities, and behavioral interventions. Five ICs reported no FOAs at their ICs with a BSSR component in the last three fiscal years; one IC responded that it was unsure.

- **NIH-Wide Initiatives:** Seventeen of the 24 ICs reported participating in BSSR-focused NIH-wide research or training initiatives. Many of the NIH-wide initiatives had good BSSR integration because they were led by the OBSSR or had significant coordination and support by the OBSSR. Five ICs reported having no BSSR-focused input in the NIH-wide initiatives in the last three fiscal years. One IC was unsure, and one IC did not respond.
- **Internal and External IC Collaboration:** Twelve ICs indicated some level of collaboration among colleagues within their IC to produce BSSR-focused projects or projects with a BSSR component. The other 11 ICs reported not having any (n = 7) or being unsure (n = 4) of any such efforts at their IC in the past three fiscal years. One IC did not respond.

Regarding collaboration across ICs to develop BSSR initiatives, 15 ICs confirmed having collaborations with BSSR colleagues across ICs. Six ICs reported not having any such collaborations in the past three fiscal years, two ICs were unsure, and one did not respond.

- **BSSR-Relevant Scientific Communication:** Scientific communication included highlighting BSSR scientific advances for Congressional reporting, press material, or other public communication. Most ICs (n = 22) reported highlighting BSSR-relevant scientific advances in communications to the external community. Three ICs reported not having such communication in the past three fiscal years, and three IC respondents left the questions blank if they did not know the answer and were unsure how to obtain it.
- **BSSR Staff:** The survey also assessed the distribution of dedicated BSSR workforce within an IC. ICs were characterized as using one or more of the following models to organize and integrate BSSR staff and expertise: BSSR-dedicated work unit(s), such as an office, branch, or division; BSSR-dedicated program staff who exclusively handle BSSR grants and/or have primary expertise in BSSR; BSSR grants distributed across the portfolios of multiple program staff, regardless of BSSR expertise.

Nine ICs reported either having dedicated work unit(s), dedicated staff, or a combination of the two. The rest of the ICs used the distributed portfolios model. ICs with dedicated work units and/or dedicated staff were more often rated as having higher BSSR integration on other indices assessed. ICs using a distributed portfolio model were more likely to be rated as having nominal BSSR integration on other indices assessed if they also had few staff with primary BSSR expertise.

## **Peer Review**

The working group invited a representative from the NIH CSR to present and discuss the CSR's continuous improvement program, including the ENQUIRE analyses, to better understand how CSR is addressing integration, representation, and bias in BSSR review. CSR is using a data-driven framework to enhance the quality of peer review through such activities as piloting multistage double blind reviews, requiring new training for peer reviewers to reduce the risk of bias, and examining study section composition to better adapt to emerging scientific areas and reduce the risk of perpetuating less innovative or relatively incremental science.

The qualitative review included understanding CSR's ongoing efforts, pilot programs, and potential future initiatives. The working group considered these in three categories: (1) reviewers (e.g., training to reduce bias, broadening the pool of reviewers, evaluating performance), (2) study sections (e.g., composition, size, and breadth; maintaining relevance; adapting to emerging areas; identification of meritorious science), and (3) processes (e.g., ensuring confidentiality and integrity, minimizing bias and promoting fairness, simplifying review criteria to focus attention on the big-picture questions that should drive scores).

