U.S. Department of Health and Human Services (HHS)
National Institutes of Health (NIH)
Office of the Director (OD)
Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI)

Council of Councils Meeting
January 19–20, 2023

Meeting Minutes

Day 1

I. CALL TO ORDER AND INTRODUCTIONS

Robert W. Eisinger, Ph.D., Acting Director, DPCPSI, welcomed participants, NIH staff members, and members of the public to the meeting of the Council of Councils. The virtual meeting began at 10:15 a.m. on Thursday, January 19, 2023. The meeting attendees are identified below.

Dr. Eisinger recognized the retirement of Dr. Betsy Wilder, the first Director of the Office of Strategic Coordination (OSC); Dr. Doug Sheeley will serve as Acting OSC Director. Dr. Joe Betz, the Acting Director of the Office of Dietary Supplements (ODS), also retired, and Dr. David Murray, the Director of the Office of Disease Prevention, will serve as Acting ODS Director. Dr. David Wilson, Director of the Tribal Health Research Office (THRO), is on detail to the White House Council on Native American Affairs, so Robin Kawazoe, Deputy Director of DPCPSI, will serve as Acting THRO Director. Dr. Eisinger then reviewed the day's agenda.

A. Attendance

1. Council Members

Council Members Present

Chair: Robert W. Eisinger, Ph.D., Acting Director, DPCPSI
Executive Secretary: Franziska B. Grieder, D.V.M., Ph.D., Director, Office of Research Infrastructure Programs (ORIP), DPCPSI
Maria Rosario G. Araneta, Ph.D., M.P.H., University of California, San Diego, La Jolla, CA
Kristin Ardlie, Ph.D., Broad Institute of Harvard and Massachusetts Institute of Technology, Cambridge, MA
Linda Chang, M.D., FAAN, FANA, University of Maryland School of Medicine, Baltimore, MD
Graham A. Colditz, M.D., Dr.P.H., M.P.H., Washington University School of Medicine in St. Louis, St. Louis, MO
Andrew P. Feinberg, M.D., M.P.H., Johns Hopkins University School of Medicine, Baltimore, MD
Rick Horwitz, Ph.D., Allen Institute for Cell Science, Seattle, WA
Kevin B. Johnson, M.D., M.S., FAAP, FACMI, FAMIA, Annenberg School for Communication, University of Pennsylvania, Applied Informatics, Children's Hospital of Philadelphia, Philadelphia, PA
R. Paul Johnson, M.D., Emory University School of Medicine, Atlanta, GA
Karen C. Johnston, M.D., M.Sc., University of Virginia, Charlottesville, VA
Paul J. Kenny, Ph.D., Icahn School of Medicine at Mount Sinai, New York, NY

Sachin Kheterpal, M.D., M.B.A., University of Michigan Medical School, Ann Arbor, MI
Gary A. Koretzky, M.D., Ph.D., Weill Cornell Medical College, New York, NY
Richard D. Krugman, M.D., University of Colorado School of Medicine, Aurora, CO
Jian-Dong Li, M.D., Ph.D., Georgia State University, Atlanta, GA
Kevin C. Kent Lloyd, D.V.M., Ph.D., University of California, Davis, Davis, CA
Edith P. Mitchell, M.D., FACP, Thomas Jefferson University, Philadelphia, PA
Megan O'Boyle, Phelan-McDermid Syndrome Data Network, Arlington, VA
Rhonda Robinson-Beale, M.D., UnitedHealth Group, Minneapolis, MN
Susan Sanchez, Ph.D., The University of Georgia, Athens, GA
Jean E. Schaffer, M.D., Joslin Diabetes Center, Harvard Medical School, Boston, MA
Scout, Ph.D., National LGBT Cancer Network, Pawtucket, RI
Anna Maria Siega-Riz, Ph.D., M.S., University of Massachusetts Amherst, Amherst, MA
Russell N. Van Gelder, M.D., Ph.D., University of Washington, Seattle, WA

Council Members Absent

Patricia D. Hurn, Ph.D., R.N., University of Michigan, Ann Arbor, MI
Charles P. Mouton, M.D., M.S., M.B.A., The University of Texas Medical Branch at Galveston, Galveston, TX

2. Liaisons

Janine A. Clayton, M.D., Director, Office of Research on Women's Health (ORWH), DPCPSI
Maureen M. Goodenow, Ph.D., Director, Office of AIDS Research (OAR), DPCPSI
Susan K. Gregurick, Ph.D., Director, Office of Data Science Strategy (ODSS), DPCPSI
Franziska B. Grieder, D.V.M., Ph.D., Director, ORIP, DPCPSI
Christine M. Hunter, Ph.D., ABPP, Acting Director, Office of Behavioral and Social Sciences Research, DPCPSI
Robin I. Kawazoe, Acting Director, THRO
Christopher J. Lynch, Ph.D., Acting Director, Office of Nutrition Research (ONR), DPCPSI
Rebecca A. Meseroll, Ph.D., on behalf of **George M. Santangelo, Ph.D.,** Director, Office of Portfolio Analysis, DPCPSI
David M. Murray, Ph.D., Director, Office of Disease Prevention, DPCPSI, and Acting Director, ODS, DPCPSI
Karen L. Parker, Ph.D., M.S.W., Director, Sexual & Gender Minority Research Office (SGMRO), DPCPSI
Douglas M. Sheeley, Sc.D., Acting Director, OSC, DPCPSI
Marina L. Volkov, Ph.D., Director, Office of Evaluation, Performance, and Reporting, DPCPSI

3. *Ex Officio* Member Absent

Tara A. Schwetz, Ph.D., Acting Principal Deputy Director, NIH

4. Presenters

Ishwar Chandramouliswaran, M.S., M.B.A., Lead, Findable, Accessible, Interoperable, and Reusable (FAIR) Data & Resources, ODSS, DPCPSI
Susan K. Gregurick, Ph.D., Director, ODSS, DPCPSI
Ashok Krishnamurthy, Ph.D., Deputy Director, Renaissance Computing Institute (RENCI)
Christopher J. Lynch, Ph.D., Acting Director, ONR, DPCPSI
Jian Ma, Ph.D., Ray and Stephanie Lane Professor of Computational Biology, School of Computer Science, Carnegie Mellon University

Clay Mash, Ph.D., Program Officer, Environmental influences on Child Health Outcomes (ECHO) Cohorts, ECHO Program
Stephanie J. Murphy, V.M.D., Ph.D., DACLAM, Director, Division of Comparative Medicine (DCM), ORIP, DPCPSI
Geeta J. Narlikar, Ph.D., Professor of Biochemistry and Biophysics, Lewis and Ruth Cozen Chair I, University of California, San Francisco
Karen L. Parker, Ph.D., M.S.W., Director, SGMRO, DPCPSI
Ana Pombo, D.Phil., Professor, Institute of Biology, Humboldt University of Berlin; and Group Leader, Max Delbrück Centre for Molecular Medicine
Ananda L. Roy, Ph.D., Assistant Director, Transformational Science and Discovery, OSC, DPCPSI
Lori A.J. Scott-Sheldon, Ph.D., Chief, Data Science and Emerging Methodologies in HIV Program, Division of AIDS Research, National Institute of Mental Health (NIMH), NIH
Heidi J. Sofia, Ph.D., Program Director, Division of Genomic Medicine, National Human Genome Research Institute (NHGRI), NIH
Lawrence A. Tabak, D.D.S., Ph.D., Performing the Duties of the Director, NIH

5. NIH Staff and Guests

In addition to Council members, presenters, and Council liaisons, others in attendance included NIH staff and interested members of the public.

B. Announcements and Updates

Franziska B. Grieder, the Executive Secretary for the NIH Council of Councils, reviewed the following:

- Council members are Special Government Employees during the days of Council meetings and are therefore subject to the rules of conduct governing federal employees.

