TITLE: R3PEATS: **R**igor, **R**eplicability, & **R**eproducibility to **P**romote **E**xcellence, **A**ccuracy, & **T**ranslation in **S**cience

INTRODUCTION: This revised concept was originally presented at the January 2026 Council of Councils meeting, and Council members were enthusiastic about a program to promote rigor, replicability, reproducibility, and culture change. However, Council members expressed a desire for additional detail and clarifications to ensure feasibility and impact, a greater focus on rigorous research practices and aligning incentives for culture change, broader participation by individual laboratories, and additional mechanisms for identifying replicable research and integrating innovation. The revised concept described below maintains the prior concept's fundamental foundation while clarifying the focus and adding new features to address these concerns. Specifically:

1. To address the desired emphasis on *the rigor of primary research as a prerequisite for replicability and reproducibility*, we clarified and enhanced opportunities for identifying, employing, testing, and disseminating rigorous research practices across the proposed Initiatives.
2. To address *the importance of culture change and addressing incentive structures*, the role of *all initiatives* in contributing to culture change has been clarified and bolstered, and an additional component has been added to Initiative 3 to provide "Rigor Scholar Awards" to promote buy-in from institutions to support researchers.
3. To address *unclear outcomes from prior NIH initiatives*, these outcomes have been provided in a table in the slide deck with a mapping of how the lessons learned were considered during R3PEATS program design.
4. To address *varied perspectives about staggering different programmatic components*, we clarify synergies and timelines: although all Initiatives start at the same time, subprojects within Initiatives do not (see text below).
5. To address concerns that *only a small group of studies would be selected for replication* and to address Council members' desire for *integrating innovative research*, Initiative 4 now contains a new component to support nationwide calls for small, innovative projects that address replication and expansion.
6. To address comments about *lack of detail*, the *need for clear definitions,* and a desire for *additional metrics for identifying rigor and replicability*, additional detail has been added throughout the proposal.

BACKGROUND: R3PEATS addresses the critical need for increased rigor, replicability, and reproducibility in biomedical research—key factors in advancing reliable and innovative knowledge acquisition to improve health outcomes and extend healthy lifespan. The terms replicability and reproducibility have different meanings and uses across scientific fields, which has led to confusion in collectively understanding problems in this area. To enhance clarity, we use the following definitions for the purposes of this report (per NIH, the NIH's Leading in Gold Standard Science report, and the OSTP Memo on Implementing Gold Standard Science):

- **Scientific Rigor:** "the strict application of the scientific method to ensure robust[,] unbiased, [and transparent] experimental design, methodology, analysis, interpretation and reporting of results."
- **Replicability:** "the ability to perform the same experiment or study using the same methods and conditions to achieve the same result." [Experiments testing this are referred to below as "**direct replications**".]
- **Reproducibility:** "the ability of independent researchers to test a hypothesis through multiple methods and consistently achieve results that confirm or refute it, ensuring findings are generalizable and robust across different approaches." [Experiments testing this are referred to below as "**conceptual replications**".]
- **Transparency:** "the open, accessible, and comprehensive sharing of all components of the research process—methodologies, data, analytical tools, and findings—to enable stringent scrutiny, validation, and reuse by the scientific community and the public."

NIH has shown sustained commitment to rigor and reproducibility through initiatives in research quality, responsible data management and sharing, education, and community outreach; however, research replication efforts and cross-sector coordination remain limited within and beyond NIH and have not yet led to widespread culture change. This goal-driven program builds on lessons learned to create unprecedented opportunities for **collaboration** and **systematic investigation** into the factors that shape replicability and reproducibility and, ultimately, reliability. R3PEATS seeks to create a synergy of **research, partnership, engagement, and coordination** to drive culture change to better promote rigorous, transparent, replicable, and reproducible practices that benefit NIH-funded research, the wider scientific community, and the general public. Due to their different approaches, distinct contributions to knowledge, and the somewhat blurred boundaries between them, both direct and conceptual replications are within scope for investigation and intervention by R3PEATS Initiatives.

PROGRAM GOALS: (1) directly promote and support comprehensive **infrastructure, projects, training, incentives, and public engagement** to enhance research rigor and replicability; (2) deliver an accessible, well-documented **knowledgebase** of high-priority replicated biomedical research, experimental factors/practices that enable or hinder replicability, and resources to optimally incentivize rigorous and replicable work; and (3) unite a broad spectrum of **public partners** (e.g., academia, publishing, industry, nonprofits, public) to work collaboratively to foster rigorous, replicable research. These novel, synergistic efforts will enable an adaptable, sustainable research enterprise where rigor, replicability, and reproducibility are the cultural norm, thereby catalyzing more reliable health science discoveries.