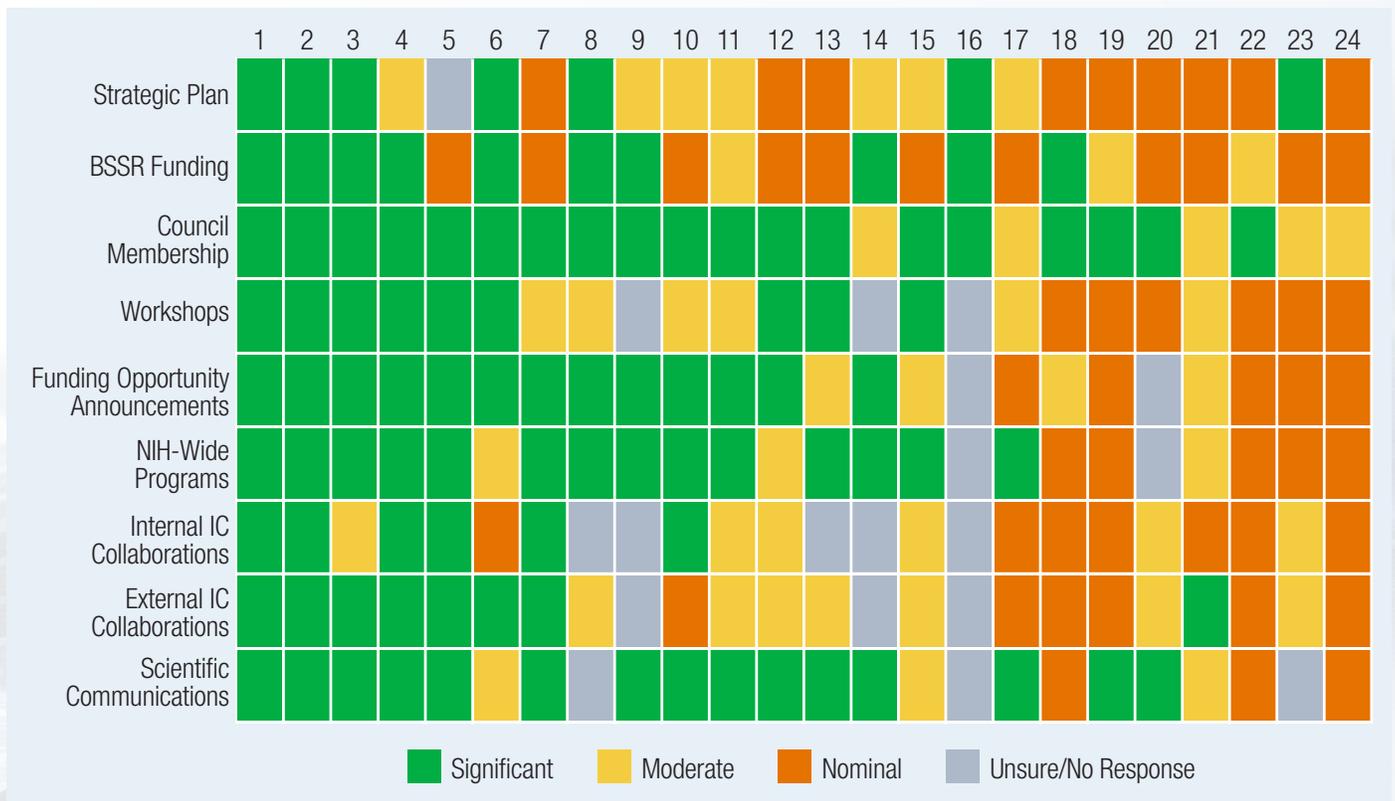
CSR also identified some ways BSSR applications differed from non-BSSR research. BSSR is less likely to be Type 2 (renewal) applications, more likely to be from early-stage investigators (23% vs. ~14% of R01s in 2021) and new investigators (40% vs. 27%), more likely to be submitted in response to a PAR (program announcement with special receipt, referral, and/or review considerations) versus a program announcement (PA), more likely to involve multiple principal investigators (38% vs. about 27%), and much more likely to involve human subjects and clinical trials. BSSR also has lower publication/citation rates, but this is thought to be driven by the greater focus on human and clinical trial research.

**Summary Heatmap of Integration Metrics**

**Figure 5** is a summary heatmap of BSSR integration based on each integration metric examined, except for BSSR workforce organization and peer review processes—metrics that did not lend themselves to a gradient rating. NIH-wide and topic-specific strategic plans also were excluded from the heatmap.

The purpose of the heatmap is to show variation and patterns of integration to support the working group’s NIH-wide recommendations, so each column is a deidentified IC. On each of these domains, an IC was characterized as having “significant,” “moderate,” or “nominal” level of BSSR integration. Green represents significant integration, yellow is moderate integration, and orange is nominal integration. Grey boxes indicate no response or an “unsure” response. For example, ICs 1–5 had significant levels of BSSR across most or all of the domains assessed, whereas ICs 22–24 had nominal integration on many of the domains assessed. See **Appendix C** for a description of how each category was coded as significant, moderate, or nominal and **Appendix D** for a list of all NIH ICs.

**Figure 5. Heatmap of Integration Assessment by Deidentified IC.**



## WORKING GROUP RECOMMENDATIONS

To fully achieve the benefits of BSSR integration, BSSR must be robustly represented across the ICs and not separate from the broader biomedical research and training enterprise. The NIH should encourage cultural and structural change to ensure representation and inclusion of BSSR at multiple levels across the agency. The following are the working group recommendations:

### 1. Strategic Planning

- a. **As strategic plans are revised or new strategic plans are developed, the NIH should ensure BSSR is more consistently included and linked to the IC mission and priorities.**

Strategic plans define and operationalize how to advance the mission of an IC or the NIH as a whole by outlining the vision and research. These plans communicate IC research priorities to relevant internal and external entities and drive initiative development and funding priorities. Behavioral science is well represented in the NIH-Wide Strategic Plan for Fiscal Years 2021–2025, which is designed to complement and harmonize with IC-specific strategic plans. *Although inclusion of BSSR in a strategic plan is not always sufficient to support integration of BSSR in the IC research agenda, the absence of BSSR in strategic plans sends a message that it may be of lesser importance.* Of the 24 strategic plans reviewed, 10 (42%) had nominal BSSR inclusion. However, as noted in detail above, BSSR has relevance to all the ICs and many of the NIH-wide strategic plans and is a fundamental component of translating discoveries into actionable interventions and policies. In addition, BSSR is critical for understanding and addressing the conditions in which individuals live and how those conditions influence health and health inequities.<sup>9</sup> Lack of inclusion of BSSR in strategic plans may limit the internal and external focus on addressing BSSR gaps and the integration of behavioral and social factors in the IC research initiatives and funding. NIH leadership should support and encourage the ICs and NIH-wide groups to work with the OBSSR and/or BSSR staff within their ICs when they develop their next strategic plans to help identify important BSSR goals that are relevant to each IC mission.