- Each Council member submitted a financial disclosure form and conflict-of-interest statement in compliance with federal requirements for membership on advisory councils. The financial disclosures are used to assess real and perceived conflicts of interest, and Council members must recuse themselves from the meeting during discussions of any items for which conflicts were identified.

- Time is allotted for discussion among the Council members and presenters, but time for comments from other meeting attendees is limited. The public may submit comments in writing; instructions are available in the *Federal Register* notice for the meeting, which was published on December 5, 2022, and January 17, 2023.

- Minutes from the September 8–9, 2023, meeting are posted on the DPCPSI website. The minutes from this meeting also will be posted there.

C. Future Meeting Dates

The next Council of Councils meeting is scheduled for May 11–12, 2023, and the final meeting of 2023 is scheduled for September 7–8.

II. OSC PROGRAM UPDATE: 4D NUCLEOME (4DN)

Ananda L. Roy, Ph.D., Assistant Director, Transformational Science and Discovery, OSC, DPCPSI, introduced the Common Fund's 4DN project, which is designed to better understand the constraints, interactions, and structure–function relationships of genomic folding in space and time, as well as how

this folding affects human health. The first phase of the program began in 2015, and the second phase began in 2020 and will run through 2024. The organizational hub and data coordination center have remained the same throughout the program to maintain stability and continuity.

The first phase focused on establishing tools and principles for spatio-temporal mapping of nuclear architecture; the second phase aims to emphasize the relationship between spatial organization and function and to determine the biological significance of nuclear architecture in normal and disease states. Dr. Roy noted that among many phase 1 accomplishments, one of the most exciting is that 4DN is the first major biologic consortium to adopt pre-print sharing of publications through bioRxiv, a model that has been adopted by other consortia.

Ana Pombo, D.Phil., Professor, Institute of Biology, Humboldt University of Berlin, and Group Leader, Max Delbrück Centre for Molecular Medicine, provided examples of 4DN research in progress at the midpoint of phase 2. She explained that understanding 3D genome folding is a highly challenging problem because organization of the genome occurs at so many layers of folding, with regulatory mechanisms acting at all scales. Many factors modulate gene regulation, and 4DN activities have shown that the conformation of chromatin inside the nucleus and the proximity of genes to their regulatory regions also affect regulation. Additionally, genome folding is highly dependent on cell type, so researchers must study the exact cell types in which particular disease mechanisms are important.

3D genome mapping allows researchers to look for target genes in complex and rare diseases, which often are polygenic and not always familial. These diseases can be induced by environmental factors; sometimes have very small numbers of patients; and are affected by mutations throughout the genome, often in regulatory and noncoding regions. Connecting variants to target genes is additionally complicated by variation in 3D genome topology among cell types, demonstrating the importance of developing technologies such as those used in 4DN that can map the topology of the genome across cell types.

Jian Ma, Ph.D., Ray and Stephanie Lane Professor of Computational Biology, School of Computer Science, Carnegie Mellon University, elaborated on the unique value of this consortium, which supports a diverse set of projects with various conceptual foci and levels of technical expertise. The consortium embraces the open sharing of data, new ideas, and manuscript preprints and encourages standardization of protocols, evaluation approaches, methods, and analyses. Collectively, these efforts enable more affordable mapping and analysis of the nucleus, further disseminating new technologies and methods to individual researchers in the broad biomedical community. The 4DN program also promotes mentoring and includes the next generation of researchers at the forefront of 4DN projects.

Dr. Ma noted several early successes enabled by collaborations, including creating a working group to collect and integrate genomic and imaging data, establishing two major cell lines, and producing various types of genomic mapping data to benchmark technologies and methods. The consortium developed several integrative analysis approaches, including one that allowed researchers to show distinct genome-wide stratification of various types of structural and functional properties. This integrated structural modeling framework is being further developed in phase 2. It can produce ensemble single-cell structures that are statistically consistent with many different data sets. This type of approach also can produce information that is not part of the input data, such as cell-to-cell variability of distances to nuclear bodies or radial positions in the nucleus. The unique information enabled by these integrative modeling approaches can allow researchers to provide a more comprehensive view of both the structure and variability of what? A phase 2 working group is developing modern artificial intelligence (AI) and machine-learning models to identify genetic variants important to 4DN research. The working group aims to use 4DN data to establish a series of machine-learning methods applicable to DNA sequences, 3D genome features, and genome function.

Geeta J. Narlikar, Ph.D., Professor of Biochemistry and Biophysics, Lewis and Ruth Cozen Chair I, University of California, San Francisco, shared case studies of ongoing research in phase 2 and some unique opportunities. Many researchers are studying how cohesin, which has been identified as one of the main genome-regulating proteins, regulates genome folding. Cohesin also engages in the cell cycle and DNA replication, so separating these actions from those in the genome organization is critical to studying its function. Several 4DN researchers are studying this research frontier, and other 4DN researchers are developing tools to assess genome folding at different time scales. Dr. Narlikar noted that the fourth dimension referred to in the 4DN name is time, which can be applied to both developmental time and how individual molecules interact with one another and with parts of the genome as it folds. Mapping these dynamics involves unique challenges; however, 4DN researchers have been able to assess how some genome regions loop at various points in time. Future research will assess whether differentiated cell types have different dynamics. These studies help researchers better understand the equilibrium of genome looping and its relation to gene expression.

In phase 2, 4DN also aims to thoroughly assess the biophysical mechanisms that underly genome organization. Dr. Narlikar's laboratory discovered that heterochromatin phase separation can explain how heterochromatin is organized to sequester chromatin and exclude activating factors. Other researchers have shown that phase separation mechanisms can explain how active regions are sequestered to potentially increase the local concentration of activators and promote transcription. Two key questions that remain are how much phase separation matters for gene expression? and how to study the role of phase separation in live cells? Pioneering work from phase 1 grantees developed optogenetic tools for localized control of the phase separation of low-abundance proteins. In phase 2, a different group of researchers is developing chemical genetic methods to control phase separation of endogenous proteins, directly assess causality, and determine the specific downstream effects on transcription.

Heterogeneity across cell types has emerged as a theme in the 4DN consortium, inspiring a group of grantees to collaborate to determine the extent of this heterogeneity, initially focusing on heart and brain tissue. The single-cell heterogeneity uncovered at this level will be mapped to function and development. Another activity across the consortium is one of developing new standards for imaging and mapping genome architecture. A phase 2 working group has also been developing standards for sharing emerging data, which can advance the field beyond the 4DN consortium.

As scientists discover new regulators of genome organization, identifying small molecules that can affect these genome regulators will be important for treating diseases related to defects in genome organization. Researchers are assessing whether known drug regulators (i.e., enzymes) affect how specific regions of the genome come together or move apart in space, which would allow targeting of regulators that affect 3D organization of these regions. Several drug targets have been identified that have well-defined active sites that can be bound by small molecules. This process also revealed that one of the kinases known to have a significant role in other pathways plays a direct role in affecting cohesin activity.

Dr. Narlikar emphasized that the goal of the 4DN consortium is to accelerate debate and discuss key concepts of genome organization and function, and that these fundamental goals are being advanced by the 4DN community. The consortium also aims to generate integrative approaches that are readily portable for studying multiple cell types. Over the long-term, 4DN aims to accelerate the conversion of curiosity-based science to improvements in human health.

Discussion Highlights

- When asked about the conflict inherent in studying dynamic structures with bioassays that capture singular events, Dr. Narlikar commented that she does not see this as a conflict because 4DN embraces the inherent messiness of biology by assessing a given process from multiple perspectives.

The work of the consortium is determining how to address these questions at different scales and integrate knowledge of other facets.

