Evaluation of the NIH Basic Behavioral and Social Science Research Opportunity Network Initiative: Executive Summary

October 2017

The National Institutes of Health (NIH) launched the Basic Behavioral and Social Sciences Research Opportunity Network (OppNet) in fiscal year (FY) 2009 to "pursue opportunities for strengthening basic behavioral and social science research (b-BSSR) at the NIH while innovating beyond existing investments" through two goals:

1. Advance basic behavioral and social science research through activities and initiatives that build a body of knowledge about the nature of behavior and social systems.
2. Expand the b-BSSR portfolio by opening opportunities to investigators who had not applied previously to NIH for b-BSSR funding or had applied previously but were unsuccessful or minimally so.

In September 2014, the NIH Office of Behavioral and Social Sciences Research (OBSSR) contracted with the IDA Science and Technology Policy Institute (STPI) to evaluate OppNet. STPI conducted a mixed-methods process and outcome evaluation using the following data sources:

- Surveys of OppNet and comparison Research Program Grant (R01) and Exploratory/Developmental Grant (R21) investigators
- Interviews with investigators who received OppNet Career Enhancement Awards (K18)
- Proprietary topic modeling of OppNet grants relative to the overall NIH portfolio of BSSR awards including b-BSSR
- Publications, as identified through NIH RePORTER, and bibliometric data about those publications
- NIH awards data[1]
- OppNet Requests for Application (RFAs), proposals, and annual reports
- Interviews with NIH program staff.

STPI researchers analyzed these data and came to a variety of conclusions regarding the engagement, research, training, and collaboration outcomes of the OppNet initiative as well as the processes by which OppNet was implemented. Findings (e.g., publications, number of subsequent research grants) were current as of June 2017 unless otherwise noted.

Advance basic behavioral and social science knowledge

As of June 2017, 391 distinct publications acknowledged OppNet; 262 from R01 and 133 from R21 awards. One OppNet R01 publication appeared in *Nature* and another in *JAMA*. The highest number of publications (40) from an OppNet award was R21 *Sleep and health in the social environment*, followed by R01 *Ecological link of psychosocial stress to exercise: Personalized pathways* with 26 publications.[2]

The mean average of publications was 7.7 for OppNet R01s and 4.8 per R21 awards. Of OppNet's 391 publications, 308 (79%) were cited at least once. Altogether, OppNet publications had 5,630 citations. The median Relative Citation Ratio (RCR) for OppNet R01 and R21 publications was 2.44 and 2.63, respectively, compared to 1.36 for (b-BSSR) R01 publications and 1.38 for R21 publications.

Table 1: Bibliometric information for OppNet R01 and R21 publications

Metric (Source)	R01 publications	R21 publications
Mean SNIP[3] ± SE (Scopus)	1.8 ± 0.1	1.8 ± 0.2
Mean SJR[3] ± SE (Scopus)	2.8 ± 0.2	2.9 ± 0.3
Median SNIP (Scopus)	1.4	1.3
Median SJR (Scopus)	2	1.9
Median NIH Relative Citation Ratio (RCR)	1.36	1.38
Mean ± SE NIH RCR	2.44 ± 0.26	2.63 ± 0.43

Source: STPI downloads of citations from OppNet publications from Scopus and the NIH iCite database, June 2017

Expand the b-BSSR portfolio by opening opportunities to investigators

There were 823 unique investigators (either PIs or co-PIs) who applied to at least one OppNet FOA between FY2011 and 2015. Of these, 30 percent (244 PIs) never had submitted a NIH R01 or R21 application. There was a statistically significant difference between the R01 and R21 RFAs with respect to the extent to which applicants previously had applied to NIH. Of the 412 R01 investigators, 95 (23%) had never applied for R01 or R21 funding; of the 411 R21 investigators, 149 (36%) had not applied previously for R01 or R21 awards. Over half (54%) of OppNet principal investigators were first-time R01 and R21 grantees. The majority of OppNet survey respondents self-reported that they would have been less likely to apply to NIH with their idea in the absence of OppNet.