### 2. Human Resources

- a. **The NIH director and each IC director should evaluate and monitor the distribution of BSSR staff in the agency and identify strategies to address gaps in the number of BSSR staff and to increase diversity of BSSR expertise.**

*At its foundation, BSSR cannot be well integrated and maximally contribute to the broader NIH research mission unless there is consistent representation of BSSR expertise at each IC.* Although a few ICs have a large number of BSSR staff, it was found that many ICs have limited or no program staff with BSSR as their primary expertise. Yet, as noted above, all NIH ICs have missions that would be enhanced by BSSR expertise. Adequate representation should also include a broad range of relevant BSSR expertise. This includes staff with expertise ranging from fundamental discovery to developing, testing, and implementing approaches/interventions at the individual, group, or population level. Staff with expertise from varied BSSR disciplines—such as social science, population health, public health/prevention, interventionists/trialists, and implementation science—are also needed.

- b. **The NIH should bring IC Advisory Council representation into alignment with the policy requiring a minimum of two members on each Council with behavioral or public health expertise as soon as possible.**

By policy, 42 U.S.C. § Chapter 6A, Subchapter III, Part B (2019), NIH Advisory Councils are required to include “not less than two individuals who are leaders in the fields of public health and the behavioral or social sciences.” However, as of December 2021, according to two levels of BSSR expert review, five IC Advisory Councils (21% of those assessed) had only one member with primary expertise in behavioral science, population science, or public health. However, these ICs may technically be in compliance if the IC

interpretation of expertise is broad, and they do not require public health or behavioral and social sciences to be the Advisory Council member's primary expertise. Regardless, the working group determined that the representation of behavioral and public health expertise is not as robust as it should be to ensure that IC leadership has BSSR expert advice relevant to their IC missions. *A lack of high-level advisory representation will hamper an IC's ability to develop, consider, and advance BSSR-relevant initiatives and grant funding.*

- c. The NIH should continue to evaluate and monitor the composition of scientific review panels to ensure they adequately reflect BSSR knowledge and expertise and then rapidly address any systematic gaps and biases.**

The working group was impressed by CSR's efforts to ensure that study sections keep pace with the changes in science through its ENQUIRE process. CSR's efforts to enhance fairness and reduce bias are also commendable. Given the central importance of review to the broader research enterprise, the working group recommends continued vigilance to issues of bias against behavioral or social sciences and the integration of BSSR and biomedical research. *The working group noted that continued attention to ensuring BSSR expertise and representation is warranted. Most applications that are predominantly BSSR are reviewed in BSSR-focused study sections. For BSSR to be well integrated into the broader biomedical research enterprise, attention needs to be paid to ensuring there is adequate BSSR expertise on study sections whose primary focus might not be BSSR but where BSSR factors, outcomes, and methods are included or should be included.*

The OBSSR can provide guidance and support to help the NIH and the ICs implement these three human resource recommendations.

### 3. IC Grant Funding and Resources

- a. The NIH should direct ICs with nominal BSSR in their portfolios to work with the OBSSR to identify opportunities to increase the application of BSSR in their research and training initiatives to better advance their mission.**

BSSR funding within an IC is a major indicator of the integration of these areas of science into the mission of an IC. Overall, BSSR represents 21 percent of the NIH portfolio over the past 10 years, but within ICs, proportions vary from more than half of their portfolios to less than 5 percent. *Although BSSR is certainly not appropriate as a significant area of funding at all ICs and the working group recognizes that there is no "right" percentage for each IC, it is important enough for the advancement of health that some representation of BSSR would be expected and should be encouraged for all the ICs.* The OBSSR can assist the ICs that currently have nominal BSSR funding to identify additional areas of BSSR that are important and consistent with their mission that could be prioritized for increased research funding. The working group encourages additional funds to be allocated to support ICs with nominal-level BSSR integration to expand their BSSR portfolios.

- b. The NIH should identify gaps and address opportunities to increase centers, resource grants, and trial networks that include BSSR capacity and focus.**

Center and resource grants (e.g., P30s, P50s, R24s) often represent significant long-term investments and commitment by an IC to provide additional support and services to enhance research development, capability, efficiency, and productivity within a given scientific area. Although not all ICs support these types of mechanisms, across the NIH there is a relative paucity of these types of major investments in BSSR (10% of all center resource and center grant funding). *Without these dedicated resources and support, BSSR is at a relative disadvantage. Increased infrastructure resources would enhance BSSR integration and meaningfully extend the advancement of the NIH's ability to translate discoveries to actionable interventions and policies to improve individual and population health.* Although the analyses the working group reviewed did not directly assess network funding, another gap identified by the working group is that there is far less IC support of clinical trial networks that have the capacity to examine social, behavioral, or implementation science interventions.

