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Concept Clearance: September 2022
Accelerating Behavioral and Social Science Through Ontology Development and Use

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Background:
As with all biomedical research, behavioral and social sciences research (BSSR) findings have exploded over the past 25 years. The flood in the quantity and complexity of data presents considerable challenges in our ability to structure, mine, standardize, and integrate information within and across health domains. To address these challenges, the biomedical sciences have increasingly turned to semantic knowledge structures (e.g., controlled vocabularies, taxonomies, and ontologies) to reflect and represent the current state of knowledge (Gruber, 1995) and to create and support data resources that are findable, accessible, interoperable, and reusable.

Ontology development and use is essential to accelerating cross-disciplinary discovery in BSSR. Use of ontologies will also facilitate BSSR to be more fully integrated into the larger biomedical research enterprise. Currently, there are few interoperable knowledge structures in health-related BSSR, and BSSR terminology has not been well-integrated into standard controlled vocabularies such as MeSH. In addition, within and across sub-fields of BSSR, there are unique definitional challenges to overcome. For example, there is a proliferation of separate theories, constructs, and associated measures. This, in turn, makes it difficult to compare within and across lines of research due to constructs with the same name meaning different things or constructs with different names meaning the same or similar things. For example, in some fields, the terms self-regulation, emotion regulation, and cognitive control may be used interchangeably; in other areas, distinctions between these constructs may be critical.

Rigorous and reproducible BSSR requires clear and consistent definitions of social and behavioral phenotypes, outcomes, and intervention components to allow effective communication between scientists and across scientific disciplines. It also requires a better understanding of the relationships between concepts. Further, identifying targets for behavioral interventions requires the ability to measure and describe a wide range of social and behavioral factors and outcomes across disciplines and diseases. Therefore, BSSR knowledge structures that include clear definitions and delineate inter-relationships must be developed and enhanced. Finally, to be truly useful, ontologies must be interoperable and widely adopted. This requires strong use cases to demonstrate an enhanced capacity to solve widespread and important problems.

As noted in a recently published NIH- and other agency-sponsored, National Academies of Science, Engineering and Medicine (NASEM) consensus study; Ontologies in the Behavioral Sciences Accelerating Research and the Spread of Knowledge: 1) "Ontology development and use has the potential to move behavioral science forward from a domain in which research is generally siloed and the data and results are often incompatible to one in which the evidence is searchable and more easily integrated and in which computer technology is leveraged in the discovery of new relationships, the development of novel hypotheses, and the identification of knowledge gaps." 2) "Although ontologies are central to the advancement of science, there are no existing funding mechanisms for the development and maintenance of such systems and for the tools that support them. Sustained public and private support for the long-term development, dissemination, and maintenance of ontologies in the behavioral sciences and related tools is needed."

Initiative Scope and Objectives:

This initiative builds on five years of work by an NIH-wide working group of the BSSR-Coordinating Committee, the recent NASEM consensus study, and a recommendation in the May 2022 Council of Council's Working Group report on the Integration of BSSR at the NIH. The proposed research consortium would include two major components, each with several functions:

Coordination and Dissemination Center: This Center will provide consortium-wide functions to include: 1) coordination and convening to foster collaboration, share results, address common challenges, and facilitate cross-project learning; 2) provision of ontology-related computational and informatics technical expertise and support; 3) compilation and dissemination of lessons learned, best practices, and other resources to support ontology expansion or development, uptake, and sustainable use; and 4) active outreach to and coordination with other relevant entities (e.g., existing semantic knowledge structures within and outside of BSSR, journal editors, or other research organizations) to increase understanding of and demand for BSSR ontology-related tools and resources.

Research Project Network: This network will support independent but collaborative and interactive research projects focused on behavioral or social science focused ontology expansion or development, dissemination, and use. The projects must include multi-disciplinary teams of subject matter experts in both BSSR and ontology related informatics. Each project will identify one or more use cases and elucidate the justification and motivation for the proposed ontological resource or tool. Examples of use cases include, but are not limited to, those listed in the NASEM consensus study (see Appendix B). The ontological tools or resources can address health-relevant social and behavioral constructs, measures, and/or interventions. Projects will advance research capabilities and efficiencies and address problems not easily solved without improvement in semantic knowledge structures. Each project must have a plan for active and ongoing engagement with the intended end-users throughout the development and deployment of the resources or tools.

Research supported through this initiative will be required to provide a strong justification for "fit for use," test innovative models of ontology development and refinement, be interoperable with or build upon existing health-related semantic knowledge structures within and outside of BSSR and have a detailed plan for dissemination and sustainability. The BSSR semantic knowledge practices developed in this initiative will be modeled on (and where possible, expand upon) successful efforts in biomedicine and aligned with data standards and principles (e.g., FHIR and FAIR). This initiative will encourage the development of BSSR knowledge structures that can build on and/or interface with existing knowledge structures and data repositories.

Deliverables across the initiative will include multiple sustainable research resources such as enhanced ontological infrastructure and technology platforms to facilitate data integration and exchange; advanced computational methodologies to develop and curate ontologies more rapidly in the future; tools to support ontology dissemination and use; and formation of professional networks to engage, inform, and build capacity for ontology use in BSSR. Achieving these goals will ensure that BSSR data can efficiently be accessed, transmitted, interpreted, and aggregated across research and clinical systems to accelerate discovery, increase the return on investment in research, and ultimately improve public health.

OBSSR will provide the funding for 5 years of this initiative with the possibility of additional funding from the participating Institutes and Centers. FOAs are anticipated to be issued in fiscal year 2023 with funding in fiscal year 2024.