- Dr. Pombo commented that 4DN uses a multi-model system that measures different factors to identify the causes and effects within one gene. Use of the data is increasing as the diversity of systems and technologies increase. Dr. Ma added that the broader community is using 4DN data to develop new tools and algorithms because 4DN has standardized and benchmarked some of its approaches.

- In response to a question about outreach to other scientific groups, Dr. Ma commented that researchers can combine their data with 4DN data to assess the effects of genetic variants on structure and function. Dr. Narlikar suggested raising the topic of outreach at the next consortium meeting.

- When asked about collaborations with the genome editing community, Dr. Roy pointed to a mouse model created by the Somatic Cell Genome Editing program that is used by 4DN researchers to better understand how genome folding affects aging.

III. NIH UPDATE

Lawrence A. Tabak, D.D.S., Ph.D., performing the duties of the Director, NIH, provided an update on NIH. He noted several recent staff changes including: Dr. Anthony S. Fauci, Director of the National Institute of Allergy and Infectious Diseases (NIAID), has retired and Dr. Hugh Auchincloss is serving as the Acting NIAID Director; the Center for Information Technology Director Andrea Norris has retired and Ivor D'Souza will serve as Acting Director; and Dr. Roger Glass has retired as Director of the Fogarty International Center and Deputy Director, Dr. Peter Kilmarx, will serve as Acting Director. The responsibilities of Dr. John Gallin, who serves as chief scientific officer and scientific director of the Clinical Center, as well as associate director for clinical research in the Office of Clinical Research in OD, will be divided among multiple people upon his retirement. Dr. Tabak also noted Dr. Wilder's retirement from OSC. He commented that Dr. Joni Rutter has been appointed director of the National Center for Advancing Translational Sciences, and Dr. Renee Wegrzyn has been appointed director of the Advanced Research Projects Agency for Health (ARPA-H). Dr. Tabak also pointed out that NIH grantees Drs. Carolyn Bertozzi and Barry Sharpless shared the 2022 Nobel Prize in Chemistry. He also highlighted the Lasker Award-winning NIH grantees.

In his budget update, Dr. Tabak noted that NIH's consistent budget increases in recent years have allowed its buying power to reach the levels seen in the early 2000s. He commented that the biomedical research and development price index likely will continue to rise, so NIH needs to continue to receive budget increases to maintain that buying power. The fiscal year (FY) 2023 omnibus bill provided $49.2 billion for NIH, including $1.5 billion for ARPA-H, a 3.8 percent increase for NIH institutes and centers (ICs), and an increase of almost 10 percent for the Common Fund.

Dr. Tabak highlighted proposed changes to the peer review criteria to improve identification of highly meritorious research with the highest impact potential. The changes are intended to mitigate reputational bias in peer review. The five current scored criteria will be collapsed into three factors: (1) importance of the research, or significance and innovation; (2) feasibility and rigor, or approach; and (3) expertise and resources, or investigator and environment. Each will be rated "appropriate" or "additional resources needed" rather than scored. Dr. Tabak noted that scoring expertise and resources overcompensated for the reputation of a particular investigator or institution. Each application will continue to receive an overall impact score, but the new system will allow NIH to refocus the criteria on whether the research can and should be conducted. Dr. Tabak encouraged Council members to submit feedback in response to the request for information (RFI), which is open through March 10, 2023.

Dr. Tabak also outlined proposed changes to the peer review of the National Research Service Award (NRSA) fellowship. Many applications currently are from researchers at highly resourced schools who are sponsored by senior scientists. Proposed changes to the review criteria would focus scores on the potential of the applicant, the strength of the science proposed, and the robustness of the training plan. Applicant's grades would no longer be required. Changes to the applicant section would allow potential fellows to present their goals, qualifications, perspectives, and planned activities. Other changes would further emphasize the training and mentorship approach, remove some character limits, revise letters of support, and allow for explanations of special circumstances.

Dr. Tabak explained that the UNITE Initiative has released a progress report describing actions it has taken to identify and address structural racism, including focusing on the key areas of health disparities and minority health research, the internal NIH workforce, and the external research workforce. A number of funding opportunity announcements (FOAs) to elevate health disparity and minority health research are available. An additional $400 million in resources has been identified and dedicated to this initiative over the next 10 years. Key initiatives have been launched to promote equity in the NIH-supported biomedical research ecosystem. An antiracism advisory board has identified inequities within the NIH internal workforce. Each IC and OD office has used this information to develop individualized Racial and Ethnic Equity Plans with best practices from these plans shared.

Additional efforts addressing this topic include publishing NIH demographic data as a function of time; evaluating ways to use the NIH Director's Awards to celebrate the entire workforce; and developing career development opportunities for more junior staff. To improve the accuracy and transparency of racial and ethnic equity data, NIH has collected more than 1,100 RFI responses, conducted listening sessions with more than 1,300 members of the extramural community, and launched initiatives to improve transparency and accountability.

Dr. Tabak provided an update on the *NIH-Wide Strategic Plan for Diversity, Equity, Inclusion, and Accessibility*. He noted that NIH is different from many other organizations, in that it plans to advance diversity, equity, inclusion, and accessibility (DEIA) through research. The strategic plan has been reviewed by many collaborators and will be published shortly. A subgroup of the Advisory Committee to the Director (ACD) working group on DEIA issues focused on disabilities reported at the last ACD meeting, and several subject-matter experts provided a series of comprehensive recommendations to the ACD that are currently being evaluated.

Discussion Highlights

- When asked how the new grant review model might affect researchers from underrepresented groups, Dr. Tabak suggested that the changes are likely to begin addressing such disparities in appropriate ways. He commented that more factors remain to be investigated, but the NIH early-stage investigator (ESI) pool is more diverse than the pools of investigators at other career stages. Dr. Tabak underscored that NIH is committed to these efforts.

- Dr. Tabak agreed that all reviewers on study sections will need additional training in the new model. Scientific review officers also will need training on how to facilitate reviews aligned with the new criteria. He noted that the training process will need to be continual because reviewers change frequently.

- In response to a question about metrics for the new review criteria, Dr. Tabak explained that patterns of scoring can be studied as a function of many other data to show whether the new system improves the success of ESI from underrepresented groups. Feedback from reviewers and grantees also will be used to assess outcomes. Council members encouraged NIH to formalize and publish those metrics.

- When asked how to accelerate science generally, Dr. Tabak pointed out that although multidisciplinary applications often are reviewed as overly ambitious or unfocused, the Common Fund supports these types of applications. He suggested that structural barriers contributing to this problem could be a topic for the Council and the ACD to address together.

- Dr. Tabak theorized that NIH would have to invest in ways to detect submissions written using AI programs.

- In response to a question about how NRSA stipend levels can address inequities, Dr. Tabak noted that an ACD working group on postdoctoral fellows was recently formed and will address this issue.

- When asked how UNITE recommendations will be applied at institutions with NIH funding, Dr. Tabak explained that FOAs will enable institutions to accomplish similar goals with their research workforce. He noted that NIH funding is limited, so institutions may need to implement some changes on their own.

- In response to suggestions of innovative DEIA models, Dr. Tabak explained that NIH DEIA goals now are part of all NIH senior leaders' performance evaluations. He commented that IC directors' 5-year reviews include a diversity component that was legislatively mandated.

- Dr. Tabak confirmed that sexual and gender minority (SGM) populations are included in the NIH DEIA plan.

IV. ORIP CONCEPT CLEARANCE: HIV/AIDS SCHOLARS PROGRAMS (K01, R21, R13) REISSUE (VOTE)

Stephanie Murphy, V.M.D., Ph.D., DACLAM, Director, DCM, ORIP, DPCPSI, introduced for concept clearance the reissue of the HIV/AIDS Scholars Program, which uses the K01, R21, and R13 mechanisms. The objective of this program is to facilitate development of safe and effective HIV/AIDS treatment and prevention strategies by increasing the workforce that can use nonhuman primates (NHPs) as preclinical models in HIV/AIDS research. The funds available and the anticipated number of awards for this program are contingent on NIH appropriations and the submission of highly meritorious applications. The award project period ranges from 2 to 4 years, depending on the funding mechanism.