Some examples of potential behavioral and social sciences–relevant center, resource, or network investments that would have an important NIH-wide impact include, but are not limited to, (1) community-based trial networks to examine effectiveness and implementation strategies for prevention and treatment in community settings outside of large academic medical centers; (2) centers and networks to facilitate linkage and bidirectional communication of foundational science with those conducting research to prevent, mitigate or treat disease and enhance well-being; (3) resources to support a more cumulative approach to BSSR across diseases and disciplines through the development, curation, and dissemination of behavioral ontologies, as well as, where appropriate, facilitating the linkage of these ontologies to related biomedical controlled vocabularies, taxonomies, and ontologies; and (4) resource grants focused on the application of BSSR to the conduct of science, including enhancing recruitment and retention, conducting effective team science, fostering equity in science, and building trust in science. These are opportunities that could be led by the OBSSR or an IC. However, optimally, they would be multi-IC efforts to achieve the best effect and maximize cross-disease integration of BSSR.

#### 4. OBSSR Resources

##### a. The NIH should increase resources allocated to the OBSSR for staff and initiatives.

The working group reviewed the OBSSR mission, strategic priorities, and processes/functions, as well as current and past accomplishments and activities. It was noted that the Congressional language was highly related to the OBSSR mission: (1) Enhance the impact of health-related behavioral and social sciences research, (2) coordinate behavioral and social sciences research conducted or supported by the NIH and integrate these sciences within the larger NIH research enterprise, and (3) communicate health-related behavioral and social sciences research findings to various interested parties within and outside the federal government.

The working group noted that much of what the OBSSR does is focused on increasing the integration and coordination of BSSR across the NIH, both within BSSR and between BSSR and more biomedically focused efforts. As a coordinating office, the OBSSR is well positioned to ensure that BSSR is integrated across different ICs and that BSSR-related initiatives are developed to advance the NIH mission. *The working group recommends the OBSSR be included early and throughout the development of large NIH-wide initiatives where a behavioral or social science perspective would enhance the accomplishment of the research aims.*

The OBSSR has had good success addressing crosscutting scientific, training, and methodology gaps. However, the resources at the OBSSR have not kept pace with the increases in overall BSSR research at the NIH that the Office is tasked with coordinating. *The working group determined that increased resources for OBSSR activities and staff would build on past and current successes by accelerating the pace of integration of BSSR across the NIH and help “realize the benefits to overall health from behavioral research at NIH.”*

With more resources, the OBSSR could be of vital assistance in helping the NIH and individual ICs in addressing the recommendations in this report by providing advice, coordination, and support, as well as leading initiatives that have NIH-wide relevance. For example, the OBSSR could lead or facilitate the development of some of the large resource, center, or network opportunities identified above and/or address other crosscutting BSSR issues at NIH, such as (1) research on identifying mechanisms and approaches to improve the maintenance of behavior change; (2) translational research networks that advance precision medicine by examining contextual variables (e.g., population, setting, delivery mode) throughout the translation research continuum and test the boundary conditions in which the mechanism of action is more or less robust; (3) support for a more integrated approach to phenotyping (e.g., bio, behavioral, digital, and social phenotyping) in intervention studies to better understand what works for whom and why and in observational studies to better understand the interplay between biological, behavioral, and social factors over time; and (4) development of initiatives to enhance methods and measures to more robustly evaluate and address structural, systemic, and environmental changes that negatively or positively influence health across populations. The working group did not have time to expand

on this in more detail but recommends that the NIH, through OBSSR leadership, identify and overcome some of these most pressing scientific challenges.

## 5. Involvement in NIH Research Policies and Practices

### a. The NIH should engage BSSR expertise early and throughout the development and implementation of new research policies and practices.<sup>b</sup>

Although there is considerable commonality in research practices and procedures across scientific disciplines, every discipline has unique ways in which research is conducted. These differences should be accounted for and reflected in the development and implementation of NIH research policies. There are research designs, methodologies, and measurement approaches that are frequently used in the behavioral and social sciences that are not as frequently used in other fields. For example, the rollout in 2016 of the [NIH clinical trial policies](#) was more challenging because some of the terminology, reporting, and registration requirements were not always compatible with BSSR practices and designs, particularly basic BSSR involving experiments with humans that were subsumed under the clinical trials policies. It is important that research policies and practices be consistent with and accommodate the application of these scientific methods. *Involving BSSR experts and considering BSSR methods, measures, and practices as a part of research policy development and implementation will improve policy initiation and roll out. It also will help ensure the BSSR fields can adhere to the policies without disruption to scientific progress.* The OBSSR should be a central point of contact to identify potential BSSR issues, participate in the policy development process, and help identify internal and external experts to provide advice relevant to any given policy.