Approximately half these new OppNet (OP) investigators applied for subsequent NIH R01 or R21 funding. A subset of these OP R-series grantees (33%) received NIH b-BSSR funding after their OppNet awards. OppNet R21 grantees received more subsequent b-BSSR awards than OP R01 awardees.

Eighteen OppNet R01 grantees are PIs on 25 subsequent NIH awards coded as BSSR (including 11 with awards coded by RCDC[4] as b-BSSR) and 13 OppNet R21 investigators are PIs on 26 subsequent NIH awards coded as BSSR (including 12 with

awards coded by RCDC as b-BSSR). STPI identified 10 awards that built on the OppNet research of R01 investigators and 13 awards built on the OppNet research of R21 investigators.

Table 2: Subsequent (b-)BSSR of OppNet investigators

Group	Number of PIs	% with subsequent awards	# subsequent (b-)BSSR grants
R01 PIs *	37	18	49%
R21 PIs *	42	13	31%
Total	78	30	38%

* = One OppNet PI received two OppNet grants in FY2011, R01AG044838, and R21DA033611. He received one subsequent award coded as b-BSSR (R01AG043458) and one subsequent award coded as BSSR but not b-BSSR (R01MH098098). Both are counted in each of the first two rows.

Given this pattern, STPI included all subsequent BSSR awards regardless of whether awards also were coded as b-BSSR. Eighteen OppNet R01 investigators received 25 subsequent NIH BSSR-coded awards totaling $37.4 million. OppNet's R21 PIs achieved an additional 26 (b-)BSSR grants totaling $42 million. (21 coded b-BSSR, 5 coded BSSR)

The amount funding that follows an OppNet grant and follows the scientific topic in the original project admittedly is cursory, yet portends scientific progress beyond the period of this evaluation. For each dollar of OppNet funding, OppNet R21 PIs received an average $1.10 of subsequent (b)BSSR funding. In contrast, for each dollar OppNet R01 PIs received, an average 45 cents of subsequent (b)BSSR funding linked to OppNet. STPI found OppNet R01 researchers to receive more overall NIH funds following their OppNet grants than OppNet R21 grantees ($25.2 million versus $16.0 million). Much of the subsequent OppNet R01-related funds were not coded as (b)BSSR, however.

K18 Mentored Research Training. STPI completed 20 interviews with researchers who received OppNet career enhancement awards (K18s) and four interviews with mentors and followed the K18 recipients' trajectories.

STPI found the K18s to meet their objectives. Most OppNet K18 investigators are established in their careers. Most mentees were mid-career investigators interested in expanding their research skills or methodologies. The K18 grants empowered investigators to gain skills through a mix of activities including research in mentors' laboratories, conferences, formal coursework, self-study, seminars, and workshops. All K18 mentees articulated enduring changes in their approach to research due to the K18-associated training in areas including clinical and translational research methodology (writing grants with human subjects, Institutional Review Board writing, and working with human subjects), experimental design methods in the mentor's discipline, data collection and analysis techniques, and specific technical methodologies.

OppNet K18 investigators receive subsequent funding to continue b-BSSR work. Eleven of the 27 OppNet K18 PIs (41%) received follow-on NIH b-BSSR funding linked to their OppNet K18 awards. STPI found the 13 subsequent NIH awards to these 11 PIs resulted in $20.7 million in funding (total costs as of Spring 2017), representing an average of $7.70 for each dollar NIH invested in OppNet K18 grantees. Moreover, the evaluation identified a continuing rationale for K18 activities, as there continues to be a dearth of available NIH mechanisms to support mid-career investigators who are looking to add biomedically oriented b-BSSR to their research portfolios.