Both the current and previous *NIH Strategic Plan for HIV and HIV-Related Research*, as well as ORIP's 2018 report on NHP resources, point to a shortage of researchers using NHP models to address preclinical topics in HIV/AIDS research. ORIP strives to form creative collaborations with NIH institutes, centers, and offices (ICOs) that have a stake in advancing research infrastructure and resources. A major theme of ORIP's strategic plan for 2021 to 2025 is facilitating specialized research training in animal models and related resources, so the office partnered with OAR to increase the workforce that can use NHPs as preclinical models for HIV/AIDS research.

Dr. Murphy outlined the history of the program, which was launched in FY 2016with a focus on HIV vaccine research and two components—the K01 Scholars Program and an annual scientific conference for ESI, supported by an R13 grant. The program was broadened in 2019 to include other NIH priorities for HIV-related research using NHPs. An R21 FOA was added in FY 2020 to address the challenges that ESI face in successfully receiving their first NIH research project grants, particularly when using expensive NHP models.

The current program maintains these three components. The K01 program provides salary and research support for HIV/AIDS investigators who are using NHP models and are within 10 years of completing

their terminal professional degree or residency training and have at least 2 years of postdoctoral training or equivalent. These awards provide 3 years of support—up to $100,000 in salary support and $100,000 in research support per year—for intensive research career development under the guidance of an experienced mentorship team. The R21 program provides research support for ESI who are using NHP models for HIV/AIDS research and are within 10 years of completing their terminal professional degree or residency training and have at least 2 years of postdoctoral training or equivalent. These awards provide 2 years of support—up to $200,000 in direct costs per year—to allow ESIs to develop new research directions and to position these researchers to be competitive for new research project grant funding. Dr. Murphy summarized achievements from FY 2016 to FY 2021 for the K01 and R21 components of the HIV/AIDS Scholars Program, noting that recipients of the 16 awards over this time period have advanced to successful careers and published many papers, most of which had a higher-than-average relative citation ratio.

The third component of the HIV/AIDS Scholars Program—the annual scientific conference, supported by the R13 mechanism—provides early-stage HIV/AIDS researchers with guidance on conducting preclinical research with NHP models that inform clinical trials addressing NIH's HIV/AIDS research priorities. The conference includes a variety of scientific topics and is not limited to the K01 program scholars. The current award provides up to $75,000 in total costs per annual meeting for 4 years. Conference attendees reported many benefits in both scientific and professional career development areas.

Discussion Highlights

- The discussants, Drs. Paul Johnson and K.C. Kent Lloyd, provided their comments. Both discussants strongly advocated renewing the program. Dr. Johnson noted that the combination of the three complementary funding mechanisms is key to the program's success and could serve as a model for other NIH programs. He commented that the scholars supported by this program have had a clear impact on the field, and longer-term follow-up of scholars will be important for continuing to assess the program's impact. He suggested assessing ways to increase applications and encouraged continued efforts by ORIP to recruit a diverse pool of program applicants. Dr. Lloyd pointed out that the program has been flexible and responsive to changing scientific needs and is well managed.

- When asked about the breakdown between the K01 and R21 awards, Dr. Murphy noted that the R21 program is new. Over the programs' lifetimes, ORIP received six R21 applications and made two awards, and 12 K01 awards have been made from 20 applications. Council members recommended publicizing the program more widely. Dr. Murphy explained that increasing the number of application receipt deadlines is intended to increase the applicant pool. She commented that the ORIP strategic plan includes themes on outreach for ORIP programs. ORIP also has highlighted scholars in success stories on its website and fact sheets, as well as seeking additional opportunities to publicize its programs.

Vote

A motion to approve the reissue of the HIV/AIDS Scholars Program was forwarded and seconded. The motion passed with one abstention.

V. ODSS CONCEPT CLEARANCE: BUILDING SUSTAINABLE FOUNDATIONS FOR OPEN SOFTWARE AND TOOLS IN BIOMEDICAL AND BEHAVIORAL SCIENCE (VOTE)

Susan Gregurick, Ph.D., Associate Director for Data Science, NIH, and Director, ODSS, DPCPSI, presented a concept to build sustainable foundations for open software and tools for biomedical and

behavioral sciences. ODSS coordinates and catalyzes data science and related activities across all ICOs and is guided by the *NIH Strategic Plan for Data Science*; this program enhances data management tools and analytics, one of the plan's themes. Some of ODSS activities to enhance tools and software for biomedical and behavioral research include a partnership with the National Science Foundation to accelerate data science and AI (R01 program). ODSS also supports a supplemental program to enhance NIH software for open science, and has developed a set of best practices for sharing software.

Ishwar Chandramouliswaran, M.S., M.B.A., Lead, FAIR Data & Resources, ODSS, DPCPSI, introduced a concept for two companion FOAs. The NIH Research Software Engineer (RSE) Award would support RSE building sustainable open software and tools. This program would use an R50 funding mechanism designed to support stable research and career opportunities for RSEs in an existing research program who may not serve as principal investigators (PIs) by providing salary support and autonomy. The award is for 2 years or less, and the budget will support the RSE's salary for at least 6 months per year.

The companion initiative, Building Sustainable Software Tools for Open Science, will fund software projects to support the development and enhancement of sustainable software tools that support open science. This will use an R03 funding mechanism for an award of 2 years or less duration. The budget is planned for $150,000 in direct costs per year. For each of these initiatives, ODSS will set aside about $6 million in anticipation of 20 to 24 awards. Application receipt dates are planned in September and January over 3 years, and all applications will be reviewed by a Special Emphasis Panel. Applicants are encouraged to submit a letter of intent and seek consultation from the intended ICO prior to submitting an application.

Lori A.J. Scott-Sheldon, Ph.D., Chief, Data Science and Emerging Methodologies in HIV Program, Division of AIDS Research, NIMH, explained that building sustainable software and tools requires building communities including one of highly skilled RSEs and a scientific community that supports and values the substantial contributions of RSEs and the critical need for open software to advance science. RSEs supported by the first initiative likely thrive in an academic research environment with cutting-edge science that can make a lasting impact on NIH research. By supporting projects crucial for reproducibility, the second initiative will foster critical collaborations between biomedical and behavioral scientists and RSEs, which will extend the impact of research beyond the initial investment. These efforts for building communities that support open software and tools are critical for creating a modern biomedical and behavioral data ecosystem that will catalyze scientific advances.

Currently, critical gaps exist in this ecosystem in regard to robust software foundations and support for RSEs who can build them. These initiatives will enable projects to support sustainable, shareable, and reusable software; conduct reproducible interpretation and analysis of complex, large-scale biomedical and behavioral research data; and create crucial partnerships with creators and developers of software and tools to leverage modern computing in the research enterprise. These initiatives also promote FAIR principles to maximize research value. Dr. Scott-Sheldon outlined the required elements of the application for each initiative.

Heidi J. Sofia, Ph.D., Program Director, Division of Genomic Medicine, NHGRI, explained that these opportunities are built on ODSS funding of administrative supplements to enhance software engineering foundations and knowledge gathered from engaging broadly with the research community across ICOs and externally. These supplements to ICs in the past few years have supported enhancement of software tools with best practices for open science and use in the cloud, providing transformational investments that make high-value research software more sustainable. This year is the fourth and final round of software supplements. She provided several examples to illustrate the diversity of science funded in these efforts across NIH.