## CROSSCUTTING CONSIDERATIONS

Across the deliberations of the working group, several considerations or lessons learned were identified that may be useful for the NIH director to consider. These issues are relevant to the goal of enhancing BSSR integration, but not unique to BSSR.

- **Enhance Approaches to Measurement of NIH Funding:** Current analysis tools allow an estimation of funding trends for different themes and topics. However, the current tracking tools (e.g., the RCDC system) do not provide a quantitative metric of the extent to which an RCDC category is represented in a grant. For example, a grant may “count” as BSSR even when BSSR is only a small component of the research and the grant is not primarily a BSSR grant. This measurement limitation is particularly challenging for the basic BSSR portfolio. *Improved precision of the measurement tools would reveal greater nuance in funding trends in BSSR and beyond.* Furthermore, tracking translation in the behavioral and social sciences remains challenging. The Office of Portfolio Analysis has been making great strides in this area; however, its translation models assume progression from the cellular/molecular level to animal and then into human research,<sup>10</sup> which does not capture the usual trajectory of translation in BSSR. Developing tools to better track the path and speed of translation in BSSR from fundamental discovery to public health application would allow the NIH to identify ways to accelerate translation and address roadblocks.
- **Enhance the Diversity of the NIH and Extramural Research Workforce:** The working group applauds the NIH for the creation of programs to strengthen and diversify the internal workforce, as well as the extramural research workforce, such as [UNITE](#) and the development of an NIH-Wide Strategic Plan for Diversity, Equity, Inclusion, and Accessibility. *The working group encourages the NIH to draw from the rich body of behavioral and social sciences findings to create evidence-based approaches to address workforce diversity.* The working group also encourages the NIH to extend its efforts “to increase inclusivity and diversity in science” to opportunities to ensure that diverse perspectives drive the research agenda through more routine inclusion of behavioral and social sciences expertise in developing research and training initiatives.

<sup>b</sup> This recommendation was based on discussion by working group members and their knowledge and experience as senior investigators with long track records of funding at the NIH rather than on a quantitative assessment.

- **Foster Team Science and Multidisciplinary Integration:** As scientific research continues to grow in scale and complexity, this has been accompanied by a shift toward collaborative research, often referred to as team science. Rather than conducting research independently through individual investigators, team science allows the concurrent contribution of different disciplines to the same scientific research question. Incorporating BSSR expertise earlier and more often in NIH research, even research that is not testing a behavioral intervention or measuring behavioral phenomena, can enhance the conduct of science and consideration of how behavioral and social factors influence such factors as decision-making and adherence. Even the most robust and successful trials are rarely effective for all participants. *Understanding how individual differences, including psychosocial and contextual differences, contribute to variability in risk or in treatment response could catalyze the next generation of intervention research.* For example, large genomic studies would benefit from more robust phenotypic characterization and assessment of environmental influences to better capture gene by environment interactions. Another salient example is the inclusion of BSSR in the study of the short- and long-term effects of COVID-19 and how behavioral and social factors influence both prevention and treatment outcomes. Integrating BSSR-relevant questions about social and behavioral variables (e.g., trust, vaccine hesitancy or refusal, understanding of risk, social influences) in vaccine and therapeutic trials could have better informed early rollout and uptake. Currently, NIH funding opportunities that systematically encourage and fund this type of integrative work are limited.
- **Enhance the Conduct of Science:** Science is ultimately a human enterprise. Behavioral and social factors play an important role in informing how we conduct, report, and reference science. Behavioral and social factors are also crucial in understanding what erodes or builds trust in science and how we can better communicate and maintain trust even as what we know continues to evolve through further study. BSSR contributions to the conduct of science include informing approaches to ethically and meaningfully engage study participants in research recruitment, retention, and the dissemination of findings. BSSR is particularly important to improve the participation of diverse populations in research. *A strong NIH science of science effort with a robust BSSR component could further advance how NIH research is conducted so that it is more efficient, diverse, robust, and open.*

## CONCLUSION

---

BSSR is essential for informing public health, ranging from disease prevention and treatment adherence to the response to the COVID-19 pandemic. BSSR is a growing proportion of research supported at the NIH, although integration of BSSR across the agency has been uneven and there are several key areas for improvement. Based on a thorough review by the working group, as outlined above, BSSR is strongly supported and more integrated at the NIH than ever before. However, the working group identified several opportunities that would significantly enhance and amplify growth and integration of BSSR at the NIH. Through quantitative and qualitative analyses, this working group identified the following needs for increased integration of BSSR: IC and NIH-wide strategic planning; BSSR staff and expertise at the levels of intramural staff, IC Advisory Councils, and scientific review panels; BSSR grant funding; support for the OBSSR; BSSR input in NIH research policies and practices; and crosscutting considerations, including measurement of NIH funding, diversity of the NIH and extramural research workforce, team science and multidisciplinary integration, and the conduct of science. Such increased BSSR integration, coordination, and investment would yield benefits to health across the NIH and beyond.