PROPOSED INITIATIVES:

R3PEATS comprises four interconnected Initiatives, and unique features of each are below. A Steering Committee of external experts will be nominated by R3PEATS awardees (see Initiative 4) and approved by NIH to serve in an advisory capacity, provide broad vision across all Initiatives, and review individual project proposals (see below). A separate R3PEATS Consortium of awardees will share best practices/lessons learned between Initiatives to promote a consistent understanding and share lessons learned across functional areas in real time.

1. Replication Centers (Research): Multi-site collaborations organized around specific methodological expertise and capacity (e.g., *in vitro* assays, behavioral measures, data science).

- **Direct and Conceptual Replication**: Plan (Year 1) and conduct (starting in Year 2) high-impact replications identified by the external community, identify novel modulators of research outcomes that could explain "why" something does (not) replicate (e.g., biological variability, confounds, experimental design, chance), and serve as an independent "reading center" for the scientific community by measuring the strength of evidence (e.g., effect size, variability, risk of bias) for findings that have broad scientific interest. The Steering Committee (see Initiative 4) provides merit review of new projects, which will have start dates staggered over Years 2-5.
- **Rigor and Replication Infrastructure:** Model, troubleshoot, and implement rigorous scientific approaches (e.g., pre-study protocol validation/standardization, preregistration, blinding/masking, randomization, detailed workflows/protocols, responsible data management and sharing, transparent reporting) to reduce barriers for members of the broader scientific community to integrate these processes into their own replication work.
- **Replication Criteria:** With the R3PEATS Consortium, predefine thresholds of replication "success" and "failure" (e.g., within confidence intervals, statistical significance, direction of effect) for each experiment and place results into the broader context of scientific evidence beyond a binary "success" metric.
- **Best Practices/Lessons Learned:** Will include rigor/replication processes that need to be optimized across laboratories and laboratory practices for scientists to prioritize in the future.

2. Metascience Testbeds (Partnership): Cross-sector partnerships (e.g., publishers, science societies, institutions) to test infrastructure, incentives, and other culture change interventions to enhance replicability.

- **Validated Toolbox:** Engage with the scientific community (beginning Year 1) to develop a toolbox of validated algorithms and metrics to identify replications in the literature, assess rigor of research practices, synthesize evidence for research questions, and quantify individual and institutional efforts to promote replicability (e.g., number of replications performed, replication-related mentorship).
- **Intervention:** Employ new (or modified) policies, processes, and/or resources in various research sectors (e.g., institutional accountability, promotion & tenure criteria, publication formats/requirements, assessment metrics, subsidization of specialized personnel and equipment/software) and evaluate effects on research practice, rigor, replicability, and scientific advancement. Interventions will be refined and validated over time using R3PEATS lessons learned to optimize the target (e.g., rigorous research practices) and approach (e.g., dissemination), with the potential to initiate new partnerships and projects in later award Years.
- **Landscape Analysis:** Periodically review the research ecosystem (e.g., institutional resources, funding structures, research dissemination approaches) to identify gaps and opportunities in promoting optimal scientific practice, impact, and accountability. This includes assessments of how well new and promising interventions (from inside or outside of R3PEATS) are integrated/adopted system-wide, which will inform both *evaluation* of Initiative 2/overall R3PEATS endeavors and *modifications* to integrate across R3PEATS over time.
- **Best Practices/Lessons Learned:** Will include metrics and interventions useful across sectors/Initiatives, optimized incentive structures, and prioritization of interventions for the scientific enterprise.

3. Education and Outreach Center (Engagement): Multi-stakeholder engagement (e.g. trainees, educators, investigators, peer reviewers, societies, publishers, the public) to identify gaps in knowledge, improve research capacity building, strengthen science communication, and build lasting trust in rigorous, reproducible research.