During the interviews, most PIs stated that their collaborations with K18 mentors and/or collaborators continued. Some PIs launched research with scientists they met through their K18 projects. Participants reported not only that they gained and continue to use skills from their mentored awards, but also that this unique career experience uniquely influenced their overall scientific perspectives. Within STPI's interview sample, many PIs indicated that they learned how to think or speak like a scientist in another discipline and were better able to communicate in interdisciplinary settings. Interviewees indicated that their training informed new insights on their pre-K18 research, altered their general research approach, allowed them to pose research questions across the translational continuum. They also reported increased insight on how their original discipline's training informs their research perspectives and increased confidence on interdisciplinary teams. These latter outcomes are difficult to quantify; nevertheless, the participants considered them to be a valuable result of the K18 award process.

OppNet has unique concept development processes

STPI staff interviewed the leaders of all OppNet R01 and R21 Concept Development Teams and determined that the concept development process is the source of OppNet's uniqueness. Its concept development effort diverged from "standard" NIH processes in that its scientific ideas originated from many different sources including a January 2010 OppNet Request for Information ([RFI](#)) and a public workshop in October 2010. "Concept teams" of 4–9 volunteers (program directors) from multiple ICOs developed concepts in a true team effort that included a background literature review, a portfolio scan, and other gap analyses. A program-level Coordinating Committee provided guidance and the ICO Director-level Steering Committee provided feedback and concept clearance. Though participating NIH staff considered this process to be time-consuming, they found it worthwhile given the FOAs and research projects generated, the expertise learned and shared, and the trans-NIH contacts made that likely would not have occurred through other means. OppNet's unique structure helped develop a sense of community among behavioral, social, and basic scientists across NIH who continue to collaborate through and outside OppNet's current structure in FY2018.

Most of the challenges reported by team leaders were unique to a concept or concept team. The only issue reported consistently was the challenge of time commitment. Most team leaders reported that OppNet concept development required time-consuming meetings with team members, literature reviews, and portfolio scans in addition to the normal work duties of NIH program staff members. Nevertheless, all interviewees posited that the time taken was worthwhile given the research projects funded through the process.

There was consensus across NIH personnel interviewed that the rationale for the initiative remains strong. They considered OppNet to be the only mechanism to solicit b-BSSR that interests multiple NIH ICs and is independent of conditions, diseases, or target populations. According to the interviewees, the majority of NIH-supported, investigator-initiated, b-BSSR understandably tends to be specific to IC missions rather than relevant to multiple conditions, diseases, or population groups.

Finally, 100% of PIs (35/35) who responded to the survey considered OppNet to be a valuable initiative. Several PIs provided qualitative comments on the value of OppNet. A major rationale for OppNet's value is its focus on basic behavioral and social processes (rather than diseases/conditions) within biomedical contexts. A related reason provided is that OppNet supports b-BSSR that is relevant to, yet might not be funded by, any one IC. Finally, one commenter suggested that NIH needs more mechanisms that place behavioral and social science research at the same level as chemical or physical stressors, and that OppNet is valuable because it does so. Though the response rate to the comparison group investigator survey limits the comparability of findings, most respondents to that survey also noted that they were familiar with OppNet, and the majority of those who were familiar with OppNet indicated that they considered it to be valuable. Those who offered a justification for the value of OppNet suggested that the program provides a unique opportunity to fund important, interdisciplinary research.

STPI Recommendations
Based on the evaluation's findings, the STPI evaluation team made recommendations regarding the future of OppNet. The first recommendation is an overarching one, the three that follow correspond to the primary activity codes of OppNet awards, and the last recommendation concerns OppNet's goals.

Continue the OppNet initiative. Given the findings, STPI team members recommend that NIH continue the OppNet initiative. This recommendation is based on three primary findings. The first is that the OppNet-funded awards have been successful. The second is that OppNet-funded research has produced strong scientific output, including 391 publications that have been cited 5,630 times. Finally, OppNet PI survey respondents consider their research unlikely to be funded elsewhere at NIH, that OppNet increased their likelihood to apply for non-OppNet NIH b-BSSR awards, and that OppNet has enhanced their research and career trajectories. Moreover, the OppNet FOA concept development process is generally viewed by NIH staff participating in OppNet as a unique strength that is successful in identifying and refining targeted research areas.