## References

- <sup>1</sup> International Health Conference. (2002). Constitution of the World Health Organization. *Bulletin of the World Health Organization*, 80(12),983.
- <sup>2</sup> Riley, W. T. (2017). Behavioral and social sciences at the National Institutes of Health: Adoption of research findings in health research and practice as a scientific priority. *Translational Behavioral Medicine*, 7(2):380-384. <https://doi.org/10.1007/s13142-017-0474-4>
- <sup>3</sup> Mensah, G. A., & Riley, W. T. (2021). Social determinants of health and implementation research: Three decades of progress and a need for convergence. *Ethnicity & Disease*, 31(1):1-4. <https://doi.org/10.18865/ed.31.1.1>
- <sup>4</sup> Riley, W. T., Borja, S. E., Hooper, M. W., Lei, M., Spotts, E. L., Phillips, J. W. R., . . . Perez-Stable, E. (2020). National Institutes of Health social and behavioral research in response to the SARS-CoV-2 Pandemic. *Translational Behavioral Medicine*, 10(4),857-861. <https://doi.org/10.1093/tbm/ibaa075>
- <sup>5</sup> PBS NewsHour. (2021, December 20). Dr. Collins reflects on career at NIH, COVID response effort, work on genome sequencing [Video file]. Retrieved from <https://www.pbs.org/newshour/show/dr-collins-reflects-on-career-at-nih-covid-response-effort-work-on-genome-sequencing>
- <sup>6</sup> Murray, C. J. L., Aravkin, A. Y., Zheng, P., Abbafati, C., Abbas, K. M., Abbasi-Kangevari, M., . . . Lim, S. S. (2020). Global burden of 87 risk factors in 204 countries and territories, 1990–2019: A systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*, 396(10258):1223-1249. [https://doi.org/10.1016/S0140-6736\(20\)30752-2](https://doi.org/10.1016/S0140-6736(20)30752-2)
- <sup>7</sup> Murphy, S. L., Kochanek, K. D., Xu, J. Q., & Arias, E. (2021). Mortality in the United States, 2020. NCHS Data Brief, no 427. Hyattsville, MD: National Center for Health Statistics. <https://dx.doi.org/10.15620/cdc:112079>
- <sup>8</sup> Fortunato, S., Bergstrom, C. T., Börner, K., Evans, J. A., Helbing, D., Milojević, S., . . . Barabási, A.-L. (2018). Science of science. *Science*, 359(6379):eaao0185. <https://doi.org/10.1126/science.aao0185>
- <sup>9</sup> U.S Department of Health and Human Services. (2022). Social determinants of health. Retrieved from <https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health>
- <sup>10</sup> Hutchins, B. I., Davis, M. T., Meseroll, R. A., & Santangelo, G. M. (2019). Predicting translational progress in biomedical research. *PLOS Biology*, 17(10):e3000416. <https://doi.org/10.1371/journal.pbio.3000416>

# Appendix A. Working Group Process

## ***Group Creation***

This working group was formed in response to the following language from the House of Representatives for the Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Bill, 2021 ([H. Rpt. 116-450](#)).

NIH Council of Councils approved a concept for the working group on January 29, 2021. This included approving the co-chairs of then–OBSSR Deputy Director, Christine Hunter, Ph.D., and Council of Councils member Paul Kenny, Ph.D.

## ***Group Membership***

Working group members were recruited from current and recent NIH council and advisory board membership rosters, so that they would understand administrative challenges and opportunities at the NIH. A diversity of scientific representation across BSSR expertise was sought, across basic science, clinical research, data and population science, and representation of a variety of IC interests.

## ***Group Process***

Because of the SARS-CoV-2 pandemic, the working group was limited to virtual meetings. Between April and November 2021, staff assisting the working group virtually convened the working group members six times. OBSSR staff worked with the Scientific Consulting Group, Inc., to coordinate schedules, send virtual meeting invitations, and capture the discussion of the meetings in notes. OBSSR staff advisors and working group members collaborated to develop measures to assess integration of BSSR at the NIH and refined their work based on the results.

## Appendix B. Survey Questions to IC Representatives

The following are summaries of survey questions related to the data points described above. The survey was distributed to the NIH Planning and Evaluation Officers to collect answers within their ICs.

1. Which of the following best describes your IC? (Select one option)

- IC has BSSR dedicated work unit(s) such as a Division/Branch/Program with staff who exclusively handle BSSR grants and/or have expertise in BSSR
- IC does not have a BSSR dedicated work unit(s) but has Program staff who exclusively handle BSSR grants in their portfolio and/or have expertise in BSSR
- IC does not have a BSSR dedicated work unit or dedicated Program staff, but IC has BSSR grants spread across multiple Program staff
- Unsure
- Other

For the following questions, the response options were “yes,” “no,” or “unsure.” For a “yes” response, ICs were given a text box to elaborate or give examples.