Discussion Highlights

- The discussants, Drs. Kristin Ardlie and Linda Chang, provided their comments. Both supported the concept. Dr. Ardlie suggested that recipients of the software development grant should be required to publish their methods and test their systems to ensure it is robust for various users and platforms.

- In response to Dr. Ardlie's question about the sustainability of these short awards, Dr. Sofia explained that ODSS considers the awards a fraction of the support needed to advance the field beyond the limitations of administrative supplements. Dr. Chang commented on the difficulty of developing and validating tools in short time frames; Dr. Sofia responded that these mechanisms are being piloted carefully to identify ways to maximize impact with limited funding.

- Dr. Sofia pointed out that NIH cannot provide RSE salaries comparable to private industry, but compensatory aspects include quality of life, flexibility, and excitement about the scientific mission.

- In response to a question about applying for both opportunities, Mr. Chandramouliswaran commented that ODSS aims to establish a sustainable ecosystem. He noted that applying for both grants is possible; however, guidelines would have to be followed to avoid program overlap. He commented that the 6-month timeline for salary requests is intended to encourage applicants to request a substantial amount of the research supplement in their salary, which would allow them to provide dedicated effort to sustaining the software and adopting best practices.

- Dr. Ardlie encouraged ODSS to ensure that a broad group of people with appropriate skills, rather than only those technically considered RSEs, are eligible to apply. Dr. Scott-Sheldon confirmed that applicants with the appropriate skills are eligible to apply; however, ODSS encourages RSEs as independent and collaborative investigators to apply as they then can engage in team science approaches that lead to more robust and sustainable software.

- In response to a question about examples of existing sustainable projects, Dr. Sofia commented on the difficulty of separating aspects of sustainability in the software and data ecosystem. Although ODSS is investing in both funding opportunities, the primary focus is how to expand the ecosystem and culture robustly and professionally, as these concepts invest in infrastructure as well as research. Mr. Chandramouliswaran added that some limited examples are available in smaller communities, but this concept aims to enable creation of more such communities, leading to more opportunities for sustainability and adoption of best practices. He pointed out that multiple receipt dates over 3 years would generate additional growth and impact in this field.

- Dr. Chang recommended allowing the grants to be renewable when appropriate.

- Dr. Sofia clarified that the FOA will not limit whether applicants need to already have NIH grants, but they must provide clear evidence of their qualifications and engagement in the research enterprise.

- Dr. Ardlie recommended strengthening the metrics for long-term success. Dr. Gregurick noted that awardees will be asked to outline their milestones and metrics, and then will be held accountable.

- In response to a question about the difficulty of judging which applications to fund, Dr. Scott-Sheldon noted that the FOA will include clear guidelines to help reviewers determine which applications have the potential for sustained impact.

- Dr. Sofia commented that both disease-agnostic and disease-specific projects would be welcome because the only requirement is that the software be of value to a defined scientific community.

Vote

A motion to approve the Building Sustainable Foundations for Open Software and Tools in Biomedical and Behavioral Science concepts was forwarded and seconded. The motion passed with three abstentions.

VI. ONR REVISED CONCEPT CLEARANCE: FOOD IS MEDICINE NETWORKS OR CENTERS OF EXCELLENCE (VOTE)

Christopher J. Lynch, Ph.D., Acting Director, ONR, DPCPSI, presented a revised version of the Food as Medicine concept presented at the Council of Councils meeting in September 2022, now entitled, "Food Is Medicine" to align with the terminology used in the White House National Strategy on Hunger, Nutrition, and Health. This concept aims to create comprehensive networks or centers of excellence to reduce the burden of diet-related diseases and nutrition disparities through Food Is Medicine research, patient care, education/training, and community outreach and engagement.

Dr. Lynch outlined how ONR has addressed reviewers' comments on the previous presentation of this concept. He emphasized that unlocking the potential of Food Is Medicine requires a broad response, but this focus area is included prominently in the national strategy. A White House Nutrition Interagency Policy Council (IPC) has been convened to develop macro-level strategies for supporting activities identified at the September 2022 White House Conference on Hunger, Nutrition, and Health, including this concept. Applicants for this initiative will be required to develop a community outreach and engagement plan, which must include the expected broad impact of these activities and propose engagements and partnerships with relevant regional and federal agencies and nongovernmental organizations.

In response to a suggestion to involve additional relevant agencies, Dr. Lynch explained that the initiative has been shared with other federal agencies through the IPC. ONR has incorporated comments from these agencies and engaged with them to explore collaborative opportunities. The White House also is monitoring progress on all activities initiated at the recent conference. Dr. Lynch emphasized that this concept complements the activities of other agencies; however, it is unique to NIH.

Dr. Lynch described the services and activities included in the concept in response to a Council member's previous comment about the lack of clarity. Food Is Medicine will increase interactions with health professionals who have nutritional expertise and social workers, particularly because many of the proposed activities will occur in the community. ONR expects an increase in food insecurity assessments and nutrition-focused physical exams, as well as increased use of Food Is Medicine in other clinical nutrition interventions where indicated. Communications about the importance of diet in disease prevention and treatment likely will increase. Additionally, he noted that training in clinical nutrition, Food Is Medicine, food insecurity, and social determinants of health will expand as a component of this initiative.

Dr. Lynch commented that applicants for this initiative will be expected to outline enhanced nutrition education in the curricula of health professional programs and for existing health care staff. This education component will include information on the impact of racism and DEIA practices on nutrition. Other options may include adding or expanding culinary medicine or teaching kitchen programs, as well as creating new fellowship programs in emerging nutrition specialties, lifestyle medicine, or obesity medicine. The proposed research projects submitted in response to this initiative likely will lead to additional research training opportunities.

Dr. Lynch outlined the concept, explaining that Food Is Medicine is an umbrella term for programs that address the critical link between diet and health while providing Food Is Medicine services and a nexus to the health care system, including deploying nutrition and lifestyle medicine to communities. This nexus

recognizes that health care providers often are a trusted source of information, but rarely provide dietary guidance. Food Is Medicine activities include medically tailored meals and groceries, nutritious food referrals, and produce prescriptions, as well as culinary and teaching programs, which incorporate diet and nutrition education in health professional training, and that are frequently deployed in the community. These programs also can educate trainees in motivational interviewing and health coaching techniques, which can help them induce sustained behavior change. Dr. Lynch pointed out that Food Is Medicine research is increasing and provides the evidence base for its use and improving its activities. While NIH funding is limited currently, interest in the federal government in this topic area is increasing. He noted that multiple federal agencies are participating in ONR's Food Is Medicine RFI, including the Health Resources and Services Administration. Dr. Lynch added that the Centers for Medicare & Medicaid Services reimburse Food Is Medicine services and have begun piloting prescriptions for medically tailored meals.

The proposed Food is Medicine networks or centers of excellence are analogous to other NIH comprehensive centers, with several cores for administration, research, education and training, patient services, and community outreach and engagement. ONR will prioritize grant support for highly meritorious applications from institutions in locations with high rates of diet-related diseases or nutrition disparities with an emphasis for applications focused on need, capacity, partnerships, and innovation. The research core—aiming to design and lead research that provides health care quality and efficacy and medical economics evidence for Food Is Medicine services—will develop innovative and testable local solutions to reduce malnutrition, food insecurity, and diet-related chronic illnesses. The education core will expand or add training to the curricula of their medical and health professional schools, as well as continued education for existing staff. The community outreach and engagement core will partner with groups in the catchment area that either already are or could be filling gaps in food and hunger, food insecurity, Food Is Medicine activities, and social determinants of health. This core will organize community activities, increase diversity in research studies and engage the community in setting the research agenda for the program site, and support outreach in the form of communications and identification of opportunities to impact policy.