- **Training Resources:** In Year 1, develop a foundational rigor curriculum (e.g., hypothesis development, blinding, randomization, preregistration of protocols/analysis plans, statistical analysis, replication designs, responsible data management and sharing, transparent reporting, evidence synthesis) that can be tailored to address specific gaps from inconsistent training across individual training programs and laboratories, which will improve collective rigor and replication knowledge and skills. Existing training resources will be evaluated, centralized, and optimized for specific settings, and in Years 2-5 lessons learned from all R3PEATS initiatives (e.g., important laboratory practices, optimized training incentives/metrics) will be integrated. Materials will be adapted for lectures, flipped classrooms, laboratories, workshops, online platforms, and certification/ continuing education and will promote consistent understanding of best practices across research fields.
- **Rigor Scholar Awards:** Beginning in Years 2 and 3, administer cohort-based development and support awards for new faculty that will hold institutions accountable for providing resources (e.g., mentoring, infrastructure) and incentives (e.g., promotion and tenure criteria) to stimulate rigor and replicability. The Steering Committee (see Initiative 4) will provide merit review of proposed projects in Years 1 and 2.
- **Outreach and Communication:** Launch efforts (e.g. webinars, podcasts, knowledge-constructing symposia, public awareness campaigns, interactive forums) to enhance dialogue, understanding, and buy-in via partnerships with scientists, institutions, policymakers, publishers, and the public. This will foster awareness and sustain culture change that values rigorous, reproducible research to accelerate innovation.
- **Best Practices/Lessons Learned:** Will include optimal training and communication paradigms.

4. Coordination and Review (CoRe) Center (Coordination): Cross-initiative coordination and administrative and logistical support for all Initiatives to enable efficient operations, long-term sustainability, and culture change.

- **Web portal/Knowledgebase:** Create and maintain a centralized web portal/knowledgebase to capture, synthesize, and disseminate program outcomes (e.g., project summaries, links to datasets and protocols in external repositories), best practices (e.g., SOPs), and lessons learned across all Initiatives. This may include developing new frameworks to standardize, harmonize, and track R3PEATS-specific measures and outcomes that could benefit the wider scientific community (e.g. replication ontologies) and provide novel insights.
- **Coordination:** Foster communication and stewardship across the program by organizing and managing an awardee-based R3PEATS Consortium to support day-to-day operations across Initiatives (e.g., collaborations, lessons learned, idea-sharing) and a R3PEATS Steering Committee of external experts from various scientific sectors to serve in an advisory capacity to provide R3PEATS with strategic guidance, oversight, and review.
- **Merit Review:** Staggered across Years 1-4, coordinate the Steering Committee's merit review (which will focus on feasibility and the potential for high/broad impact) and selection (in collaboration with NIH) of proposed Replication Center projects, Innovation Awards (see below), and Rigor Scholar Awards.
- **Innovation Awards:** Administer and monitor small, pilot-like awards (starting in each of Years 2-5) that stimulate a broader group of biomedical researchers to directly or conceptually replicate potentially high-impact prior studies, and based on the results, expand into novel areas.

DELIVERABLES: Expected deliverables from R3PEATS include the following:

1. A **knowledgebase** of important and broadly applicable experimental and biological **contributors to variability**, heterogeneity, and replicability; **best practices** in the laboratory; and optimized **incentive structures**.
2. Publicly accessible evidence base of rigorously **replicated NIH mission-relevant studies**, novel **validated metrics** for assessing and stimulating replication activities, and **infrastructure** to support further efforts.
3. A cadre of **researchers** newly participating in and promoting highly rigorous and replicable research.
4. A curated collection of **effective educational resources**, curricular activities, guidance documents, and incentive implementation plans to strengthen rigorous and replicable research practices.
5. Enhanced **communication channels** between the scientific community and the public.
6. A network of **strategic partnerships** to test, champion, and sustain community-wide efforts to promote rigorous, transparent, replicable, and reproducible research to provide a strong evidentiary foundation, catalyze reliable scientific discoveries, and transform human health outcomes.

BUDGET: $161.71M total costs over 5 years.

TABLE 1 – BUDGET SUMMARY Costs in Millions

Initiative (Number of Awards)	**Lead IC**	**FY27** (Year 1)	**FY28** (Year 2)	**FY29** (Year 3)	**FY30** (Year 4)	**FY31** (Year 5)	**Total**
Initiative 1 - Replication Centers (4)	TBD	7.20	16.80	16.80	16.80	16.80	74.40
Initiative 2 - Metascience Testbeds (3)	TBD	5.45	9.95	9.95	9.95	4.95	40.25
Initiative 3 - Education and Outreach Center (1)	TBD	3.42	3.85	5.10	6.50	5.50	24.37
Initiative 4 - Coordination and Review Center (1)	TBD	2.61	4.12	4.12	4.12	3.97	18.94
RMS - NIH staff salary/travel; NIH-organized workshops	TBD	0.75	0.75	0.75	0.75	0.75	3.75
Grand Total		**19.43**	**35.47**	**36.72**	**38.12**	**31.97**	**161.71**

Note: Funding ramps between FY27 and FY30 as initiative operations, Innovation Awards, and Rigor Scholar Awards begin and mature, then declines in FY31 as selected activities sunset or step down.