2. In the past three years (FY19-FY21), has your IC developed any BSSR initiatives that resulted in a research or training workshop/conference?
3. In the past three years (FY19-FY21), has your IC published any BSSR-focused FOAs?
4. In the past three years (FY19-FY21), has your IC highlighted BSSR relevant scientific advances for Congressional reporting, press material, or other public communication?
5. In the past three years (FY19-FY21), has your IC led any collaborations between BSSR and non-BSSR colleagues within your IC to produce BSSR-focused projects or projects with a BSSR component? (Note: BSSR colleagues include staff who manage research, review, analysis, or communication about BSSR in the extramural program at NIH.)
6. In the past three years (FY19-FY21), has your IC led any collaborations between your IC and colleagues outside your IC within the NIH on BSSR-focused projects or projects with a BSSR component? (Note: BSSR colleagues include staff who manage research, review, analysis, or communication about BSSR in the extramural program at NIH.)
7. During the past three years (FY19-FY21), has your IC been involved with or been consulted in the development of NIH-wide research and training programs (such as those found on the <https://www.nih.gov/research-training/medical-research-initiatives>) specifically to provide a BSSR perspective?

# Appendix C. Analyses Conducted in Support of the Working Group Recommendations

As stated in [Appendix A](#), the working group considered the following analyses and data points in developing their recommendations:

- Strategic plans across the NIH
- Portfolio analyses
  - » Trends in grant awards and budgets
  - » Select resource and center grants
- Advisory Council membership
- NIH-wide survey of BSSR workforce and initiatives
- CSR analysis

These analyses are described in detail below.

## ***Strategic Plans Across the NIH***

The working group collected current (as of summer 2021) strategic plans at the NIH to read and assess the amount of BSSR integration.

Example characteristics of each level of integration are as follows:

- **Significant Integration**
  - » Includes BSSR in a strategic priority, goal, or objective
  - » Demonstrates impact of BSSR on specific health conditions
  - » Directly ties BSSR with non-BSSR research and expresses IC support
  - » Provides an example of a developed tool that integrates biomedical and behavioral science
- **Moderate Integration**
  - » Encourages cross-discipline communication but not specifically BSSR integration
  - » Recognizes that behavioral and social factors significantly contribute to health conditions, but does not identify BSSR contributions to the field
  - » Identifies behavioral approaches as recent research advances, but does not provide details of the intervention
- **Nominal Integration**
  - » Calls attention to BSSR only in relation to the NIH mission or in background material, or not at all
  - » Lists BSSR in a long list of disciplines but does not call out specific examples of application
  - » Admits barriers in clinical outcomes but does not propose BSSR interventions to address this
  - » Identifies BSSR-focused conditions in scientific priorities, but not behavioral interventions

## ***Portfolio Analyses***

Grants were identified as BSSR or non-BSSR using the Behavioral and Social Science [RCDC term](#). (Projects not coded as BSSR with the RCDC term were, by default, coded as non-BSSR.)

- **Trends in Awards and Budgets:** One of the first analyses the working group considered was trends in BSSR awards and budgets in relation to non-BSSR spending at the NIH to understand the current landscape and similarities or differences between the BSSR and non-BSSR portfolios. Ultimately, this portfolio included awarded, competitive (Types 1 and 2) RPGs between FYs 2010 and 2020. This accounted for 31,490 BSSR-coded projects. Within those 10 fiscal years, funding for BSSR increased, as did the number of BSSR projects awarded.

### ***Coding of BSSR Funding for the Summary Heatmap***

The percentage of BSSR funding from an IC was compared to the total funding (non-BSSR). Based on the percent of funding that was designated for BSSR, ICs were categorized into having “significant,” “moderate,” or “nominal” BSSR funding. Ten ICs were identified as having significant BSSR funding, three ICs were identified as having moderate BSSR funding, and 11 ICs were identified as having nominal BSSR funding. ICs that were identified as having significant BSSR funding had greater than 20 percent of their funding identified as BSSR, ICs that were identified as having moderate BSSR funding had 10 to 20 percent of their funding identified as BSSR, and ICs that were identified as having nominal BSSR funding had less than 10 percent of their funding identified as BSSR.

### ***Advisory Council Membership***

For the integration heatmap, ICs that were rated as having no Advisory Council members with primary BSSR expertise were coded as nominal, one member as moderate, and two or more members as significant. No IC Advisory Councils had zero members with BSSR expertise.

### ***Survey***

A survey was conducted to assess how BSSR is represented, organized, and integrated within the ICs’ extramural research programs. Through the IC planning and evaluation leads and the IC-designated representatives to the BSSR Coordinating Committee, the survey was widely disseminated to federal staff within each Institute and relevant Centers and Offices. The survey respondents excluded the intramural research programs and the Office of Director. Centers included in the survey were the Fogarty International Center, National Center for Advancing Translational Science, and National Center for Complementary and Integrative Health. The CSR was excluded from the survey because it does not have grant-making authority and was assessed separately.