The Food Is Medicine initiative will have a 3-year planning and pilot phase leading to a limited competition for up to eight 5-year phase 2 awards. Deliverables include: 1) reduced chronic diseases and nutrition disparities in the catchment areas; 2) common evaluation metrics for Food Is Medicine strategies in various health conditions; 3) profiles of people and how they benefit from various Food Is Medicine interventions; and 4) an evidence base to inform policy changes. ONR will convene annual meetings of the grantees to showcase innovations and lessons learned and define regionally appropriate and culturally sensitive Food Is Medicine best practices.

Discussion Highlights

- The discussants, Drs. Maria Rosario Araneta and Anna Maria Siega-Riz, provided their comments. Both supported the concept. Dr. Araneta suggested additional collaborations with the Department of Education. Dr. Lynch confirmed that representatives from this Department participated in the IPC and they recently commented on a potential link between the increase in diet-related diseases and the decrease in home economics programs in schools.

- Dr. Araneta recommended that the program consider dental conditions, food allergies, fetal origins of disease, diabetes, and time-restricted eating as areas of study.

- When asked about sustainability after the end of funding cycles, Dr. Lynch noted that the Council had previously approved a concept on nutrition and the developmental origins of health and disease.

- Dr. Siega-Riz noted that the metric of reducing diet-related chronic diseases and nutrition disparity is difficult to measure in a short period of time, so other proxy measures might be needed.

- Dr. Lynch elaborated on the coordination with other agencies and noted that this initiative is intended to raise the importance of nutrition within the medical community; although other agencies have expressed interest and suggested modifications to the concept.

- Dr. Lynch clarified that Food Is Medicine programs are covered by insurers in some states, suggesting that reduced health care costs are anticipated. .

- Dr. Lynch noted that there is an opportunity for additional activities in the Food is Medicine area by other agencies.

Vote

A motion to approve the Food Is Medicine Network or Centers of Excellence concept, including all raised discussion points, was forwarded and seconded. The motion passed with no abstentions.

VII. ECHO CONCEPT CLEARANCE: SECONDARY ANALYSIS OF EXISTING DATA FROM THE ECHO RESEARCH PROGRAM (VOTE)

Clay Mash, Ph.D., Program Officer, ECHO Cohorts, ECHO Program, introduced two companion FOAs to expand research and training in high-priority areas of maternal and child health by stimulating novel analyses of ECHO data by non-ECHO investigators. The ECHO program studies the effects of a broad range of early environmental exposures on childhood health outcomes using solutions-oriented research that informs programs, policies, and actual practices. Facilitating and sustaining the next generation of child health investigators is a key component of ECHO's overall goal. Open to graduate students and postdoctoral researchers, the first request for applications (RFA) will be an R36 for dissertation grants, and the second will be an F32 for individual postdoctoral fellowship awards. ECHO will commit $960,000 over FY 2024 and FY 2025 for up to eight 2-year awards.

ECHO is a nationwide cohort study incorporating longitudinal data from 69 pediatric cohorts. Each cohort contributes both its own unique data and data collected under the ECHO-wide protocol of research measures. The program currently is in its seventh year and has been renewed to begin a second 7-year cycle in September 2023. The data being collected under the ECHO-wide protocol reflect many participants, many types of exposures and outcomes, and several distinct stages of the life course. Exposure is examined from prenatal through age 5 years, during the developmental period of maximal plasticity. The next cycle of the program also will include the study of pre-conception measures and exposures.

ECHO research focuses on a wide range of exposures—including physical and chemical, societal, medical, psychosocial, behavioral, and biological—and five key pediatric outcomes with high public health impact: pre-, peri-, and postnatal outcomes; upper and lower airway; obesity; neurodevelopment; and positive health. Outcomes are measured longitudinally from birth through childhood and adolescence. The program has had a large impact that continues to expand.

A key part of ECHO's mission is to build a platform to harmonize and integrate data from participants across every cohort and share data with the broader scientific community to ensure its maximum utility and impact. Harmonized, deidentified data from the ECHO program are now available through the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development Data and Specimen Hub (DASH), a centralized resource that allows researchers to access data on more than 17,000 pregnancies

and more than 23,000 children from the ECHO-wide cohort. ECHO will add new data annually to DASH.

This FOA is intended to advance research in high-priority areas of child health outcomes by stimulating the broad use of ECHO data by research trainees. The RFAs will provide opportunities for new investigators interested in analyzing large longitudinal data sets to investigate child health outcomes, and stimulate public access and analysis of data currently in DASH. The breadth, magnitude, and richness of the ECHO data provide an optimal foundation for learning how to work with large data sets and forming high-impact research questions about the effects of early exposures on child health outcomes. Simultaneously, trainees will extend the use of data beyond those investigators who are currently funded to use it, and broader use of the data maximizes their impact.

ECHO will fund R36 awards with $60,000 in direct costs per year for 2 years for students in research doctoral programs, and F32 awards with $80,000 in direct costs per year for 2 years to enhance the research training of promising postdoctoral candidates. Dr. Mash emphasized that child exposure and health outcomes research depends on talented investigators who are highly trained with specific skill sets, and these funding opportunities will support the training within the context of a multidisciplinary nationwide research program.

Discussion Highlights

- The discussants, Drs. Kevin Johnson and Richard Krugman, provided their comments. Both strongly supported the program. In response to Dr. Johnson's questions, Dr. Mash confirmed that ECHO funding is distinct from the Human Placenta Project. He explained the Institutional Development Award (IDeA) Network conducts clinical trials for the ECHO program IDeA trainees are welcome to apply, as they are part of the broad scientific community to which this RFA will appeal. The network does not collect the cohort observational data that is the focus of these RFAs.

- Dr. Mash commented that ECHO is not planning to develop unique training resources or coursework, but applicants can propose training plans within their own institutions, and the funding will enable them to register for relevant courses. Dr. Johnson pointed out that if the goal of the FOAs is to exercise the capabilities of ECHO's system, trainees will need to learn how to use it. Dr. Matthew Gillman, the Director of ECHO, emphasized that students and postdoctoral researchers are the focus of this award because they often have the time and interest to delve into complex data sets. Training modules are available on the DASH website, but the program also will use Dr. Johnson's feedback to help enhance existing DASH training opportunities.

- Dr. Krugman recommended approval and proposed that a special effort be made to recruit fellows in child-abuse pediatrics, a field with a paucity of funding for research and training. He also asked if the data collected include whether the children followed have experienced physical, sexual, or emotional abuse or neglect, particularly given the importance of such experiences to longitudinal growth and development. Dr. Mash commented that ECHO does study aspects of stress in mothers and how those aspects are translated into outcomes in children. In addition, the ECHO protocol includes the mother's report of her own adverse childhood experiences (ACES) as well as those of her child. Dr. Mash noted that expanding the opportunities to analyze and report on the data will expand and accelerate findings from the ECHO public use dataset.

- In response to a question, Dr. Gillman explained that ECHO's position in NIH OD was at the explicit request from Congress.

- Council members emphasized that this would be an excellent opportunity to encourage students with broad perspectives because opportunities for dissertation awards and postdoctoral fellowships are key to increasing career success. The outcomes that can be studied intersect with NIH's goals.

Vote

A motion to approve the Secondary Analysis of Existing Data from ECHO concept, with attention to measurable outcomes on the RFA's objectives being met, was forwarded and seconded. The motion passed with no abstentions.

VIII. ADJOURNMENT FOR THE DAY

Dr. Eisinger adjourned the meeting at 3:24 p.m. on January 19, 2023.

Day 2

IX. REVIEW OF GRANT APPLICATIONS

This portion of the meeting was closed to the public, in accordance with the provisions set forth in Sections 552(b)(c)(4) and 552(b)(c)(6), Title 5, U.S. Code and Section 10(d) of the Federal Advisory Committee Act, as amended (5 U.S.C. Appendix).[1] Members were instructed to exit the meeting if they deemed that their participation in the deliberation of any matter before the Council would represent a real or perceived conflict of interest. Members were asked to sign a conflict-of-interest/confidentiality certification to this effect. The *en bloc* vote for concurrence with the initial review recommendations was affirmed by all Council members present. During the closed session, the Council concurred with the review of 368 ORIP applications with requested first-year direct costs of $301,790,056, and 37 Common Fund applications with requested first-year direct costs of $31,617,447.