Expand the use of K18 RFAs using FOAs with flexible application dates and domain areas rather than periodic, targeted solicitations. The OppNet K18 awards have been largely successful at relatively low cost per award; the evaluation identified a continuing need for them. STPI therefore recommends continuing and expanding OppNet's focus on the K18 approach. Moreover, STPI recommends a more flexible K18 FOA approach, especially making use of PARs,[5] would allow investigators to apply based on their schedules and career needs. Finally, if OppNet K18 FOAs also are

intended to attract new investigators to NIH-supported b-BSSR research, STPI recommends that NIH establish corresponding eligibility criteria and review processes.

Emphasize OppNet R21 FOAs that open new areas of b-BSSR inquiry and, perhaps, to attract new b-BSSR investigators. The outcome evaluation found that OppNet R21 RFAs have been more successful to date than OppNet R01 RFAs in terms of publications and subsequent award dollars per OppNet dollar invested. STPI therefore recommends that OppNet emphasize R21 solicitations for new scientific opportunities identified. If the OppNet R21 RFAs also are intended to attract new investigators to NIH-supported b-BSSR research, STPI recommends that NIH establish award eligibility criteria and review processes encourage applications from investigators who have not previously received NIH b-BSSR funding.

Revise OppNet goals consonant with three preceding recommendations. If STPI's recommendations are accepted, current OppNet goals should be revised accordingly. First, OppNet should emphasize initiation or seeding of new b-BSSR domains as its goal rather than to focus on "building" bodies of knowledge. Second, OppNet should emphasize the development of new b-BSSR investigators by expanding the K18 and R21 programs and encouraging applications from investigators who had not applied previously to NIH for b-BSSR funding or had applied previously but were unsuccessful or minimally successful. That said, attracting investigators without previous b-BSSR experience should not be considered a major program goal. Finally, OppNet should certainly retain the goal of focusing on basic mechanisms of behavior and social processes and building upon existing NIH b-BSSR investments without replicating them.

Endnotes

1. OppNet lists all its awards at, https://oppnet.nih.gov/funding/. Multiple-year projects appear only once, by the first year in which each project was funded.

2. To account for the possibility that these two outliers disproportionately influence the reported results, STPI staff re-ran the bibliometric analyses without them. The two outliers had some influence on the publication results, as follows:
   - The mean publications per award declines from 7.5 publications per award for the R01s to 7.2 and from 3.4 for the R21s to 3.2.GLM is still significant ($p < 0.001$), showing that the R21 awards have significantly fewer number of publications per award than the R01s ($p < 0.001$).
   - The median publications per award remains unchanged for the R01s (6 publications) but declines from 2 to 1 for the R21s.
   - Cost per publication increases from \$214,000 to \$238,000 for the R01s and from \$110,000 to \$157,000 per publication for the R21s.
   - Average citations per publication (including publications with 0 citations) increases from 13.8 to 14.6 for the R01s and from 14.9 to 15.1 for the R21s. The difference between R01 and R21, which was previously statistically significant ($p = 0.02$) is no longer significant ($p = 0.27$).

3. These are reporting abbreviations from [Scopus](#), an abstract and citation database of scientific peer-reviewed literature:
   - SNIP: <u>S</u>ource <u>N</u>ormalized <u>I</u>nput per <u>P</u>aper
   - SJR: <u>S</u>CImago <u>J</u>ournal <u>R</u>ank

4. [RCDC](#) is the abbreviation for NIH's <u>R</u>esearch, <u>C</u>ondition, and <u>D</u>isease <u>C</u>ategorization system.

5. PAR is the abbreviation for a <u>P</u>rogram <u>A</u>nnouncement with special <u>r</u>eceipt, <u>r</u>eferral and/or <u>r</u>eview considerations.

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