The survey focused on the current BSSR workforce, as well as BSSR activities in the following areas in the past three fiscal years (FYs 2019–2021): research or training workshops, FOAs, NIH-wide research and training initiatives, internal IC collaborations, external IC collaborations, and scientific communication with the external community. The survey responses at each IC were coordinated through the IC’s planning and evaluation staff and BSSR Coordinating Committee representatives.

- **BSSR Workforce:** IC responses were coded as one or more of the following workforce organization models: BSSR “dedicated work unit(s),” BSSR “dedicated program staff” (who exclusively handle BSSR grants and/or have expertise in BSSR), and a distributed model (BSSR grants distributed among multiple program staff portfolios regardless of BSSR expertise). As noted, the responses to this survey item were used to inform working group recommendations, but these data did not lend themselves to ratings of nominal, moderate, or significant and so were not included in the heatmap.
- **IC-Specific or NIH-Wide Workshops and FOAs:** ICs that indicated that they had developed at least five initiatives that resulted in an IC-specific or NIH-wide research or training workshop in the past three years were deemed to have “significant” BSSR integration. Those that indicated fewer than five BSSR initiatives that resulted in a research or training workshop/conference in the past three years were deemed to have “moderate” BSSR integration. ICs that had not developed any BSSR initiatives that resulted in a research or training workshop in the past three years were deemed to have “nominal” BSSR integration. IC responses that indicated that they were “unsure” were not assigned a value and coded as grey in the heatmap.

- **Internal and External IC Collaboration:** ICs that indicated that they had led at least five collaborations between their IC and NIH colleagues outside of their IC or at least five collaborations between BSSR and non-BSSR colleagues within their IC to produce BSSR-focused projects or projects with a BSSR component in the past three years were deemed to have “significant” BSSR integration. Those with fewer than five collaborations were coded as having “moderate” BSSR integration. ICs that reported none were coded as “nominal” BSSR integration. ICs that responded that they were unsure in either or both types of collaborations were not assigned a value and coded as grey in the heatmap.
- **Scientific Communication:** ICs that indicated that they had highlighted BSSR-relevant scientific advances for Congressional reporting, press material, or other public communication at least five times in the past three years were deemed to have “significant” BSSR integration. Those that reported fewer than five times in the past three years were deemed to have “moderate” BSSR integration and “nominal” if they had not highlighted any. ICs that responded that they were unsure were not assigned a value and coded as grey in the heatmap.

### **CSR Analysis**

The NIH CSR serves an essential role within the NIH to coordinate and ensure fair and rigorous peer review of grant applications. The working group reviewed many of the recent evaluations and pilot programs CSR has been conducting as part of its continuous quality improvement processes. For example, CSR’s [ENQUIRE](#) program assesses the output of CSR’s study sections by scientific cluster and recommends changes to ensure the scientific scope and function of study sections are optimized to identify high-impact science. Each year ENQUIRE conducts several analyses within several study sections. The presentation focused on lessons learned after the ENQUIRE completed evaluation of three Integrated Review Panels that have a considerable BSSR focus: Healthcare Delivery/ Patient Outcomes (11 study sections), Functional/Cognitive Neuroscience (11 study sections), and Epidemiology and Population Sciences (9 study sections).

## Appendix D. List of ICs

### ***NIH Institutes***

NCI	National Cancer Institute
NEI	National Eye Institute
NHGRI	National Human Genome Research Institute
NHLBI	National Heart, Lung, and Blood Institute
NIA	National Institute on Aging
NIAAA	National Institute on Alcohol Abuse and Alcoholism
NIAID	National Institute of Allergy and Infectious Diseases
NIAMS	National Institute of Arthritis and Musculoskeletal and Skin Diseases
NIBIB	National Institute of Biomedical Imaging and Bioengineering
NICHD	Eunice Kennedy Shriver National Institute of Child Health and Human Development
NIDA	National Institute on Drug Abuse
NIDCD	National Institute on Deafness and Other Communication Disorders
NIDCR	National Institute of Dental and Craniofacial Research
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases
NIEHS	National Institute of Environmental Health Sciences
NIGMS	National Institute of General Medical Sciences
NIMH	National Institute of Mental Health
NIMHD	National Institute on Minority Health and Health Disparities
NINDS	National Institute of Neurological Disorders and Stroke
NINR	National Institute of Nursing Research
NLM	National Library of Medicine

### ***NIH Centers***

CC	NIH Clinical Center
CIT	Center for Information Technology
CSR	Center for Scientific Review
FIC	Fogarty International Center
NCATS	National Center for Advancing Translational Sciences
NCCIH	National Center for Complementary and Integrative Health