X. CALL TO ORDER

Dr. Eisinger welcomed participants, NIH staff members, and members of the public to the second day of the meeting and reviewed the day's agenda. The open session of the virtual meeting began at 11:45 a.m. on Friday, January 20, 2023.

XI. ODSS SCIENCE AND TECHNOLOGY RESEARCH INFRASTRUCTURE FOR DISCOVERY, EXPERIMENTATION, AND SUSTAINABILITY (STRIDES) UPDATE AND USER EXPERIENCES (COST/BENEFIT/SUSTAINABILITY)

Dr. Gregurick introduced the STRIDES program, which allows NIH to explore the use of cloud environments to streamline NIH data storage and compute by partnering with commercial providers, which currently include Google Cloud Services (GCS), Amazon Web Services (AWS), and Microsoft Azure. The STRIDES initiative aims to modernize the biomedical research enterprise by reducing the economic and process barriers to using commercial cloud services. This enables access to extensive data sets and advanced computational infrastructures, tools, and services. The types and diversity of NIH data sets currently in the cloud vary widely. ODSS has supported the STRIDES program for the past 3 years, funding a number of activities to enhance cloud capabilities for researchers. Initially, the program focused on provided researchers cloud credits and many programs have partnered with ODSS and been awarded

[1] For the record, it is noted that members absented themselves from the meeting when the Council discussed applications (a) from their respective institutions or (b) in which a conflict of interest may have occurred. This procedure applied only to applications that were discussed individually, not to *en bloc* actions.

STRIDES cloud credits. Starting last year the program also provides funding for NIH intramural researchers to hire cloud experts. In FY 2023, the program will be expanded to the extramural community through supplemental funding to existing NIH grants. A current Notice of Special Interest (NOSI) was issued in February of 2023 to engage the extramural community with cloud computing.

STRIDES awardees have reported challenges including a lack of general experience with cloud computing and the need for additional training. Researchers often have difficulty setting up cloud environments, and uncertainty about cloud costs is common. To help address these challenges, NIH is launching Cloud Lab, a cloud sandbox environment. Researchers will be able to experiment in a cost-free place, build proof-of-concept solutions, and use training modules. Expert developers will work in the sandbox to benchmark tools with various configurations and infrastructures, benchmark costs, and optimize infrastructures. Cloud Lab currently supports the NIH intramural community and will be deployed to the NIH extramural community in spring 2023.

Ashok Krishnamurthy, Ph.D., Deputy Director, RENCI, presented on the impact of STRIDES on the National Heart, Lung, and Blood Institute (NHLBI) BioData Catalyst, which collects a large amount of data from many NHLBI-funded studies in one ecosystem with a single access point, allowing researchers to find data sets and also compute in the same environment. STRIDES democratizes access to data and compute such that even a single researcher in a small institution can access a large data set and large-scale compute capability, which may not have been available with just their own institutional resources.

The BioData Catalyst aims to use genomic, clinical, and imaging data to develop and discover improved diagnostic tools, therapeutic options, or prevention strategies that improve patient outcomes. RENCI began participating in BioData Catalyst in an earlier stage and was involved in developing imaging and deep-learning solutions that could be deployed on BioData Catalyst. The prototypes focused on one specific research community that was given its own computational workspace on AWS. No STRIDES discount was provided, and cost monitoring was difficult, so the program frequently spent more than anticipated on cloud costs. STRIDES immediately improved the ability to manage cloud costs by managing the program's account and providing tools and reports, which improved the ability to estimate costs. The ability to compute at scale with large image data sets, as well as with other data available at the time, resulted in new scientific findings published in peer reviewed journals.

BioData Catalyst provides two primary computational workspaces. Investigators can apply for $500 in cloud credit on either platform and use the credit to quickly assess the capabilities of the platform. When they are familiar with BioData Catalyst, researchers can write STRIDES costs into their NIH grant applications. Participation in STRIDES provided NHLBI with cost savings and access to expertise that would have been difficult to develop in house. The providers of the workspaces had existing relationships with several cloud providers. With a STRIDES account, individual researchers no longer need to interact with STRIDES directly. Eventually, institutional accounts could be supported, with funding included in all institutional grants, which would improve STRIDES' usefulness further.

RENCI's Cloud Cost Modeling Project provides researchers an estimate of the cost of running workflows in the cloud. Dr. Krishnamurthy demonstrated the modeling for classifying and segmenting images, processes that often now use deep learning. He noted that many factors affect the cost of developing and training people on these models, including model complexity and size, the size of image data, the level of training required, and the length of time to provide results. Dr. Krishnamurthy's team created benchmarks to produce curves for both models that allow researchers to estimate how much training a model will cost. The STRIDES discount was determined to be 15 to 35 percent lower than each estimated cost.
Dr. Krishnamurthy commented that a large collection of health data in the cloud can be transformative to research and STRIDES is moving NIH toward this ability.

Discussion Highlights

- Two Council of Councils members, Drs. Ardlie and Sachin Kheterpal, provided comments on their experience with STRIDES. Dr. Ardlie commented that STRIDES offers a significant path forward but requires slightly more work. Most of Dr. Ardlie's compute activities occurs in the cloud. She noted that determining how to include compute costs in NIH grant applications was difficult, but STRIDES made this very simple. An institutional STRIDES relationship has been more effective than if individual investigators had tried to implement STRIDES. She suggested that large grants, especially at resource centers, could be provided a STRIDES allocation and the option to request additional funds if necessary. Although her team can estimate data size fairly well, the compute costs are difficult to estimate because of the complexity and potential problems. STRIDES reports could be more detailed or more frequent, but they provide helpful breakdowns of storage and compute costs. Dr. Ardlie encouraged more standardization within NIH and funding mechanisms to support the future of sharing data with consortium members in the cloud.

- Dr. Kheterpal commented that the University of Michigan uses a hybrid computing model with some cloud and some on-premise activities. He noted that the importance of STRIDES extends beyond costs and compute to include its suite of tools, which is difficult for an institution to create and requires about 3 years for people to discover the resource and learn how to use it. One major obstacle to implementing STRIDES is the inability to cap charges to the account. Dr. Kheterpal recommended broader outreach about the sandboxes, which can help researchers estimate costs. He noted that some institutions have discount agreements that may exceed the discount offered by STRIDES. He also commented that directing investigators to the best price will help encourage them to use cloud systems. Dr. Kheterpal emphasized the importance of price transparency, price capping, and outreach about tools. He emphasized that cloud computing is not only the way of the future, but it is the way of the present.

- Dr. Kevin Johnson who was the moderator for the discussion, asked whether STRIDES is achieving its goals in removing economic and process barriers and whether such barriers are equally mitigated across commercial providers. Dr. Kheterpal pointed out that his institution uses Azure less often than AWS and GCP because it is newer. Dr. Krishnamurthy noted that researchers may not be able to see which cloud provider runs their program, so they may not need to compare providers.

- When asked about the learning curve for other ICOs, Dr. Krishnamurthy noted that some ICs already use cloud platforms, but the tools differ because they were designed for different purposes. Dr. Gregurick pointed out that STRIDES aims to provide a consistent experience across ICs, but some programs with significant data needs have received more attention from STRIDES. She added that setting up a STRIDES environment is challenging, and ODSS needs to provide additional support.

- In response to a question about how users and reviewers can assess the costs of cloud computing, Dr. Krishnamurthy referred to the cost comparisons in his presentation, which offer some ways to make decisions in the face of overwhelming options.

- When asked whether NIH is considering the carbon footprint of cloud computing, Dr. Kheterpal suggested that most larger scale processes are more efficient than those at smaller scales. Council members pointed out that some local systems may have greener power sources, so NIH could consider such factors in the future.

- Dr. Kheterpal clarified that costs associated with *All of Us* are not visible to his team.

- In response to a question about integrating large data sets under STRIDES, Dr. Gregurick explained that a working group focused on medical imaging data sets has been working on this issue. She noted that some data sets owned by ICs require negotiation to integrate with STRIDES.

- When asked how STRIDES will be offered to the NIH extramural community, Dr. Gregurick commented that the goal is to offer supplemental funding to existing NIH grantees to assist moving their large data sets and compute activities to the cloud through STRIDES, as well as support expert research engineers. About $5 million has been allocated for this task in FY 2023. She acknowledged that this funding is not sufficient, but it can incentivize movement of large data sets to the cloud, which will be more cost-effective. ODSS works with IC program directors and reviews diversity to prioritize which data are moved to the cloud and reach as broad a community as possible.

- Dr. Johnson commented on the challenge of understanding all aspects of conducting research in the cloud and the associated costs.

XII. *NIH STRATEGIC PLAN TO ADVANCE RESEARCH ON THE HEALTH AND WELL-BEING OF SEXUAL AND GENDER MINORITIES, FISCAL YEARS 2021–2025*: A MIDCOURSE REVIEW WITH RECOMMENDATIONS (VOTE)

Karen L. Parker, Ph.D., M.S.W. Director, SGMRO, introduced the midcourse review of the *NIH Strategic Plan to Advance Research on the Health and Well-Being of Sexual and Gender Minorities, Fiscal Years 2021–2025*. This represents NIH's second strategic plan on this important topic. Although the plan provides a roadmap for SGM research across NIH, it also guides the activities of SGMRO. The plan requires accountability in the form of check-ins and progress evaluations, including this midcourse review, which was discussed by the Council of Councils SGM Research Working Group on September 7, 2022.

Goal Area 1 in the strategic plan is to advance rigorous research on the health of SGM populations in both NIH intramural and extramural communities. The SGM Research Working Group recommends that NIH consider funding the SGMRO to support a U54 Centers of Excellence in SGM health research. Dr. Parker noted that SGM health research activities can be challenging to fund within a specific IC because they have many aspects that overlap and cross diseases and health conditions, so a Centers of Excellence program would advance the field. The group's second recommendation is to expand research on gender-affirming care for transgender and gender-diverse populations and consider funding the SGMRO to collaborate with ICOs on building a network to research gender-affirming care and related health outcomes. The third recommendation is for NIH to increase education-related research via R25s focused on medical and allied health professional training specific to LGBTQI+ health. The working group also recommended that NIH identify SGM health work and, in particular, gender minority health-related research as a priority for the NIH Loan Repayment Program.

Goal Area 2 is to expand SGM health research by fostering partnerships and collaborations with a strategic array of internal and external stakeholders. The working group recommends enhancing collaborations with the Agency for Healthcare Research and Quality to consider ways to increase funding related to health services research. Dr. Parker pointed out that this research requires collaborations with other agencies to encourage connecting investigators to other federal funding sources. The working group also recommended that SGMRO collaborate with ORWH to consider updating NIH-wide policies and external-facing materials to be inclusive of sexual and gender diversity. The third recommendation is that SGMRO continue to enhance collaborations with the NIH Intramural Research Program and Office of Intramural Training and Education. The fourth recommendation is that SGMRO continue to collaborate with the NIH Center for Scientific Review and encourage mentoring of early-stage reviewers.

Goal Area 3 focuses on fostering a highly skilled and diverse workforce in SGM health research. The working group recommended providing funding to the SGMRO to support T32 grants in SGM-related health research. Dr. Parker noted that the field remains nascent and requires additional training and mentoring structures, particularly beyond specific disease and health conditions. The group also suggested that NIH should update its *Notice of Interest in Diversity* to explicitly include SGM populations, which would clarify how the notice should be interpreted. The working group's third recommendation is to conduct barrier analyses by collecting sexual orientation and gender identity (SOGI) data from PIs who apply for NIH grants.

Goal Area 4 focuses on encouraging data collection related to SGM populations in research and the health research workforce. The working group's first recommendation is to build on the research agenda outlined in the recent National Academies of Sciences, Engineering, and Medicine (NASEM) report focused on SOGI measurement—*Measuring Sex, Gender Identity, and Sexual Orientation*—co-funded by SGMRO and 18 other NIH components, This report described a robust research agenda for measurement of SOGI and variations in sex characteristics. Dr. Parker commented that the working group recognized the momentum around the report and suggested that NIH capitalize on research activities outlined in it. The second recommendation is that the NIH Clinical Center add both sexual orientation and intersex status to its electronic health record. Dr. Parker noted that the Clinical Center already collects gender identity data. The working group also recommended that SGMRO collaborate with ORWH and the National Library of Medicine to develop guidance related to the collection, analysis, and reporting of sex and gender articles in peer reviewed journals. Finally, the working group recommended that SGMRO work with the Federal Committee on Statistical Methodology's SOGI Research Group to develop a primer on measurement in science. Dr. Parker noted that she co-chairs this group and discussions are in progress.

Discussion Highlights

- The discussant, Dr. Edith Mitchell, provided her comments. She emphasized the importance of SGM health research, particularly because the SGM population is increasing significantly yet many aspects of SGM health remain understudied. She commended that NIH fund the recommendations in the review and noted the importance of SGMRO's management of the efforts because the office interacts with the relevant communities. Dr. Mitchell also emphasized the importance of building on the foundation of the NASEM report.

- Dr. Scout pointed out that lack of data on the SGM status of investigators has hindered pipeline diversity initiatives and understanding of the research populations. He added that Centers of Excellence are a known way to accelerate research within the NIH. Dr. Scout noted the NASEM report prompted many Cancer Centers to begin collecting SOGI data, which required the centers to add more inclusive language to their systems. He added that because one in five of the youngest adults now identify as a member of the SGM population even amid many legislative actions to restrict the rights of SGM people, advancing research on the health of all communities—particularly underrepresented populations—is more important than ever.

- Dr. Parker explained that as an OD office, SGMRO relies on relationships with other ICOs. SGMRO has co-funded initiatives on measurement and structural discrimination with the National Institute for Minority Health and Health Disparities (NIMHD), assisted with NIMHD's first workshop related to SGM health, and collaborated on its annual Health Disparities Research Institute. SGMRO also collaborates closely with NIMH and other ICOs on SOGI data measurement initiatives and the upcoming workshop on gender-affirming care for transgender and gender-diverse populations.

Vote

A motion to approve the midcourse review and recommendations of the *NIH Strategic Plan to Advance Research on the Health and Well-Being of Sexual and Gender Minorities, Fiscal Years 2021–2025* was forwarded and seconded. The motion passed with no abstentions.

XIII. CLOSING REMARKS

Dr. Eisinger thanked the Council members and presenters and encouraged attendees to stay safe. He noted that the next meeting of the Council is on May 11-12, 2023, and it would be convened virtually.

XIV. ADJOURNMENT

Dr. Eisinger adjourned the meeting at 2:00 p.m. on January 20, 2023.

XV. CERTIFICATION

I hereby certify that, to the best of my knowledge, the foregoing summary minutes are accurate and complete.

Robert W. Eisinger, Ph.D. Chair, NIH Council of Councils Acting Director, DPCPSI, OD, NIH	Date
Franziska B. Grieder, D.V.M., Ph.D. Executive Secretary, NIH Council of Councils Director, ORIP, DPCPSI, OD, NIH	Date